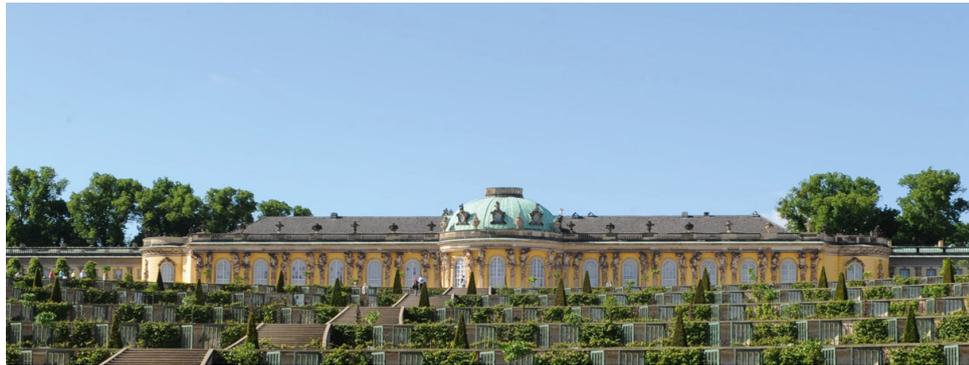




Universität Potsdam



Johannes Haack | Heike Wiese
Andreas Abraham | Christian Chiarcos (eds.)

Proceedings of
KogWis 2010

10th Biannual Meeting of the
German Society for Cognitive Science

Potsdam Cognitive Science Series | 2

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10. Tagung der Gesellschaft für Kognitionswissenschaft

Universitätsverlag Potsdam

Bibliografische Information der Deutschen Nationalbibliothek

Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über <http://dnb.d-nb.de/> abrufbar.



October, 3rd – 6th, 2010, Potsdam, Germany
Cognitive Sciences Area of Excellence, University of Potsdam

Universitätsverlag Potsdam 2010

<http://info.ub.uni-potsdam.de/verlag.htm>

Universitätsverlag Potsdam, Am Neuen Palais 10, 14469 Potsdam

Tel.: +49 (0)331 977 4623 / Fax: 3474

E-Mail: verlag@uni-potsdam.de

Die Schriftenreihe **Potsdam Cognitive Science Series** wird herausgegeben von Johannes Haack, Christiane Wotschack und Michael Dambacher

ISSN (print) 2190-4545

ISSN (online) 2190-4553

Das Manuskript ist urheberrechtlich geschützt.

Online veröffentlicht auf dem Publikationsserver der Universität Potsdam

URL <http://pub.ub.uni-potsdam.de/volltexte/2010/4605/>

URN <urn:nbn:de:kobv:517-opus-46055>

<http://nbn-resolving.de/urn:nbn:de:kobv:517-opus-46055>

Zugleich gedruckt erschienen im Universitätsverlag Potsdam

ISBN 978-3-86956-087-8

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KogWis 2010 is a bilingual conference, with English and German as conference languages. Accordingly, in this volume you will find abstracts in either language. The preface is in two versions, the German following the English one.

Die KogWis 2010 ist eine zweisprachige Tagung, Konferenzsprachen sind Englisch und Deutsch. Die Abstracts in diesem Band sind daher, wie die Beiträge, in jeweils einer der beiden Sprachen. Das Vorwort steht in zwei Versionen.

Preface

As the latest biannual meeting of the German Society for Cognitive Science (Gesellschaft für Kognitionswissenschaft, GK), KogWis 2010 at the University of Potsdam reflects the current trends in a fascinating domain of research concerned with human and artificial cognition and the interaction of mind and brain.

A wealth of experimental research, cognitive modelling, and conceptual analysis is integrated here in 4 plenary talks, 5 invited symposia, over 150 individual talks, 6 symposia, and more than 40 poster contributions.

When submitting their papers, authors could give (multiple) assignments of cognitive science partner disciplines for their contributions. The following table for the accepted papers gives an interesting insight into the connections between our program and the partner disciplines.

Cognitive Science Partner Discipline	Contributions
Psychology	113
Linguistics	58
Cognitive Neuroscience	46
Artificial Intelligence/Cognitive Systems	42
Philosophy	36
Human-Computer-Interaction	22
Neurobiology	5
Others	21

Table 1: Assignment of Partner Disciplines to Contributions through the Authors

The category “Others” also subsumes a number of contributions to “Cognitive Ethnology”, a subdiscipline that we are fortunate to host in the form of a special satellite workshop (organisers: Andrea Bender and Sieghard Beller, Freiburg). This means that all of the 6 partner disciplines of Tack (1994)’s¹ “Cognitive Hexagon” are represented here.

The Plenary talks provide a venue for questions of the numerical capacities and human arithmetic (Brian Butterworth), of the theoretical development of cognitive architectures and intelligent virtual agents (Pat Langley), of categorizations induced by linguistic constructions (Claudia Maienborn), and of a cross-level account of the “Self as a complex system“ (Paul Thagard).

We host a number of invited symposia, which bring together current research foci in cognitive science: the symposium “Complex Cognition” (organiser: Ute Schmid, Bamberg) is concerned with complex everyday actions, their cognitive modelling, and the development of cognitive assistance systems, the symposium “New Theories of Rationality” (organisers: Markus Knauff, Gießen, and Wolfgang Spohn, Konstanz) deals with the question what empirical findings from psychology can contribute to the development of normative theories of rationality. Further invited symposia reflect local and regional strengths of research in the Berlin-Brandenburg area: the two largest research fields of the university Cognitive Sciences Area of Excellence in Potsdam are represented by an invited symposium on “Information

¹ Tack, W. H. (1997). Kognitionswissenschaft: Eine Interdisziplin. *Kognitionswissenschaft*, 6:2-8.

Structure” (organisers: Gisbert Fanselow and Stavros Skopetea) by the Collaborative Research Centre (Sonderforschungsbereich, SFB) 632 of the same name, of the University of Potsdam and the Humboldt-University Berlin, and by a satellite conference of the research group “Mind and Brain Dynamics” (organisers: Ralf Engbert und Reinhold Kliegl). The Berlin School of Mind and Brain at the Humboldt-University Berlin takes part with an invited symposium on “Decision Making” from a perspective of cognitive neuroscience and philosophy (organisers: Michael Pauen and Ralf Stoecker), and the DFG Cluster of Excellence “Languages of Emotion” of Free University Berlin (organisers: Cora Kim and Christiane Wotschack) presents interdisciplinary research results in an invited symposium on “Symbolising Emotions”.

As organisers, we are especially happy to offer several satellite events associated with KogWis 2010 on Potsdam University’s Griebnitzsee Campus. This includes the two aforementioned events on “Cognitive Ethnology” and “Mind and Brain Dynamics” that will take place on the day before the main program in Griebnitzsee, as well as a kick-off workshop of the new DFG focus program “New Frameworks of Rationality” (organisers: Markus Knauff, Gießen, and Wolfgang Spohn, Konstanz) that will take place right after the conference.

As part of the German Cognitive Science Society’s support program for young researchers, there is also doctoral symposium as part of KogWis 2010 (organisers: Angela Schwering, Münster and Stefan Kopp, Bielefeld) that provides an opportunity for young cognitive science researchers to present their work.

We hope that KogWis 2010, in view of the breadth of partner disciplines involved, will contribute to further cross-disciplinary research, open new application perspectives, and at the same time support theoretical integration within a “Unified Theory of Cognition” in the sense, for instance, of Newell (1994) and Glenberg (2010).²

Acknowledgements

Organising a large academic conference is not possible without the ongoing collaborative support of a large team. We are particularly grateful to the members of the programme committee:

Ria de Bleser (University of Potsdam), Ralf Engbert (University of Potsdam), Christopher Habel (University of Hamburg), John-Dylan Haynes (Humboldt-University Berlin), Christoph Hoelscher (Albert-Ludwigs-University Freiburg), Reinhold Kliegl (University of Potsdam), Markus Knauff (Justus-Liebig-University Gießen), Stefan Kopp (University of Bielefeld), Michael Pauen (Humboldt-University Berlin), Torsten Schaub (University of Potsdam), Ute Schmid (Otto-Friedrich-University Bamberg), Angela Schwering (Westfalian Wilhelms-University Münster), Manfred Stede (University of Potsdam), Ralf Stoecker (University of Potsdam), Manfred Thüning (Technical University Berlin), Leon Urbas (Technical University Dresden), Shravan Vasishth (University of Potsdam), and Marianne Vater (University of Potsdam).

We would like to thank them for their active support in the development, preparation, and realisation of the conference as well as for their generously delegation of members of their scientific staff, which has established an organisational team whom we thank for their commitment and excellent work, and pleasant cooperation:

Andreas Abraham, Christian Chiarcos, Felix Engelmann, Ulrike Freywald, Julia Glahn, Annette Hohlfeld, Sarah Risse, Antje Sauermaun, and Wolfgang Severin.

² Newell, A. (1994). *Unified Theories of Cognition*. Harvard University Press, Cambridge, Mass.

Glenberg, A. (2010). Embodiment as a unifying perspective for psychology. *Wiley Interdisciplinary Reviews: Cognitive Science* 1(4):586-596.

An outstanding secretarial office has contributed to the successful planning of the conference and three satellite events. For this we are very grateful to Petra Köhler, Marina Kienitz, and Nicole Stietzel.

Special thanks also to the students and interns who helped us from the very beginning with dedication and diligence: Peter Haffke, Josephine Moritz, Lena Marie Olbrisch, Nora Olbrisch, and Renate Rutiku.

Additionally, the editors would like to thank a number of people who helped with the compilation of these proceedings and made it possible to get them out in time for the conference, namely Renate Rutiku, Nora Olbrisch, Felix Engelmann and Josephine Moritz. Many thanks to Peter Haffke for his irreplaceable assistance concerning the print version of these proceedings.

We are grateful to the Human Sciences Faculty and the Philosophical Faculty of the University of Potsdam and to the university Cognitive Sciences Area of Excellence for their generous financial support for planning and preparing the conference. The German Research Foundation (DFG) and the Potsdam University Society made it possible, through their financial support, to invite outstanding keynote speakers, who further contribute to the conference's scientific attraction. We thank our co-organisers UP TRANSFER, Gesellschaft für Wissens- und Technologietransfer mbH an der Universität Potsdam, who supported us in many ways.

We would like to thank the board of the German Society for Cognitive Science, and in particular its chair, Markus Knauff, for their valued cooperation throughout the conference design.

Then we would like to pay our especial thanks to all anonymous reviewers for their work, in particular for meeting the subtle challenges in evaluating cross-disciplinary contributions.

Last but not least, we thank all participants of KogWis 2010, who enrich the cognitive science discourse with their talks, their posters, their moderating, and their contributions to discussions.

Johannes Haack and Heike Wiese

Vorwort

Die KogWis 2010 an der Universität Potsdam bildet als Fachtagung der Gesellschaft für Kognitionswissenschaft die aktuellen Trends eines faszinierenden Forschungsgebiets ab, das sich mit menschlicher und künstlicher Kognition und dem Zusammenspiel von Geist und Gehirn befasst.

Die produktive Integration von experimenteller Forschung, kognitiver Modellierung und konzeptueller Analyse wird sowohl in 4 Hauptvorträgen und 5 eingeladenen Symposien als auch in über 150 Einzelvorträgen und etwa 40 Posterbeiträgen deutlich.

Bei der Einreichungen von Abstracts konnten Autor/inn/en der Beiträge (Mehrfach-Zuordnungen) von Teildisziplinen zu den von ihnen eingereichten Beiträgen machen. Tabelle 1 gibt einen interessanten Einblick in die Anschlussdichte zu den verschiedenen kognitionswissenschaftlichen Partnerdisziplinen.

Kognitionswissenschaftliche Partnerdisziplin	Beiträge
Psychologie	113
Linguistik	58
Kognitive Neurowissenschaft	46
Künstliche Intelligenz/Kognitive Systeme	42
Philosophie	36
Mensch-Computer-Interaktion	22
Neurobiologie	5
Andere	21

Tabelle 1: Zuordnung der Beiträge zu Partnerdisziplinen durch die Autor/inn/en

Unter der Kategorie „Andere“ sind unter anderem eine Reihe von Beiträgen zur „Kognitiven Ethnologie“ zu finden, die als Teildisziplin in Potsdam erfreulicherweise durch einen eigenen Satelliten-Workshop (Organisation: Andrea Bender und Sieghard Beller, Freiburg) vertreten ist. Damit sind alle in Tack (1994)³ beschriebenen 6 Partnerdisziplinen des „Kognitiven Sechsecks“ in Potsdam vertreten.

Die Plenarvorträge widmen sich Fragen numerischer Kognition und arithmetischen Denkens (Brian Butterworth), des theoretischen Entwicklungsstands kognitiver Architekturen und intelligenter virtueller Agentensysteme (Pat Langley), sprachlich induzierter Kategorisierungen (Claudia Maienborn) und eines Ebenen übergreifenden Ansatzes zum „Selbst als komplexem System“ (Paul Thagard).

Eine Reihe eingeladener Symposien bringt aktuelle Schwerpunkte der Kognitionswissenschaft zusammen: Das Symposium „Complex Cognition“ (Organisation: Ute Schmid, Bamberg) widmet sich der Erforschung komplexer Alltagshandlungen, ihrer kognitiven Modellierung und der Entwicklung kognitiver Assistenzsysteme, das Symposium zu „Neuen Theorien der Rationalität“ (Organisation: Markus Knauff, Gießen, und Wolfgang Spohn, Konstanz) befasst sich mit der Frage, was empirische Befunde aus der Psychologie zur Entwicklung normativer Theorien der Rationalität beitragen können. Weitere eingeladene

³ Tack, W. H. (1997). Kognitionswissenschaft: Eine Interdisziplin. *Kognitionswissenschaft*, 6:2-8.

Symposien setzen lokale und regionale Akzente der Wissenschaftslandschaft Berlin-Brandenburg: Die beiden größten profilbildenden Forschungsdomänen des lokalen Exzellenzbereichs Kognitionswissenschaften an der Universität Potsdam sind vertreten mit dem Themenbereich „Informationsstruktur“ (Organisation: Gisbert Fanselow und Stavros Skopetea) des gleichnamigen Sonderforschungsbereichs 632 der Universität Potsdam und der Humboldt-Universität Berlin und durch eine Satelliten-Konferenz der Forschergruppe „Mind and Brain Dynamics“ (Organisation: Ralf Engbert und Reinhold Kliegl). Die Berlin School of Mind and Brain an der Humboldt-Universität zu Berlin befasst sich aus neurowissenschaftlicher und philosophischer Perspektive in einem eingeladenen Symposium mit dem Thema „Decision Making“ (Organisation: Michael Pauen und Ralf Stoecker); der DFG-Exzellenzcluster „Languages of Emotion“ der Freien Universität Berlin (Organisation: Cora Kim und Christiane Wotschack) präsentiert interdisziplinäre Forschungsergebnisse in einem eingeladenen Symposium zu „Symbolising Emotions“.

Als Organisator/inn/en freuen wir uns besonders darüber, dass wir im Umfeld der KogWis 2010 auf dem Campus Griebnitzsee der Universität Potsdam mehrere Satellitenveranstaltungen anbieten können. Dazu gehört neben den beiden erwähnten Veranstaltungen zur „Kognitiven Ethnologie“ und zu „Mind and Brain Dynamics“, die am Vortag der KogWis in Griebnitzsee stattfinden, die Kick-Off-Tagung des neuen DFG-Schwerpunktprogramms „New Frameworks of Rationality“ (Organisation: Markus Knauff, Gießen, und Wolfgang Spohn, Konstanz), die direkt im Anschluss an die Tagung stattfinden wird.

Im Rahmen der Nachwuchsförderung der Gesellschaft für Kognitionswissenschaft wird darüber hinaus wie in den Vorjahren ein Doktorand/inn/en-Symposium im Vorprogramm veranstaltet (Organisation: Angela Schwering, Münster und Stefan Kopp, Bielefeld), in dem junge Kognitionswissenschaftler/innen die Gelegenheit zur Präsentation ihrer Forschungsarbeiten erhalten.

Wir hoffen, dass die KogWis 2010 angesichts der Vielfarbigkeit der unterschiedlichen Partnerdisziplinen zur weiteren disziplinübergreifenden Forschung beiträgt, neue Anwendungsperspektiven eröffnet und zugleich die theoretische Integration innerhalb einer „Unified Theory of Cognition“, etwa im Sinne von Newell (1994) und Glenberg (2010), fördert.⁴

Danksagung

Eine große wissenschaftliche Konferenz ist ohne das konstante Zusammenwirken eines großen Teams nie möglich. Unser besonderer Dank gilt den Mitgliedern des Programmkomitees:

Ria de Bleser (Universität Potsdam), Ralf Engbert (Universität Potsdam), Christopher Habel (Universität Hamburg), John-Dylan Haynes (Humboldt-Universität zu Berlin), Christoph Hoelscher (Albert-Ludwigs-Universität Freiburg), Reinhold Kliegl (Universität Potsdam), Markus Knauff (Justus-Liebig-Universität Gießen), Stefan Kopp (Universität Bielefeld), Michael Pauen (Humboldt-Universität zu Berlin), Torsten Schaub (Universität Potsdam), Ute Schmid (Otto-Friedrich-Universität Bamberg), Angela Schwering (Westfälische Wilhelms-Universität Münster), Manfred Stede (Universität Potsdam), Ralf Stoecker (Universität Potsdam), Manfred Thüning (Technische Universität Berlin), Leon Urbas (Technische Universität Dresden), Shrvan Vasisht (Universität Potsdam) und Marianne Vater (Universität Potsdam).

⁴ Newell, A. (1994). *Unified Theories of Cognition*. Harvard University Press, Cambridge, Mass.
Glenberg, A. (2010). Embodiment as a unifying perspective for psychology. *Wiley Interdisciplinary Reviews: Cognitive Science* 1(4):586-596.

Unser Dank gilt der tatkräftigen Unterstützung bei Konzeption, Vorbereitung und Durchführung der Konferenz ebenso wie der großzügigen Delegation von wissenschaftlichen Mitarbeiter/inne/n, durch die ein herausragendes Organisationsteam geschaffen werden konnte, dem wir für unermüdlichen Einsatz, kompetente Arbeit und ein angenehmes Arbeitsklima danken:

Andreas Abraham, Christian Chiarcos, Felix Engelmann, Ulrike Freywald, Julia Glahn, Annette Hohlfeld, Sarah Risse, Antje Sauer mann und Wolfgang Severin.

Zum guten Gelingen der umfangreichen Konferenzplanung mit drei Satellitentagungen hat ein hervorragendes Konferenzsekretariat beigetragen. Wir bedanken uns dafür ausdrücklich bei Petra Köhler, Marina Kienitz und Nicole Stietzel.

Ein besonderer Dank gilt auch den studentischen Hilfskräften und Praktikant/inn/en, die uns seit den ersten Planungsschritten in vielen Herausforderungen tatkräftig und umsichtig unterstützt haben: Peter Haffke, Josephine Moritz, Lena Marie Olbrisch, Nora Olbrisch und Renate Rutiku.

Die Herausgeber des vorliegenden Abstractbandes möchten darüber hinaus noch einmal gesondert all jenen danken, die an der Erstellung dieses Bandes beteiligt waren, insbesondere Renate Rutiku, Nora Olbrisch, Felix Engelmann und Josephine Moritz. Zudem danken wir Peter Haffke ausdrücklich für seine Hilfe bei der Erstellung der Druckversion dieses Abstractbandes.

Bei der Humanwissenschaftlichen und der Philosophischen Fakultät und dem lokalen Exzellenzbereich Kognitionswissenschaften der Universität Potsdam bedanken wir uns für die großzügige finanzielle Unterstützung im Vorfeld der Tagungsplanung. Die Deutsche Forschungsgemeinschaft und die Universitätsgesellschaft Potsdam e.V. haben uns durch ihre finanziellen Mittel die Einladung von renommierten Haupt sprecher/inne/n ermöglicht, die zur wissenschaftlichen Attraktivität der Tagung beitragen. Wir danken UP TRANSFER, der Gesellschaft für Wissens- und Technologietransfer mbH an der Universität Potsdam, die uns als Mitveranstalter der Tagung in vielerlei Hinsicht unterstützt haben.

Dem Vorstand der Gesellschaft für Kognitionswissenschaft e.V., besonders dem Vorsitzenden, Markus Knauff, danken wir für die vertrauensvolle Zusammenarbeit in allen Phasen der Entwicklung unseres Tagungskonzepts.

Abschließend möchten wir allen anonymen Gutachtern einen besonderen Dank für ihre Arbeit aussprechen, besonders für die Annahme der subtilen Herausforderungen bei der Beurteilung disziplinüberschreitender Beiträge.

Nicht zuletzt sei allen Teilnehmer/inne/n der KogWis 2010 gedankt, die durch ihre Vorträge, Poster, Moderationstätigkeiten und Diskussionsbeiträge den kognitionswissenschaftlichen Diskurs beflügeln.

Johannes Haack und Heike Wiese

**Plenary Talks /
Eingeladene Vorträge**

Stability and Change in Basic Numerical Capacities and the Foundations of Arithmetic

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It is now widely accepted that humans inherit specific capacities for processing quantity information. However, there are two important unresolved issues. The first concerns the nature of the capacity that underlies the development of human arithmetic, which may be termed the “foundational capacity”. Even if we allow that we inherit a capacity to represent and process exact numerosities, or a capacity to represent and process approximate numerosities, or a capacity to represent continuous quantity, or all three, it is still critical to determine which of these is foundational. The second issue concerns how a deficit in basic capacities can give rise to developmental dyscalculia, a selective disorder of learning arithmetic.

Cognitive Architectures and Virtual Intelligent Agents

Pat Langley

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In this talk I review the notion of cognitive architectures as unified theories of cognition and the role of such frameworks in building virtual agents that exhibit intelligent behavior. I present one such architecture, Icarus, that combines ideas from a number of traditions. Icarus shares some core assumptions with older theories, but it also makes distinctive claims about the hierarchical organization of memory, the difference between concepts and skills, and relationships among inference, execution, problem solving, and learning. In addition to incorporating many ideas from cognitive psychology, Icarus also borrows from work on logic and reactive control. The architecture has a strong emphasis on embodied behavior, which in turn makes it a natural candidate for constructing virtual agents that operate in synthetic environments. I report our experiences with Icarus agents in a number of settings, including an urban driving testbed and a simulated playground. I also report recent revisions to the architecture that have been driven by efforts to model key aspects of social cognition.

This talk describes joint work with Will Bridewell, Dongkyu Choi, Glenn Iba, Tolga Konik, Nan Li, Daniel Shapiro, David Stracuzzi, and Nishant Trivedi.

Linguistically Induced ad hoc Categorization

Claudia Maienborn

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Key words: linguistic cognition; ad hoc categorization; concept combination; adjectival passive; eventive modifiers; semantics/pragmatics interface.

Linguistic as well as non-linguistic cognitive processes are based on categorization. Grouping things together and identifying them as being instances of a certain category is a prerequisite for interacting with and talking about our environment. As has been prominently stressed by Barsalou (1991), categorization may also take place ad hoc, creating new, possibly complex, goal-derived categories that take into account more or less particular, contextually salient demands. Yet, comparatively little is known about (a) the emergent properties of such ad hoc categories resulting from concept combination (e.g., Connolly et al., 2007) and (b) productive linguistic means for expressing ad hoc categorization.

In my talk I will present the case of adjectival passives as a probe into linguistically induced ad hoc categorization. Adjectival passivization as illustrated by the examples in (1) will be analyzed as a productive grammatical means of creating potentially new ad hoc properties based on the verbal event, by which the subject referent is categorized according to contextually salient goals; see Maienborn (2009).

- (1) a. Phoenix Partners are certified and consistently successful.
- b. Juice is a little pricy but it is hand-squeezed, organic, and delicious.
- c. Each chapter is written by an expert and well-edited.

Besides simple forms such as (1a), the grammar has both morphological (1b) as well as syntactic (1c) means for adding complexity to this event-based ad hoc property formation. I will present the results of several experimental studies that we have conducted in order to determine the grammatical and pragmatic conditions on the interpretation of adjectival passives (i.a., Stolterfoht et al., 2010) and discuss their implications for the understanding of event-based property ascriptions within an experiential-simulations account of linguistic and non-linguistic cognition; see Kaup et al. (2010) and Kukina & Claus (2010).

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Who Are You? The Self as a Complex System

Paul Thagard

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This talk proposes a theory of the self as a multilevel system consisting of social, psychological, neural, and molecular mechanisms. This theory provides integrated explanations of many phenomena concerning how people represent, control, and change themselves. The multilevel system account of the self provides a scientific alternative to transcendental and deflationary views favored by many philosophers. More than sixty aspects of the self divide naturally into nine groups, and multilevel accounts can be given for: self-concepts, self-consciousness, self-deception, self-presentation, self-criticism, self-esteem, self-affirmation, self-regulation, and self-development. In place of reductionist and holistic approaches to cognitive science, this talk advocates a method of multilevel interacting mechanisms.

Invited Symposia / Eingeladene Symposien

Invited Symposium

Optionality of Information Structure

Organisation: Gisbert Fanselow, Stavros Skopeteas

Potsdam University, Germany; Humboldt-University Berlin, Germany, Collaborative Research Centre (“Sonderforschungsbereich”, SFB) 632 “Information Structure: The linguistic means for structuring utterances, sentences and texts”

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Keywords: information structure, optionality, focus, topicalisation, cleft, movement, prosody

Theories of information structure are often based on the assumption that information structural concepts such as 'focus' and 'topic' are associated with certain properties of linguistic expression such as movement operations or maximal prosodic prominence. These assumptions are challenged by the observation that the properties of expression at issue optionally occur (e.g., focus does not always involve overt movement). These mismatches motivate an array of theoretical options, ranging from the refinement of the information structural concepts to the assumption of an indirect correlation between information structure and grammar. Aim of this symposium is to discuss the empirical phenomenon of optionality and its theoretical implications.

Craige Roberts Resolving Focus

The relationship between prosody and pragmatic Focus in English is complex and indirect, involving a confluence of presuppositions. As with presupposition resolution generally, the challenge is to understand how contextual factors interact with linguistic triggers to permit an addressee to grasp the intended presupposition(s). Two central factors interact in prosodic accentuation: On the one hand, there is a congruence requirement on prosody, so that greatest prominence within an utterance must correspond to some set of maximally salient alternatives; this is in keeping with the central thrust of the work by Jackendoff (1972), Selkirk (1984, 1996), Rooth (1985, 1992), and others. On the other, there is the creation of a sort of bas-relief, wherein non-accentuation reduces constituents of the utterance which can be retrieved from prior context, thereby triggering a presupposition to that effect (Schwarzschild, 1999; Kadmon, 2000). Though the two factors are near-complements, they are reflected in independent principles; this gives rise to complex interactions, including reduced

subconstituents of otherwise prominent Foci. To capture the felicity conditions on such reduction, I offer an alternative to Schwarzschild's GIVENNESS and Kadmon's EXPECTEDNESS which is shown to improve empirical coverage: The proposed RETRIEVABILITY constraint on felicitous lack of accent is the same as the core constraint on both nominal anaphora and a variety of ellipses; so that it is independently motivated. A Focus Congruence Constraint which echoes the STRESS-FOCUS constraint of Féry and Samek-Lodovici (2006) captures the congruence requirement. However, in the present theory there is no need to stipulate an ordering among the principles involved: Priorities fall out from the character of the principles themselves and their interaction with the larger pragmatic theory in which this proposal is embedded.

Shravan Vasishth and Rukshin Shaher

Clefting and Left-dislocated Topicalization in Hindi: Evidence for the Retrieval Advantage

We present three eyetracking studies which present new evidence that clefting and left-dislocation (LD) facilitate retrieval. We looked at how clefting and LD of an antecedent affects pronoun resolution. Hindi has a gender neutral pronoun, which in our experiments could have one of two possible antecedents from a previous sentence. The antecedent was either clefted or not, or left-dislocated or not; in addition, the antecedent was either the subject or object of the preceding sentence.

In a reading study on clefting, we replicated the retrieval advantage previously found in Vasishth et al (2010a, 2010b). Our results reveal a recency effect such that the pronoun preferentially resolves to the last mentioned noun phrase. We did not find any effect of clefting at the pronoun, which occurred in the following sentence, suggesting that the advantage due to clefting is short-lived (intrasentential).

To further explore the extent of this retrieval advantage, we conducted two visual world studies. In contrast to the reading study, we found a significant preference to resolve the ambiguous pronoun to the first noun in the preceding sentence. In addition, we found an effect on the pronoun in the following sentence (a long-lived advantage).

In sum, we present evidence that syntactic information-structure markers may cause a long-lived facilitation in processing. We discuss the implications for theories of how syntactically prominent elements are stored in working memory.

Gisbert Fanselow and Stavros Skopeteas

Focus in Verb-final Languages

Verb-final languages are known to have a general preference for placing the focused constituent to a position that is immediately adjacent to the verb. Beyond this general tendency, individual V-final languages allow for additional options: Turkish allows for focus in situ, Georgian displays an option of postverbal focus, and Armenian allows for all these possibilities. Our talk presents evidence that the array of focus realizations depends on configurational properties of the languages at issue that are independent from information structure.

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Invited Symposium

Symbolizing Emotions

Organisation: Cora Kim and Christiane Wotschack

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Keywords: language, emotion, affectivity, vocabulary, prosody, word processing, picture processing

In the introduction to the Symposium “Symbolizing Emotions” the five cluster projects to be presented within this symposium will be situated in the context of the clusters’ research program which focuses on the interdependencies between symbolic practices and affect. It appears to be a distinctive feature of the ways symbolic and emotional practices interact in human communication that these practices apply not just to real phenomena, but also to imaginary constructions. The cluster investigates throughout its research areas the forms and functions of configurations of emotion, symbolic practices, and imaginary (fictive) phenomena, especially in the realms of language and the arts. Research in the four areas of the cluster examine

- the relations between affective phenomena and various representational media (language, sound, image)
- the artistic practices and poetics of (re)presenting/shaping emotions
- the correlations between emotional and linguistic competencies (and their disorders) and
- the modes of emotion modeling at the level of cultural codes and patterns of social behavior.

The clusters' research intends to contribute to the development of adequate theoretical models of language, symbolic practices and affect, which is imperative because theories of language and symbolic practices in general tend to ignore affectivity: The most widely discussed models of emotion in more recent psychology and neuroscience tend to disregard the role of language as well as of other cultural sign systems. Conversely, the current language models in modern linguistics say little or nothing about emotional processes. The cluster aims to reverse this trend.

Lorna Schlochtermeyer, Lars Kuchinke and Arthur Jacobs
Processing Emotional Pictures and Words

Neuroscientific investigations regarding aspects of emotional experiences mainly focus on one stimulus modality. Hence, relatively little is known about the distinct contributions of different modalities of emotional stimuli, and the thus resulting similarities and differences in emotional processing.

The comparison of verbal and pictorial emotional stimuli often reveals a processing advantage of emotional pictures in terms of larger or more pronounced emotion effects evoked by pictorial stimuli. Kensinger and Schacter (2006) showed in their fMRI study that, while emotional arousal elicited comparable effects in both modalities, emotional valence is associated with greater activations in extra-striatal and prefrontal regions when processing emotional pictures. In the present studies we examined whether this picture advantage might at least partially be referred to differences in complexity between pictures and words or whether it refers to more general processing differences across the modalities.

Therefore, we developed a new stimulus database comprising valence and arousal ratings for more than 200 concrete objects representable in four different modalities including different levels of visual complexity: words, phrases, pictograms, and photographs. Using EEG and fMRI we studied the dynamic aspects and their associated neural basis when processing these emotional stimuli in a valence judgment task (while the stimulus material was controlled for differences in emotional arousal). The results reveal sustained emotional processing for words compared to pictograms in later processing stages, and an independency of stimulus complexity for prefrontal and limbic activations. Thus, the results reveal a picture of common emotion effects that cannot solely be attributed to the stimuli's complexity – neither can it be attributed to the central distinction between verbal and pictorial material. It rather points to specific advantages in lexico-semantic processing in the respective modalities.

Sonja A. Kotz, Tim Raettig, Martin von Koppenfels and Winfried Menninghaus
Rhythmic Language and Emotion

Stylized rhythmical patterns are one of the defining features of classical poetry and play a significant role in the production and perception of emotional prosody. Thus, rhythmic speech has an impact on both the cognitive and the emotional reception of poems. At a cognitive level, rhythmic features correlate positively with the ease of understanding and memorizing poetry. In addition, rhythmicity can enhance context-dependent perception of emotional content.

Utilizing behavioral paradigms as well as event-related potentials (ERPs) and functional magnetic resonance imaging (fMRI), we are empirically investigating the impact of different relations between context and rhythm on the processing of affective speech in poetry. To this end, we selected a set of stimuli consisting of 30 short stanzas (4 verses each) taken from classical poetic texts, containing both rhyme and rhythmic regularity (+rhythm, +rhyme). We then created 3 additional versions of each stimulus (+rhythm, -rhyme; -rhythm, +rhyme; -rhythm, -rhyme) and generated an analogous set of pseudo-word poems without lexical-semantic content.

In two rating studies we were able to show that both rhythmic regularity and rhyme influence aesthetic and emotional processing of poetry. Study 2 in particular yielded highly relevant results, indicating that the presence of rhyme and rhythm led to increased levels of both aesthetic appreciation and perceived emotional intensity. Similar effects were replicated in an ERP study. fMRI data acquisition is currently underway. Here, we predict that rhythm as a component of prosody will elicit brain activations in a right-lateralized inferior-temporal network. In addition, we expect that rhythmically regular poems will elicit a hemodynamic response in the reward network (orbito-frontal cortex, ventral striatum, amygdala) when compared to rhythmically irregular poems.

Markus Conrad, Guillermo Recio, Hauke Blume, David Schmidtke, Arthur Jacobs and Gisela Klann-Delius
Multilingualism and Emotional Effects during the Reading Process in Different Languages

The project „Multilingualism and emotional effects during the reading process in different languages“ (Languages of Emotion, FU Berlin) investigates whether the processing of emotional content of linguistic material in L2 is – in general- comparable to that of L1 processing.

We are also interested in the documentation of differential emotional connotations of comparable concepts across different language systems, and focus our research on the consequences of such phenomena for bilingual language processing.

To be able to address these research questions we have extended existing normative databases providing rating values for emotional dimensions of words (valence, arousal, imageability) to a shared common base of more than 5,000 English, German and Spanish words.

We present data from two lexical decision ERP studies using words from these databases, the size and range of which enabled us to address the following phenomena:

1. In a 3 x 3 design crossing the factors valence and arousal for German words the classical ERP effect for word valence proved to systematically interact with effects for the arousal level of our stimuli.
2. In another study using a word valence manipulation for German and Spanish words presented to second language learners from the two respective countries in both L1 and L2 context, ERPs revealed
 - a) A sensitivity to valence indicating an automatic processing of emotional content not only in first but also in second language processing
 - b) Differential valence-related effects for semantically comparable material in the respective first language context showing a positivity bias for Spanish but a negativity bias for German native speakers.

Dana Marinos and Michaela Schmitz

How does Emotional Prosody Influence Word Learning in Young Children and Adults?

The question whether and how emotional prosody influences speech processing is in the focus of recent research. We are the first to address this question with respect to word learning in a study with 14-, 20-, and 26-month-old children and an adult control group. Using a combination of a non-behavioral training phase (recording event-related brain potentials) and a behavioral test phase (an object-selection task), we investigated word learning in two affect conditions: positive and neutral. We hypothesized that word learning would be enhanced in the positive affect condition compared to the neutral affect condition, at least in younger children. During the training phase, the participants were repeatedly presented with pairs of novel objects and novel words. Half of the words were spoken with neutral intonation (i.e., like a news speaker) and half of the words with positive intonation (“happy speech”). This training phase was followed by an object-selection task to evaluate word learning. The object-selection task was repeated one day later to investigate long term memory effects. The data of the behavioral test show an age-dependent development which relates to general word learning capacities, and in which the influence of positive affect seems to be most prominent in the 20-month-olds. The data of the event-related potentials show a difference between children and adults in the positive affect condition, but not in the neutral affect condition. In the neutral condition we find in both groups an N400 priming effect which represents word learning. This effect is missing in the positive condition in the children’s data. Thus, the positive prosody seems to have an effect on word learning, as the behavioural data show, and it influences the electrophysiological semantic processing in children.

Christiane Wotschack and Gisela Klann-Delius

Verbal Expression of Emotion in Alexithymia

The term alexithymia means ‘no words for feelings’ and refers to a personality trait characterized by difficulties in experiencing, regulating and verbalizing emotions. The language of alexithymic persons has generally been described as flat and humor-less and subjects are characterized by cognitive, operative thinking. Though a symbolization deficit has been viewed as a core problem in the multifaceted construct of alexithymia, only a few studies examined verbal emotional expressiveness in alexithymic persons. So far, there is no detailed analysis of the verbal means used by alexithymic persons to refer to emotions that goes beyond the analysis of terms denoting emotions. Furthermore, samples investigated in former studies have rarely been controlled for mental health or psychiatric disorders that limits the interpretations related to the validity of the alexithymia construct. It is open to debate if the characteristics of the language in alexithymia originate in a deficit in emotion vocabulary, e.g. a restricted variability of the emotion lexicon, or if there is a general deficit in the verbal expression of emotion and the usage of emotion terms. In a study with 30 healthy alexithymic persons and 30 control persons, semi-standardized interviews covering emotional topics were conducted and narratives were elicited. The verbal emotional expressiveness was analyzed for proportion of emotion words, implicitly and figuratively encoded affect. The quality of narratives was further evaluated with respect to the completeness of the narrative structure, the occurrence of evaluation, and forms of perspective taking. Results of group differences will be presented and discussed with regard to facets of the alexithymia construct.

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Invited Symposium

Decisions: Perspectives from Philosophy, Neuropsychology and Cognitive Science

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Keywords: free will, decision making, willpower, obsessive-compulsive disorder, control-dilemma

Philosophy, neuropsychology and cognitive science have made significant advances in understanding decisions. Neuropsychologists are studying decision-making processes in healthy subjects and subjects suffering from a variety of disorders. The results both seem to call into question widespread common sense assumptions (e.g. free will) and deepen our understanding of how decision-making patterns differ in certain psychological disorders (e.g. in the case of OCD). In addition, new evidence also helps to explain our complex ability of decision-making by modeling the nature and influence of willpower on decision-making and the way in which subjects solve ubiquitous control dilemmas.

John-Dylan Haynes

Unconscious Neural Determinants of "Free" Will

It is a common folk-psychological intuition that we can freely choose between different behavioural options. Neuroscientific experiments challenge this view as they have shown that it is possible to predict the outcome of a decision up to several seconds before a person is aware of how they are going to decide. This lecture will give an overview of the neuroscientific work on free choices while at the same time clarifying which important questions are still open and need to be addressed in future research. Then it will delineate the consequences these findings have for concepts of free will. In particular it will become apparent that neuroscience mainly challenges the folk-psychological intuition of free will by providing first-person experiences of one's unexpected predictability.

Henrik Walter
Decision Making and the Concept of Willpower

Conscious and deliberate decisions often are hierarchically nested, i.e. decisions depend on prior, higher order intentions (HOI). In order to make decisions consistent with HOIs it is necessary to include the latter in the decision process, shield them from distractions, give priority to them, and not to easily revise them in case of conflicts or temptations. This effortful capacity is also known as willpower, e.g. the quantitative aspects of volition that has been reemerged within psychology and cognitive neuroscience as a subject of interest. I will review recent attempts to measure willpower with neurocognitive methods, give examples from our own research on emotion regulation, and discuss some of the challenges the concept of willpower poses for decision making.

Norbert Kathmann
What is Abnormal in Decision Making of Individuals with Obsessive-compulsive Disorder?

Obsessive-compulsive disorder (OCD) leads to difficulties in making efficient and adequate decisions. Patients are indecisive, inflexible, and repeat actions in an agonizing manner. We studied decision behavior and its psychophysiological correlates in OCD patients and healthy control samples. In a probabilistic learning and selection task (Frank et al., 2004) using combined EEG/fMRI recordings, patients were better in avoiding suboptimal than in selecting optimal choices. In a reversal task requiring reward contingency updates, OCD patients performed worse compared to controls indicating reduced flexibility. These results point to an alteration of OCD patients in processing external feedback during reward-based decision tasks. In other studies analyzing EEG responses to self-generated erroneous actions (error related negativity, ERN), OCD patients showed larger ERN amplitudes (Endrass et al., 2008), suggesting overactive internal monitoring processes. It is concluded that alterations in response monitoring and feedback processing might account for the tendency of OCD patients to avoid risky choices and instead to repeat seemingly safe actions.

Thomas Goschke, Stefan Scherbaum, Maja Dshemuchadse, Stefanie Beck, Hannes Ruge and Rico Fischer
Decisions under Conflict: Control Dilemmas and the Dynamics of Action Selection

Organisms pursuing goal-directed action face control dilemmas, for instance, to shield a goal from distraction vs. to flexibly switch between goals in response to significant changes (stability-flexibility-dilemma); or to choose between smaller but immediately available vs. later but larger rewards (intertemporal choice dilemma). Little is known about how such control dilemmas are solved and how agents select among complementary cognitive control operations. I will present experiments from our lab in which we combined choice-reaction and decision-making tasks with continuous measures to assess the dynamics of action selection under conflict and the adjustment of cognitive control to changing task demands.

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Invited Symposium

Complex Cognition

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Dealing with complexity has become one of the great challenges for modern information societies. To reason and decide, plan and act in complex domains is no longer limited to highly specialized professionals in restricted areas such as medical diagnosis, controlling technical processes, or serious game playing. Complexity has reached everyday life and affects people in such mundane activities as buying a train ticket, investing money, or connecting a home desktop to the internet.

We will characterize a cognitive process as complex if at least one of the following conditions holds: (1) The domain is complex due to no full observability of states, non-deterministic outcome of actions, internal dynamic, or underspecified goals. (2) Emotional or motivational processes are considered as modulating, triggering or influencing cognitive states. (3) At least two of the following cognitive processes are involved in generating system response: decision making, reasoning, planning, problem solving, learning, language understanding, perception.

Examples for research topics of relevance to complex cognition are: reasoning in complex domains, learning from problem solving experience, planning and problem solving in dynamic environments, automated decision making or cognitive assistance systems. To develop intelligent support technology basic research of complex cognitive systems is needed. Insights in cognitive structures and processes underlying successful human reasoning and planning can provide suggestions for algorithm design. Insights in restrictions, typical errors and misconceptions can provide information about that parts of a complex task from which the human should be relieved. The development of formal and cognitive models for various aspects of complex cognition can provide further insight about the mechanisms underlying

complex cognition as well as provide the basic building blocks for intelligent support technology.

Kai-Uwe Kühnberger

Remarks on the Dynamics of Theory Blending

Based on work by Rosch, Lakoff, and Fauconnier it was Joseph Goguen who proposed the so-called Unified Concept Theory as an approach towards concept blending. Although some algorithmic aspects can be found in Goguen's work, the theory itself leaves it rather unclear how the blends of two given concepts are algorithmically computed. An alternative approach is proposed that is based on the analogy making framework heuristic-driven theory projection (HDTP). The crucial ideas of computing analogies with HDTP and an application to the computation of mathematical metaphors will be presented.

Claus Möbus

Modeling Complex Real-Time Behavior and Planning of Interventions by Counterfactual Reasoning with Bayesian Models

Bayesian Autonomous Driver (BAD) models are presented which implement the sensory-motor system of human drivers in a psychological motivated mixture-of-behaviors (MoB) architecture with autonomous and goal-based attention allocation processes. A MoB model is able to decompose complex skills into basic skills and to compose the expertise to drive complex maneuvers from basic behaviors. The type of model chosen is a dynamic Bayesian network (DBN). We demonstrate with examples that the DBN-based BAD-MoB-Model has the ability to predict agent's behavior, to abduct hazardous situations (what could have been the initial situation), to generate anticipatory plans and control, and to plan counteractive measures by simulating counterfactual behaviors or actions preventing hazardous situations.

Pat Langley

A Testbed for Research on Complex Cognition

One factor discouraging research on complex cognition has been the lack of accessible testbeds that provide challenge problems and support empirical evaluation. This talk describes a new testbed in which a simulated embodied agent must carry out a series of increasingly complex tasks. Early problems involve the execution of simple action sequences but later ones require conditional action, multi-step reasoning, and problem solving. The most complex tasks involve communicating with other agents and coordinating actions to achieve common goals. Both people and computer programs can control the simulated agents, enabling studies of human and machine behavior on the same tasks. The challenging character of these problems, combined with the testbed's accessibility, should foster research on the important topic of complex cognition.

Dietrich Dörner**Acting in Complex Domains and Consciousness**

The result of an analysis of the mistakes and errors when acting in very complex domains unveils that the same types of errors can be found again and again. The mistakes are – with only few exceptions always rather similar. Common error types are "excessive generalisation", "actionism" and "excessive analysis", which will be characterized and illustrated. To avoid these errors it is necessary to self-reflect frequently and regularly ones own stream of thought and decision-making with the purpose of identifying the "true" reason for a decision and of identifying inappropriate forms of thinking and reasoning. Although this is quite clear, self reflection is hardly ever encountered when thinking and decision making in complex domains is analyzed. Reasons for avoidance of self reflection are discussed.

Invited Symposium

Neue Theorien der Rationalität

Organisation: Wolfgang Spohn¹, Markus Knauff²

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Das Ziel des Symposiums ist es, einen neuen Diskurs zwischen Psychologen und Philosophen über die Eigenschaften menschlicher Rationalität zu etablieren. Aus unserer Sicht ist das Fehlen einer solchen Interaktion zwischen empirischen und normativen Theorien der Rationalität anachronistisch. Wir sind überzeugt, dass, wenn ein adäquater Begriff von Rationalität angenommen wird, die Behauptung, dass Menschen an sich "irrational" oder "unlogisch" seien, in Frage gestellt wird. Für uns ist die Frage "Was ist rational?" und nicht "Sind wir rational?" Das Symposium soll deshalb den Wert der bisherigen normativen Theorien der Rationalität für die Modellierung alltäglichen menschlichen Denkens und Entscheidens untersuchen und zugleich der Frage nachgehen, was empirische Befunde aus der Psychologie zur Entwicklung normativer Theorien der Rationalität beitragen können. Ein solcher Diskurs zwischen Psychologie und Philosophie, so glauben wir, fördert die nachhaltige Verbindungen zwischen den beiden Disziplinen und ein neues Verständnis von menschlicher Rationalität.

Das Symposium steht in Verbindung zu dem gerade von der DFG neu eingerichteten Schwerpunktprogramm SPP 1516 „New Frameworks of Rationality“. Für potentielle Antragsteller findet ein Kick-off Workshop zu dem SPP direkt im Anschluss an die Kogwis am 07. und 08.10. statt.

Igor Douven

Lernen Konditionaler Information

Stichworte: Linguistik, Philosophie; Konditionale, Bayesianische Bestätigungstheorie, Konditionalisierung

Einige Informationen erhalten wir in konditionaler Form. So lernen wir zum Beispiel, dass wenn es weiterhin regnet, das Spiel morgen abgesagt wird oder dass wenn die Emission von Treibhausgasen nicht zurückgeht, mit Wüstenbildungen in Teilen Europas zu rechnen ist. Wie sollte man den eigenen Glauben updaten, falls man Informationen dieser Art erhält? Gegeben die Bayesianische Bestätigungstheorie ist im Großen und Ganzen eine adäquate normative Lerntheorie, kann diese Frage wie folgt umformuliert werden: Wie soll man die eigenen (subjektiven) Wahrscheinlichkeiten updaten nachdem man konditionale Information erhalten hat? Es ist verwunderlich, dass dieser Frage in der Bayesianischen Literatur bisher wenig Aufmerksamkeit geschenkt wurde. Nach Standard Bayesianischer Auffassung sollen wir nach dem Erhalten von einer Information so updaten, dass wir auf sie konditionalisieren. Doch wie Brian Skyrms anmerkt: „wir haben keine genaue Vorstellung davon wie man auf ein Konditional zu konditionalisieren vermag“. In der Präsentation möchte ich innerhalb des Bayesianischen Rahmens bestimmte normative Einschränkungen zum Umgang mit konditionaler Information vorschlagen. Ich argumentiere dafür, dass, zumindest für eine große Klasse von Konditionalen, der Umgang mit dem Lernen von Konditionalen auf Überlegungen zu Erklärungszusammenhängen beruhen sollte.

Klaus Fiedler

Das Konzept der Rationalität aus der kognitiv-ökologischen Perspektive der Urteils- und Entscheidungsforschung

Stichworte: Psychologie; Rationalität, Stichprobenfehler, kognitiv-ökologischer Ansatz

In der Psychologie findet die Rationalitätsdebatte hauptsächlich in der Urteils- und Entscheidungsforschung statt, die in den letzten Jahrzehnten von dem alles dominierenden Forschungsprogramm über Heuristiken und Illusionen geprägt war. Typisch für dieses Paradigma ist die interne Attribution von Simon's Idee der „bounded rationality“, welche durchweg durch die begrenzte Kapazität oder Motivation des Individuums erklärt wird. Unabhängig davon, ob Heuristiken als fehlerhaft und faul, oder als „fast and frugal“ interpretiert werden, scheint der Schlüssel für rationales Verhalten in der Auswahl und Anwendung geeigneter Heuristiken auf die gegebenen Informationen zu liegen. Diese „fundamentale Attributionsneigung“ im theoretischen Denken der Wissenschaftler wird durch den kognitiv-ökologischen Ansatz in Frage gestellt. Dieser in den letzten Jahren entstandene Ansatz bietet alternative Erklärungen für eine ganze Vielzahl von Illusionen und Verstößen gegen rationale Normen. Als fehlerhaft und verzerrt erweisen sich demnach häufig nicht die kognitiven Algorithmen, die auf die gegebene Information angewandt werden. Die Ursache für irrationales Urteilen und Entscheiden liegt vielmehr darin, dass die von der Umwelt angebotenen Informationen bereits fatale Stichprobenfehler in sich tragen. Über Rationalität wird also oftmals schon durch ökologische Stichprobenprozesse entschieden, bevor die kognitiven Prozesse des Individuums überhaupt ins Spiel kommen. Eine wichtige Implikation

dieses Ansatzes ist, dass Coherence und Correspondence allein keine Rationalität begründen. Diese hängt vielmehr entscheidend von der meta-kognitiven Überwachung und Kontrolle ökologischer Verzerrungen durch das Individuum ab („meta-cognitive myopia“).

Niki Pfeifer

Wahrscheinlichkeitslogik als Rationalitätsnorm

Stichworte: Künstliche Intelligenz/Kognitive Systeme, Philosophie, Psychologie; Rationalität, Wahrscheinlichkeitslogik, Denken

Seit den ersten experimentalpsychologischen Arbeiten von Gustav Störring (1908) wurde die Rationalität menschlicher Schlussfolgerungen mithilfe der klassischen Logik bewertet. Typische Deduktionsaufgaben (Wasons Wahlaufgabe, konditionale bzw. kategoriale Syllogismen) sowie die einflussreichsten Theorien des schlussfolgernden Denkens (Mentale Modelle, Mentale Regeln) wurden vor dem Hintergrund der klassischen Logik entwickelt. Wenn Probanden von aussagen- oder prädikatenlogischen Vorhersagen abwichen, wurden ihre Schlussfolgerungen als "irrational" bewertet. Ob Logik eine angemessene Rationalitätsnorm ist, wurde in der Psychologie des schlussfolgernden Denkens im letzten Jahrzehnt stark hinterfragt. Hauptkritikpunkte umfassen die Monotonie-Eigenschaft, die Interpretation von Konditionalen, die Paradoxien des materialen Konditionals sowie die Tatsache, dass Prämissen oft mit Unsicherheit behaftet sind. In meinem Vortrag stelle ich jüngere probabilistische Rationalitätsnormen vor. Ich werde für eine kohärenz-basierte Wahrscheinlichkeitslogik argumentieren und zeigen, wie diese die genannten Probleme der Logik zu vermeiden. Weiters werde ich wahrscheinlichkeitslogische Versionen von Argumentformen (wie dem Modus Ponens) vorstellen sowie deren Eigenschaften diskutieren. Die daraus resultierenden psychologischen Vorhersagen werde ich mithilfe von ausgewählten Experimenten illustrieren.

Mark Siebel

Immer wieder Linda. Warum es rational sein kann, einen Fehlschluss zu begehen

Stichworte: Philosophie, Psychologie; Rationalität, Wahrscheinlichkeit, Kohärenz

Das berühmte Linda-Experiment von Amos Tversky und Daniel Kahneman hat nach einer weit verbreiteten Auffassung gezeigt, dass wir Menschen irrational sind, weil wir die Konjunktion „Linda ist Bankangestellte und Feministin“ für wahrscheinlicher als ihr Konjunkt „Linda ist Bankangestellte“ halten. Diesem Verdikt liegt die Vorstellung zugrunde, dass für die Auswahl von Hypothesen allein ihre Wahrscheinlichkeit relevant sei. Eine breitere Perspektive bietet hier eine Kohärenztheorie, nach der es darum geht, diejenige Hypothese auszuwählen, die sich am besten in das vorhandene Meinungssystem einpasst. Widersprüche und isolierte Subsysteme werden dabei als kohärenzmindernd angesehen, während Folgerungs- und Erklärungsbeziehungen die Kohärenz steigern. Aus kohärenztheoretischer Sicht ist es durchaus sinnvoll, sich für die Konjunktion zu entscheiden, weil sie insbesondere aufgrund des Erklärungspotentials von „Linda ist Feministin“ zu einem kohärenteren System führt. Zu diesem Ergebnis kommen auch formale Kohärenzmodelle wie das von Paul Thagard oder die neuerdings verstärkt diskutierten probabilistischen Theorien. Ansätze dieser Art werfen ein neues Licht auf den Vorwurf der Irrationalität.

Antje Krumnack, Leandra Bucher, Jelica Nejasmic und Markus Knauff
Belief Revision beim räumlichen Denken – Ein rationaler Prozess?

Stichworte: Künstliche Intelligenz/Kognitive Systeme, Psychologie; Belief Revision, räumliches Denken, Modellierung

Im Alltag werden wir dauernd mit neuen Informationen konfrontiert. Diese können im Widerspruch zu den Vorstellungen stehen, die wir bis dahin von einem Sachverhalt haben. Um ein konsistentes Weltbild zu erhalten ist es dann nötig, Vorstellungen zu revidieren. Belief Revision stellt also einen rationalen Prozess dar. Hier soll diskutiert werden, wie eine solche Belief Revision für räumliche Vorstellungen aussieht. Dabei sollen neue, widersprüchliche Angaben zu einer vorhandenen Anordnung von Objekten im Raum berücksichtigt werden. Wie sieht dieser Revisionsprozess bereits existierender Vorstellungen aus? Nach welchen Kriterien und Mechanismen läuft er ab und wie sieht das Ergebnis aus?

Diese Fragen sollen durch eine Kombination aus Verhaltensexperimenten und formalen Methoden beantwortet werden. Ziel ist es diese kognitiven Prozesse auf zwei Stufen zu beschreiben: zum einen auf der Verhaltensebene und zum anderen mit Hilfe informationsverarbeitender Prozesse. Grundlage hierfür sind die in Verhaltensexperimenten gewonnenen Erkenntnisse, wie Menschen die Konsistenz zwischen unvereinbaren räumlichen Informationen erzeugen und welche Informationen sie bereit sind zu widerrufen, um Konsistenz wieder herzustellen. Auf dieser Basis werden dann formale Methoden verwendet, um die Informationsverarbeitungsprozesse beim räumlichen Denken und bei der Revision räumlicher Vorstellungen algorithmisch zu rekonstruieren. Es werden experimentelle Befunde und erste Ansätze zur Modellierung vorgestellt.

Michael R. Waldmann, Björn Meder und Ralf Mayrhofer
Modelle elementaren diagnostischen Schließens

Stichworte: Psychologie; causal reasoning, diagnostisches Schließen, Bayesianische Modelle

Wir stellen ein neues rationales Modell des elementaren diagnostischen Schließens vor, also des Schließens von einem Effekt auf eine Ursache. Während traditionellerweise die bedingte Wahrscheinlichkeit der Ursache bei gegebenem Effekt ($P(\text{Ursache} | \text{Effekt})$) als normativer statistischer Standard für die Beurteilung diagnostischer Schlüsse herangezogen wird, modellieren wir die Aufgabe mit Hilfe eines rationalen Bayesianischen Modells kausalen Denkens, das der Unsicherheit induktiver Schlüsse Rechnung trägt. Dem Modell liegt die Kernidee zugrunde, dass diagnostische Schlüsse von Annahmen über kausale Strukturen beeinflusst werden. Dies führt dazu, dass die Vorhersagen unseres Modells für Aufgaben diagnostischen Schließens von denen abweichen, die klassische statistische Maße wie bedingte Wahrscheinlichkeiten liefern. Das Modell sagt insbesondere vorher, dass diagnostische Urteile nicht nur von der Wahrscheinlichkeit der potentiellen Ursache bei gegebenem Effekt abhängen sollten, sondern auch von der induktiven Plausibilität einer kausalen Verbindung zwischen diesen beiden Ereignissen. Diese Vorhersage wird in drei Experimenten getestet, die zeigen, dass die Urteile der Versuchsteilnehmer besser durch unser kausales Bayesianisches Modell als durch klassische statistische Normen vorhergesagt werden.

Wolfgang Spohn
A Dynamic Model of Belief

Empirical investigations of cognitive or belief states by psychologists usually refer to Bayesianism, or subjective probability theory, as the primary rational paradigm proposed by philosophers. A major defect of this paradigm is that it does not represent the basic notion of belief, but only degrees of belief; none of those degrees is suited for expressing belief. The talk will present an alternative representation of belief states, called ranking theory, which properly contains beliefs, and which behaves in ways characteristically diverging from Bayesianism, though it is of similar power and applicability as Bayesianism. In the latter respect it outruns other attempts at representing beliefs. Of course, the suggestion will be that psychologists might as well use ranking theory as a rational reference point, and I am interested in learning whether this might be a useful perspective for them.

Literaturnachweis

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Symposia / Symposien

Symposium

Adaptivity of Hybrid Cognitive Systems

Organisation: Peter Bosch

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Keywords: linguistics, cognitive neuroscience, artificial intelligence / cognitive systems, psychology; adaptivity, vision, semantic mapping, personality, definite reference

This symposium discusses intermediate results from the research programme associated with the University of Osnabrück Cognitive Science Research Training School on Adaptivity of Hybrid Cognitive Systems, which involves the Cognitive Science subdisciplines Artificial Intelligence, Linguistics, Neuroscience, Philosophy, Psychology, and Robotics.

The programme assumes that biological and technical cognitive systems alike are characterised by their adaptivity, i.e., by their capacity to adapt their behaviour to unforeseen situations and to changing environmental requirements.

The adaptivity in the external behaviour of cognitive systems is apparently reflected internally in an architecture that integrates sub-symbolic as well as symbolic data structures. The programme investigates the contribution that this hybrid structure makes towards the external adaptivity of cognitive systems and thus attempts to integrate classic models of cognition that rest upon symbol processing with approaches that build on signal processing.

Presentations at the Symposium will be by senior researchers in association with PhD students. The four key note presentations planned (see below) will each look at specific

aspects of the adaptivity of hybrid cognitive systems and will prepare for a discussion on the common traits of adaptive system behaviour.

Joachim Hertzberg, Sven Albrecht, Martin Günther, Kai Lingemann, Jochen Sprickerhof and Thomas Wiemann

From Semantic Mapping to Anchored Knowledge Bases

Most previous approaches to semantic mapping in robots have worked bottom-up: given the raw sensor data, objects or structures must be identified and the respective labels be added to the geometry map. We now propose to view the task differently: rather than building a geometry map with tags of known classes added, we instantiate a knowledge base by providing sensor data and spatial information concerning instances of object and aggregate categories contained in the knowledge base. The resulting combination of knowledge base and map we call an anchored knowledge base. The difference to previous semantic mapping approaches is that context-dependent top-down information can be generated from the knowledge base that helps the robot generate expectations about objects to-be-sensed, which, in turn, can help focus attention within the sensor data, disambiguate noisy data, and fill up occlusions. - In the talk, we will present first results concerning the generation of anchored knowledge bases.

José Pablo Ossandón, Selim Onat, Dario Cazzoli, Thomas Nyffeler, René Müri and Peter König

Unmasking the Contribution of Low-level Features to the Guidance of Attention

In two experiments with patients with acute left-sided visual neglect and with healthy subjects whose posterior parietal cortex (PPC) was inhibited by repetitive transcranial magnetic stimulation we studied the contribution of low-level visual features to the guidance of overt attention in free-viewing behaviour under impaired cortical control of attention.

We found that correlations of low-level visual features with selected fixation points are increased with inhibition/lesion of parietal cortex. This suggests that silencing PPC unmasks the contribution of low-level image features to the guidance of visual selection. Consequently, we conjecture that the affected regions of PPC mediate not bottom-up mechanisms but high level saliency and other presumably sub-cortical structures mediate the influence of low-level features. Finally, our results highlight potential contributions of low-level features to compensate the behavioural deficit in hemineglect.

Rainer Düsing, Lucas Eggert, Julius Kuhl and Markus Quirin
A Double-Hybrid Architecture for Personality

What are the cognitive and affective prerequisites of adaptive behaviour and what can be learnt from human adaptive behaviour for modelling artificial systems? To answer these questions, this talk will present an information-processing architecture that we consider the minimum requirement for a functional analysis of personality. The architecture comprises four distinct systems with corresponding interactions and is hybrid with respect to two dimensions: First, information-processing can take place analytically ('symbolic') or holistically ('sub-symbolic'). Secondly, systems can be distinguished according to their level of integration, i.e., low-inferential and high-inferential. We claim, that the dynamic integrative

character of the interactions between those systems is the basis for adaptive behaviour. Taken the examples of volitional efficiency and self-growth, we illustrate the adaptive gain of the dynamic interplay of the double-hybrid architecture.

Sascha Alexejenko, Kirsten Brukamp, Maria Cieschinger, Xiaoye Deng, Peter Bosch and Peter König

Adaptivity in the Visual Interpretation of Definite Reference

Speakers using definite referential expression (DREs), like "the such-and-such", mean to refer to one specific such-and-such, and would not use a DRE unless they were aware of exactly one such-and-such and believe their audience to be aware of the same entity. Otherwise, presupposition failure would occur and, formally speaking, the DRE could not be interpreted.

In a visual world study we tracked subjects' eye movements with respect to a visual scene while they listened to stories containing DREs. We could show that DREs that were either anaphorically definite or were first-mention DREs that had exactly one referent in the scene, were interpreted reliably within less than 1000ms. When there were several suitable referents, and one was either visually isolated or visually close to a previously mentioned referent, and thus more salient than its competitors, we observed reliable but delayed decisions for those referents albeit with a smaller proportion of focussings. The focussing proportions were still much closer though to the ideal case of unique reference than in the condition of fully ambiguous DREs.

We conclude that in situations where the uniqueness requirement for DREs is not literally satisfied by the visual scene, additional cognitive processes are recruited that adapt the interpretation of speaker's intentions to the visual input.

Symposium

Perspektiven für die Kognitionsethnologie in den Kognitionswissenschaften

Organisation: Andrea Bender

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Stichworte: Psychologie, Kognitive Ethnologie, Interdisziplinäre Ansätze, Kultur, Methoden

Vor rund dreißig Jahren entstanden die Kognitionswissenschaften aus dem Zusammenschluss von sechs verschiedenen Disziplinen, die ein gemeinsames Ziel verfolgten: die Grundlagen des menschlichen Geistes und seine Leistungen zu erforschen (Gardner, 1985). Die Ethnologie konnte zu diesem Zeitpunkt bereits auf zwei Jahrzehnte kognitiver Forschung zurückblicken; sie hatte entscheidende Beiträge zur Kognitiven Wende in den Sozialwissenschaften geleistet und gehörte deshalb nicht nur zu den Pionieren auf diesem Gebiet, sondern bildete – zumindest anfangs – auch eine der tragenden Säulen im interdisziplinären Gebäude der Kognitionswissenschaften. Über die Fachgrenzen hinweg profitierten alle Beteiligten von dem regen Austausch theoretischer Konzepte, methodischer Zugänge und empirischer Erkenntnisse. Seit damals jedoch haben sich die Ethnologie und die übrigen Kognitionswissenschaften zunehmend entfremdet – und das in einem Umfang, dass die Ethnologie, vor allem in der deutschen Forschungslandschaft, nicht einmal mehr als potentieller Partner wahrgenommen wird. Das ist umso bedauerlicher, als die kulturelle Dimension der Kognition in den letzten Jahren wieder zunehmend ins Blickfeld der internationalen Forschung rückt (Bender et al., in press).

Für ein umfassendes Verständnis davon, wie Kultur und Kognition interagieren, ist die Expertise der Kognitiven Ethnologie allerdings unverzichtbar, und so mehren sich nun die Anstrengungen, der wechselseitigen Entfremdung entgegenzuwirken und die Ethnologie wieder stärker in die Kognitionswissenschaften zu integrieren. Dieses Symposium ist Teil dieser Anstrengungen. Es bringt Vertreter einer jungen Generation von Wissenschaftlern zusammen, die nicht nur kognitionsethnologisch, sondern insbesondere fächerübergreifend arbeiten, um das Wechselspiel von Kultur und Kognition zu erforschen. Anhand von

Beispielen aus ihren aktuellen Arbeiten wollen sie zeigen, welchen Beitrag die deutschsprachige Kognitionsethnologie zu den Kognitionswissenschaften leisten kann:

Kira Eghbal-Azar wird zeigen, wie sich ethnologische und psychologische Methoden für eine kognitionswissenschaftliche Besucherforschung in Museen sinnvoll verknüpfen lassen.

Birgitt Röttger-Rössler wird kognitionsethnologische Perspektiven und Forschungsansätze zum Thema autobiographisches Gedächtnis vorstellen.

Daniel Haun wird von aktuellen Arbeiten aus der Forschergruppe für Vergleichende Kognitive Anthropologie berichten.

Sieghard Beller und Andrea Bender präsentieren ein Forschungsprojekt zur kulturellen Konstitution kausaler Kognition anhand von Beispielen aus drei Domänen, das ethnologische, psychologische und linguistische Ansätze zu integrieren sucht.

Im Anschluss an die Einzelbeiträge sollen schließlich Perspektiven für die Re-Integration der Ethnologie in die Kognitionswissenschaften und das Potential für zukünftige Kooperationen gemeinsam diskutiert werden.

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Symposium

Visual Attention and Gestures in Language Processing

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Keywords: linguistics, human-computer-interaction, psychology; eye gaze, gestures, humancomputer interaction, language processing, eye tracking, event-related brain potentials, computational modeling

Prior research has provided strong evidence that online language processing is rapidly influenced by information about objects and events in non-linguistic visual context. It has further been shown that visual cues provided by speakers can affect language processing: Eye gaze of a human speaker to an object can permit a listener to rapidly resolve a referentially ambiguous utterance (Hannah and Brennan, 2007; Kreysa, 2009). The coupling of speaker and listener eye movements further plays an important role in communication (Richardson et al., 2007). In addition to effects of a speaker's gaze we also know that gestures can rapidly influence language processing (Kessel et al., 1999; Wu and Coulson, 2007). Some of these findings (on facilitative effects of human eye gaze) have recently been extended to human-robot interaction (Staudte and Crocker, 2009).

Many aspects of how speaker gaze affects language comprehension; how speakers coordinate their gaze with language production; how speaker and listener gaze are coupled; and how gestures and speech interact during comprehension, are still not that well understood.

The proposed symposium brings together recent research that addresses these four issues with a focus on human-human and human-robot / agent interaction. This interdisciplinary approach will lead to interesting discussions about how recent findings on human-human interaction

can contribute towards improving human-computer interactions. Examining these issues will further permit us to extend existing processing accounts and computational models of situated language processing with how speaker-based information contributes to comprehension.

Andriy Myachykov, Simon Garrod and Christoph Scheepers
Sentence Production Across Languages: From Visual Attention to Structural Selection

Andriy Myachykov and colleagues discuss research on priming speaker's linguistic choices (e.g., structural selection) and eye tracking how they deploy visual attention. Some studies show that ordering of the speaker's early fixations predicts ordering of sentence constituents; other reports suggest a reverse link from structural commitments to the allocation of attention. The authors discuss an emerging model that involves priming and constraining mechanisms that span across production stages.

Maria Staudte and Matthew W. Crocker
Speaker Gaze Reveals Referential Intentions: Evidence from Human-Robot and Human-Agent Interaction

Maria Staudte and Matthew W. Crocker report results from two experiments on the effects of robot gaze: They found that the order (but not temporal synchrony) of robot gaze relative to the order of mentioned references plays an important role in facilitating human language comprehension. They argue that listeners expect visual references to reflect the order of planned linguistic references.

Daniel Richardson
Common Ground and the Coupling of Eye Movements during Dialogue

Daniel Richardson will present research on gaze coordination in human-human conversation. In a new paradigm, they separated the fact that a visual scene was shared or not and the belief that a visual scene was shared or not. The effects of these factors upon joint attention were quantified. Results show that both the presence of the visual scene and beliefs about its presence for another influenced participants' discussion and coordination of their joint attention.

Helene Kreysa and Pia Knoeferle
Using Speaker Gaze for Language Comprehension

Helene Kreysa and Pia Knoeferle report research that examines whether speaker gaze can facilitate language comprehension and thematic role assignment. They present a new paradigm for examining the effects of speaker eye gaze in human-human communicative interaction. First findings corroborate that speaker gaze facilitates language comprehension; the role of speaker gaze in facilitating thematic role assignment will be discussed.

The role of synchrony and ambiguity in speech – gesture integration during comprehension:
Boukje Habets will report results from an event-related brain potential (ERP) study on what degree of asynchrony in speech and gesture onsets are optimal for their semantic integration.

The results imply that speech and gesture are integrated most efficiently when the differences in onsets do not exceed a certain time span.

Stefan Kopp

Computational Modeling of Gestures in Human Communication

Stefan Kopp will present work on modeling gesture perception and recognition. He will discuss how fusing these two models can point the direction for both modeling and understanding mutual coordination and social resonance in embodied communication.

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Symposium

Kognitive Modellierung in Mensch-Maschine-Systemen

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Stichworte: Mensch-Maschine-Interaktion; Kognitive Modellierung, Werkzeuge, ACT-R, Erweiterungen

Die Leistung eines Mensch-Maschine-Systems (MMS) hängt maßgeblich von der benutzerfreundlichen Interaktion zwischen Mensch und Maschine ab. Werden die Fähigkeiten und Grenzen des Menschen bei deren Gestaltung nicht berücksichtigt, sinkt die Gesamtleistung und das Risiko für Unfälle steigt. Eine Methode, um den Faktor Mensch frühzeitig in die Entwicklung von MMS zu integrieren, ist die kognitive Modellierung. Dadurch können in frühen Entwicklungsphasen Schwächen in der Systemgestaltung erkannt und beseitigt werden.

Die Modellierung und Simulation kognitiver Strukturen und Prozesse ist eine Methode der Kognitionswissenschaft, um Theorien der menschlichen Kognition experimentell zu überprüfen. In kognitiven Architekturen werden dazu kognitionspsychologische Theorien mit deren kognitiven Anforderungen und Beschränkungen implementiert. Die in kognitiven Architekturen erstellten Modelle beruhen somit auf einem definierten Satz von Elementen (z.B. Wissensstrukturen, Regeln), simulieren die angenommenen kognitiven Prozesse und generieren beobachtbare Verhaltensstrukturen wie Sprache und Blickbewegungen (Newell, 1990).

Voraussetzung für die Nutzung kognitiver Modelle ist, dass zum einen Werkzeuge für die einfache Modellerstellung und -analyse bereitgestellt werden und zum anderen die verwendeten kognitiven Architekturen das menschliche Verhalten valide abbilden.

In diesem Symposium werden aktuelle Entwicklungen im Bereich der kognitiven Benutzermodellierung am Beispiel der kognitiven Architektur ACT-R (Anderson und Lebiere, 1998) vorgestellt. Dafür ist das Symposium in 3 Themengebiete unterteilt: (TG 1) Grundlagen der Interaktion in MMS, (TG 2) Anbindung kognitiver Modelle an externe Simulationen und (TG 3) Anwendungsbeispiele. Es werden jeweils kurze Impulsvorträge (15

Minuten) mit anschließender Diskussion (5 Minuten) gegeben. Abschließend werden die Themen im Gesamtkontext diskutiert.

Uwe Drewitz

Modellierung kausalen Schließens unter Unsicherheit (TG 1)

Das Erkennen von Ursache-Wirkungs-Zusammenhängen, der Erwerb kausalen Wissens und die Generierung von Diagnosen und Prognosen ist grundlegende Voraussetzung für die sichere Bedienung komplexer technischer Systeme im Regel- sowie im Störfall. Aufgrund unvollständigen Wissens über das technische System oder unvollständige Datenlage handeln Operateure dabei auch unter Unsicherheit. Untersucht wird, wie Repräsentationen und darauf operierende Prozesse der Inferenzgenerierung das Vertrauen in die eigenen Urteile bestimmen.

Nele Pape

Die Modellierung von Working Memory Updating in MMS (TG 1)

Eine Working Memory Updating Aufgabe ist gekennzeichnet durch regelmäßiges Aktualisieren verschiedener Informationselemente. Die Interaktion mit MMS weist häufig eine vergleichbare Struktur auf, wie z.B. das Autofahren. Der Autofahrer muss regelmäßig die Position anderer Autos aktualisieren, wie auch den Zeitpunkt für einen geplanten Fahrstreifenwechsel. In derartigen Aufgaben müssen Informationseinheiten abgerufen, verändert und die neue Information im Gedächtnis abgelegt werden. Es wird ein Modellierungsansatz vorgestellt, der erklärt, wie Menschen mit derartigen Aufgaben umgehen und welche Gedächtnisprozesse stattfinden.

Leon Urbas

Übersicht zu verschiedenen Ankoppelungsebenen kognitiver Modelle an externe Systeme (TG 2)

Viele Software-Simulationen sind für kognitive Modelle nicht zugänglich, da die Implementierung dieser Simulationen meist in einer eigenen Programmiersprache erfolgte (z.B. Java). Um diese Simulationen dennoch mit kognitiven Architekturen verwenden zu können, gibt es die Möglichkeit das kognitive Modell über Schnittstellen an eine Simulation anzubinden. Auf diese Weise können bspw. Informationen der Wahrnehmung und der Handlung, über die bereitgestellten Schnittstellen mit einer externen Simulation ausgetauscht werden. In diesem Beitrag werden verschiedene Ankoppelungsebenen und Lösungsansätze mit den damit verbundenen Vor- und Nachteilen diskutiert.

Philippe Büttner

Eine Java Simulation als Device von ACT-R verwenden (TG 2)

In diesem Beitrag wird ein Werkzeug vorgestellt, das die Kommunikation von ACT-R 6 mit externen Java-Schnittstellen ermöglicht. Das Werkzeug besteht aus zwei Komponenten deren Kommunikation über TCP/IP stattfindet. Die erste Komponente stellt die Lisp-Implementierungen der benötigten Methoden in ACT-R dar, um die kognitiven Prozesse zu bedienen. Die zweite Komponente steuert die externe Schnittstelle. Handlungen, wie das

Bewegen des Mauszeigers und das Anschlagen einer Taste werden von Java ausgeführt, sobald diese Handlungen von dem kognitiven Modell intendiert wurden.

Stefan Schaffer

Nutzung modalitätsspezifischer Abkürzungen in multimodaler MMI (TG 3)

Nutzer multimodaler Systeme haben die Wahl zwischen unterschiedlichen Interaktionsstrategien. Die Anzahl an Interaktionsschritten zur Bearbeitung einer Aufgabe kann dabei für die zur Verfügung stehenden Modalitäten variieren. Entsprechende modalitätsspezifische Abkürzungen können die Strategiewahl des Nutzers beeinflussen. Im Beitrag werden effizienzbezogene Aspekte der Strategiewahl erläutert und Ansätze zur Modellierung multimodaler Interaktion dargestellt.

Maik Friedrich

Konzepte zur Implementierung von Lotsenheuristiken mit Unterstützung einer Mikrowelt (TG 3)

In dieser Arbeit wird vorgestellt, wie die Lotsenheuristiken im Modell mit farbigen Petrinetzen umgesetzt wurden. Dabei wird die Stärke der Analysierbarkeit des ganzheitlichen Mensch-Maschine-Modells betont. Zum Vergleich wird für dieselbe Mikrowelt ein Lotsenmodell in ACT-R implementiert. Als Grundlage für die Umsetzung werden die bereits umgesetzten Aspekte des Arbeitsablaufes des farbigen Petrinetzmodells wiederverwendet.

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Symposium

Frames – A General Format of Representation?

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Keywords: linguistics, philosophy; representation, frame, concepts, knowledge, grounded cognition, modeling, associative anaphora

Based on the programmatic paper of Minsky (1975), Barsalou (1992) advanced and refined the notion of frames as a general format of mental representation. The basic idea is that all kinds of representations are organized in the form of recursive attribute-value-structures. However, his description of frames is too unspecific to allow for a detailed analysis of its merits. Although Barsalou's approach offers a general framework for many disciplines investigating the emergence and cognitive representation of linguistic meaning, motor activities and perceptions of different modalities in the human brain, multidisciplinary analyses that bring Barsalou frames into practice are still rare.

The aim of the interdisciplinary symposium is to discuss and assess the ambitious claim of having found the general format of representation from different but converging perspectives. Based on a mathematically precise description of frames, applications in several disciplinary fields of research will help to evaluate the fruitfulness of frame theory. In the case of history of medicine, frames help to elucidate the evolution of concepts and theories in history. From a philosophical point of view, it is shown that frames help to elaborate the thesis of grounded cognition by allowing for an explicit representation of the different aspects of concepts. In the field of linguistics, a case study on associative anaphora shows that a theory of concept types can be developed in terms of frames. In this context, frames are introduced as interface structures mediating between linguistic and cognitive levels of semantic representation.

Wiebke Petersen

Formal Frame Theory for Concept Composition and Decomposition

Frames are recursive-attribute value structures that can be modeled as directed graphs with labeled nodes (value types) and vertices (attributes). In Petersen (2007), we define frames as a

proper generalization of typed feature structures (Carpenter, 1992). By typing frames and organizing the types in a type hierarchy, appropriateness conditions can be postulated which restrict the class of admissible frames. In contrast to feature structures, frames allow for nodes which cannot be reached by the central node, which makes them more flexible and allows the adequate modeling of relational concepts, i.e. concepts like sister that ask for the specification of a possessor argument (sister of Mary).

In the presentation we will introduce our frame theory and argue how a frame-based semantics could open the way to handle composition and decomposition in a unified way.

Alexander Ziem

Frames, Concept Types and Type Shifts: The Case of Associative Anaphora

In his paper on associative anaphora, Löbner (1998) argues that the head noun of an associative anaphor NP is interpreted as a functional concept with the possessor being specified by the antecedent. E.g., in *Peter's car is in the garage, but the tires are flat* the anaphoric noun *the tires* is interpreted as a functional concept in that the tires are specific ones belonging to Peter's car. Taken in isolation, *tire* is a relational noun; its meaning is a relational concept. Thus, in the context of the above sentence it undergoes a type shift since its value (= the possessor) is contextually specified.

Since associative anaphors are always interpreted as functional concepts, they meet all criteria of frame attributes (in Barsalou's technical sense). As a consequence, all types of associative anaphors, including their representational and processual properties, shall be entirely analyzable as recursive attribute-value structures and constraints holding between these elements.

Based on an annotated corpus, the talk offers frame based analyses of several types of associative anaphora attested in the data.

Heiner Fangerau

Evolution of Theories and Concepts

The talk introduces an analysis of scientific concept development as a networking process. The potential for investigating change of concepts as a change in inherent relationships between objects and terms is delineated. First, frame theory is introduced and applied to interpret neuroscientific findings. Second, findings from cognitive- and neurosciences and their use in the analysis of knowledge development are discussed. It is argued that the frame-model provides a methodology that proves instructive for both neuroscientific and historical aspects. The history of urine diagnosis is used to exemplify how novel attributes and values are integrated into existing knowledge in a modality overarching way. At a certain point of integration, massive contradictions inevitably occur, such that a conceptual shift becomes necessary. The similarity of resolutions of anomalies revealed by frames resembles Ludwik Fleck's considerations of thought style shifts. It is discussed whether his views regarding changing ideas in thought collectives can be understood as a continuous fluctuation at the level of frames.

Gottfried Vosgerau

Grounded Cognition: Sensorimotor Values in Frames

The thesis of grounded cognition states that concepts are based on basic sensorimotor abilities. However, it is still unclear whether sensorimotor abilities are necessary for the acquisition of abstract concepts (a weak thesis), or whether they are constitutive in the sense that the loss of basic abilities means the loss of concepts (a strong thesis)?

The attribute-value-structure of frames will allow scrutinizing the idea in the following way: Each value in a frame can be specified by further attributes and values, but the tree has to come to end-point-values. The claim of grounded cognition can be defined as the claim that end-point-values in frames are sensorimotor values. Based on examples, these values will be specified as parameters also occurring in basic sensorimotor processing. Moreover, the weak and the strong version of grounded cognition can be distinguished by specifying whether the relevant values are obligatory or facultative in a given concept frame.

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Symposium

Interdisciplinary Perspectives on Memory

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Keywords: neurobiology, philosophy; memory, hippocampus

Even though both semantic and episodic memory are key functions of human cognition and memory research is a well-established field in neuroscience and psychology, the interdisciplinary exchange within the cognitive sciences and especially with high-end disciplines like philosophy has been limited so far. The purpose of this symposium is to enhance the interdisciplinary dialogue between molecular, behavioral and computational neuroscience on the one side, and philosophy on the other side. It thus promises to provide a platform for vital interactions in memory research at the German Cognitive Science Conference.

Christian Leibold

Synaptic Tagging, Evaluation of Memories and the Distal Reward Problem

Long-term synaptic plasticity is thought to exhibit distinct phases. The synaptic tagging hypothesis suggests an early phase in which synapses are prepared for protein capture and a late phase in which those proteins are integrated into the synapses to achieve memory consolidation. A computational model of associative memory in a neuronal network is introduced to test the tagging hypothesis on its potential to prolong memory lifetimes in an online-learning paradigm. We find that tagging is helpful if it is used to evaluate memories. Only the "important" memories evoke protein synthesis such that they become stable against plasticity stimuli evoked by "unimportant" memories. Then the network is in a state that is very susceptible to the storage of new memories: Most synapses are in an early phase that can easily undergo plastic changes and only the comparatively few synapses that are essential for

the retrieval of the important memories are in the stable late phase. The model provides a parameter regime that solves the distal reward problem, where the initial exposure of a memory item and its evaluation are temporally separated. The estimates of memory lifetimes derived from our model are in the order of years. Synaptic tagging hence provides a viable mechanism to consolidate and evaluate memories on a synaptic basis.

Sen Cheng

A Mechanism for the Formation of Memories in the Hippocampus?

Two results have been known about the hippocampus for decades: First, it is needed to form memories about events. Second, hippocampal neurons are place cells, i.e., neurons become active selectively in a small region of space. However, it remains unclear how these two results fit together. I will discuss my recent advances in the resolution of this puzzle. I present data on how neural activity changes as rats form memories for novel locations. Neurons with place fields in novel locations exhibit strongly correlated activity on the timescale of tens of milliseconds. These correlations are organized by special network events, called ripples, and decrease as novel locations become familiar. In contrast, spatial activity is initially less accurate in novel locations but improves with increased familiarity. Thus, ripples during learning might drive the formation of memories and accurate spatial representations.

Motoharu Yoshida

Persistent Firing and Memory in the Medial Temporal Lobe

When humans or animals perform a working memory task, there are neurons in the brain that show repetitive spiking activity during the period of memory maintenance. This repetitive spiking is induced by a short triggering stimulus and persists after the termination of this stimulus. This type of activity is called persistent firing and it is unclear if persistent firing is maintained by a network of neurons or by a property of single neuron. In this talk, I will first introduce my recent work on this issue in the rat postsubiculum. The postsubiculum has head direction cells that fire persistently when the animal's head is oriented in particular directions. Persistent firing of the head direction cells therefore maintains direction of the head. In this work, we showed that neurons from postsubiculum show persistent firing in single neuron level, independently from synaptic network. This suggests that single neuron has ability to maintain memory information. Persistent firing is observed also during sleep which is believed to be important for memory consolidation. Secondly, I will introduce our finding that persistent firing can be induced by the group I mGluR-activation, in addition to but independently from previously described cholinergic mechanism. This suggests that persistent firing supported by single cell mechanism could occur, for example, during the slow-wave sleep and it could be important for memory consolidation function.

Magdalena M. Sauvage

Uncovering the Neural Substrates of Memory Function: A Translational Approach

Recognition memory can be achieved on the basis of two processes: familiarity, a vague feeling of *deja-vu*, and recollection, the ability to remember different features of a given event. Recollection is significantly reduced in amnesic patients and in aging whereas familiarity is relatively spared. Hence, identifying the neural substrates of these processes could help in rescuing part of these memory deficits. A major controversy in human

recognition memory is whether recollection and familiarity are qualitatively distinct processes and are supported by different neural structures: the hippocampus and the parahippocampal region respectively, or whether they reflect different strengths of the same process and are both supported by the hippocampus. Using a lesion approach combined to translational behavioral paradigms in rats, I first report evidence that recollection and familiarity are qualitatively distinct processes and that the hippocampus supports recollection but not familiarity. Second, I will present new data suggesting a selective involvement of the medial entorhinal cortex (MEC), a major source of projections to the hippocampus, in the processing of recollective information. Taken together, these data suggest a functional segregation within the medial temporal lobe areas in terms of their contribution to the recollection and the familiarity processes in recognition memory and suggest the MEC processes information required by the hippocampus to complete recollection-based judgements.

Markus Werning

Symbolic or Ontological Ascent in the Cortical Hierarchy of the Ventral Visual Stream?

The ventral visual stream, beginning in the primary visual cortex and finally merging into the entorhinal cortex and the hippocampus, hosts a large number of functionally heterogeneous areas. According to a widespread and recently detailed (Wyss, et. al. 2005; König and Krüger, 2006) view, the cortical hierarchy of the ventral stream goes along with a symbolic ascent from non-compositional, analogous representations at early stages to condensed symbolic representations with a discrete constituent structure at late stages. It has been argued that this symbolic ascent is driven by optimizing the temporal stability of sensory representations in order to maximize feature predictability. Sharing the optimization principles, the talk gives an alternative interpretation of the cortical hierarchy: (i) Based on rich experimental data (Singer and Gray, 1995) and oscillatory neural network models (Maye and Werning, 2004; Werning, 2005) relating to objectrelative binding by neural synchrony, it is argued that compositional representations already occur at the very early stages of cortical visual processing. (ii) Recent studies (Tettamanti et. al., 2008), which allow to differentiate between symbolic and neurosimulatory formats of representation, indicate that representations with a discrete constituent structure do not even occur on highest stages of processing when it comes to language comprehension. (iii) It is concluded that no symbolic ascent, but a non-symbolic, however, compositional format of representation is prevalent throughout the ventral stream. (iv) Instead, a hypothesis of ontological ascent is formulated: the contents represented increase in density from volatile attributes to temporally stable substances.

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Doctoral Symposium / Doktorand/inn/ensymposium

Reading Disjunction in Legal Contexts

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Keywords: disjunction; discourse; context dependence; inquisitive semantics; legal language.

This paper investigates the well-known problem of interpreting disjunction within legal texts. The data comes from a currently neglected corpus of texts - the disputes of the World Trade Organisation. This data provides examples of disjunction and, in addition, explicit reasoning about their interpretation within legal discourse. The participants of disputes find ambiguities and argue, although not necessarily correctly, for interpretations in specific contexts. Examples include embedded disjunctions, effects from questions (both explicit and question under discussion), effects from negative polarity and the contextual differences between treaty texts and everyday information exchange conversation. Some of these effects have been analysed in linguistics, others add to the list of problems for a model of disjunction. This paper uses the framework of inquisitive semantics by Jeroen Groenendijk and Floris Roelefsen to approach those cases which rely on explicit and implicit questions in preceding discourse context for their disambiguation.

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Response, Resonance, Relationship – Reciprocity as a Structural Characteristic of a Second-Person-Perspective

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Reciprocity is a particular structural characteristic, which applies to the second-person-perspective. As soon as I start interacting with one person (or more) I have gained a new and irreducible access to objects of knowledge, which allow me to experience this person's *response* to me as a primary part of the interaction. This access from a second-person-perspective differs fundamentally from a potential access to objects of knowledge from a first- and third-person-perspective as the latter structurally preclude the moment of reciprocity.

Knowledge gained from the second-person-perspective primarily has to be *reactional knowledge* (on the counterpart as well as on myself). Here, the term of 'reaction' cannot be understood as simply behavioural but furthermore as a form of *bodily resonance* (Fuchs, 2003), meaning to awake the mood of the respondent, including expressions of his

autobiographic situation and incarnated feelings. By the *expression* of my counterpart becoming tangible as my own *impression* (and vice versa), a form of reciprocity emerges. With the help of self-bodied expression, this reciprocity provides access to an area of knowledge on the inner life of a human being – a knowledge which has been only made tangible through interaction.

In fact, the term *interaction* needs clarification regarding his scope as well as his boundary. Also, this newly gained knowledge only applies *to me* as part of the interaction, of the *relationship* which has developed between me and my counterpart through the interaction. Second-personal knowledge as *relationship knowledge* (Buber, 1984) is therefore interbodily (Merleau-Ponty, 1967).

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Interfacing a Conversational Agent with Contextual Knowledge Drawn from Wikipedia

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Keywords: conversational knowledge, human-agent conversation, dialog topic, wikipedia

In order to talk to each other meaningfully, conversational partners utilize different types of conversational knowledge. Thereby, knowledge about dialogical and terminological context turns out to be very important in language understanding, since speakers often use grammatically incomplete and incorrect sentences.

By implementing an adequate interface to the online encyclopedia Wikipedia, the conversational agent Max obtains access to contextual knowledge and gains competence in looking up information on Wikipedia similar to humans. Furthermore, first results of how to identify the topic of single utterances and how a topic may influence the search for the relevant Wikipedia article could be obtained (Breuing and Wachsmuth, 2010). However, looking at single utterances to specify the dialog topic appears to be insufficient, as dialogs are streams of everchanging topical threads. Thus, my current research focuses on how to improve the topic detection process and how to make the agent Max more situation- and context-aware.

According to Schank's original work single sentences are unlikely to contain topics in isolation (Schank, 1977). They rather introduce possible concepts acting as topic suggestions. Thus, we have to consider at least two successive utterances to define a dialog topic.

The ongoing conceptualization factors these basic findings. Therefore, the classification of Wikipedia articles will be employed to construct a graphically represented taxonomy based on Wikipedia categories. By treating articles as potential conversational concepts and categories as potential dialog topics, we will devise a taxonomical representation of dialog concepts and topics, and of the way they are linked together. The specification of a dialog topic will result in defining the conceptual intersection between successive utterances by identifying the nearest common Wikipedia category of the ascertained concepts. Further insights based on the graphical representation will additionally support the authenticity of the agent's contextual awareness.

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Der Erwerb von Konstruktionen im Nachfeld

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Stichworte: Linguistik; Spracherwerb, usage-based, Konstruktionsgrammatik, Topologisches Feldermodell

Das Nachfeld (NF) und nachfeldähnliche Strukturen werden häufig als Phänomen der gesprochenen Sprache bezeichnet (Schwitalla, 2003). Angesichts des hohen Auftretens in der Alltagskommunikation sowie der Tatsache, dass das NF in der Regel eine fakultative Stelle darstellt, stellt sich die Frage nach der Funktion dieser Strukturen. Sie müssen vor allem informationsstrukturell begründet sein, da die meisten Nachfeldelemente ihre kanonische Position im Mittelfeld haben (vgl. Lambrecht, 1994; zu semantisch äquivalenten, aber formal und pragmatisch unterschiedlichen Strukturen). In der Arbeit soll mithilfe einer Korpusanalyse untersucht werden, wie Kinder (Deutsch L1) das NF sowie nf-ähnliche Strukturen und die damit verbundenen Funktionen erwerben und gebrauchen. Als Grundlage dienen die Aufzeichnungen der Sprachentwicklung von fünf Kindern, welche im Rahmen von CHILDES zur Verfügung stehen. Die Interpretation der Daten erfolgt innerhalb des usage-based Ansatzes (Tomasello, 2003), welcher wiederum konstruktionsgrammatische Grundsätze vertritt.

Die Arbeit soll folgende Fragen beantworten:

1. Was ist das NF? Was sind nf-ähnliche Strukturen? (basierend u.a. auf Altmann, 1981; Vinckel, 2006; Zifonun et al., 1997; Averintseva-Klisch, 2009)
2. Wie erwerben Kinder Sprache? (kognitiv-funktionaler Ansatz)
3. Wie können das NF und nf-ähnliche Strukturen innerhalb der Konstruktionsgrammatik dargestellt werden?
4. Wie werden diese Konstruktionen erworben?

Erste Ergebnisse zeigen, dass frühe Nebensätze nicht eingebettet und somit nicht im NF positioniert sind. Darüber hinaus zeichnen sie sich dadurch aus, dass sie relativ konkrete (in Opposition zu abstrakten) Konstruktionen darstellen (guck mal +Nebensatz/ weißt du +Nebensatz). Diese Konstruktionen werden im Fall der Komplementsätze nach und nach erweitert bzw. im Fall der Adverbialsätze in einen anderen Satz integriert (vgl. Diessel, 2004; für das Englische), so dass komplexe Konstruktionen entstehen.

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Automatic Behavior via Phonetic Priming

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Keywords: phonetic priming; automatic behavior; performance; psycholinguistics.

Semantic priming of concepts like “old” can influence individuals’ subsequent behavior. For example, priming individuals with the concept of the elderly activates the stereotype of slowness and individuals temporarily reduce their pace (Bargh, Chen and Barrows, 1996). Advertising industry makes use of such effects when constructing new brand names.

Beyond the semantic effect, the sound of a brand name has been detected as another possible source of influence. Sound with no overt meaning is connected to particular attributes. For example, people prefer a dark beer’s name congruent with its vowel sounds. Back vowels (as opposed to front vowels) are judged as “darker” and therefore fit a dark beer’s name much better (Klink, 2008).

Psycholinguistic research has shown that different phonemes evoke different associations. An artificial and meaningless word constructed of front vowels and voiceless consonants is received as, for example, “faster” (versus “slower”) than an artificial word constructed of back vowels and voiced consonants (Shrum and Lowrey, 2007). Thus, the sound of a semantically meaningless word can convey meaning. We assume that such meaning does not only affect judgment but even performance.

Within the Ph.D. project we aim at finding evidence for phonetic priming effects on behavior, underlying processes of phonetic priming, and answers to what exactly has been primed: goals, motivation, or behavior (Bargh, 2006; Dijksterhuis et al., 2007).

In Experiment I, participants worked on a concentration test introduced with different artificial test names. In support of the hypothesis, different test names affected working speed and error rates.

The dependent variables (main DV: speed) in Experiment II are measured in a driving simulator. Preliminary data will be presented.

Further experiments are intended to focus on the underlying mechanisms and potential moderators.

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Acquisition of Efficient Visual Word Processing: Evidence from Eye Movements and Naming Latencies

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Keywords: psychology; development of reading skills, visual word recognition, naming, eye movements

The present study examined the development of efficient visual word processing and measured both eye movements and vocal reaction time in reaction to singly presented words. Participants were children learning to read the rather transparent German writing system with about 20 participants from grade levels two, three and four. The youngest group, tested in the first months of Grade 2, had experienced about one year of reading instruction, because there is no reading preparation in kindergarten. The pool of words presented for reading aloud varied along several dimensions of interest. Word length varied from 3 to 6 letters and, among 4-6 letter words, number of syllables (one vs. two) and presence of consonant clusters was varied. Critical eye movement measures were number, duration and position of fixations. Results show a massive gain of efficiency from second to third Grade resulting from diminishing effects of word length, number of syllables and consonant cluster density. Interestingly, the increasing efficiency was mainly reflected in shorter fixation durations, whereas the number of fixations decreased only slightly from second to fourth Grade. Additionally, all three groups showed an marked word length effect exclusively in their number of fixations. In sum, the present study suggests that early reading strategies rely predominantly on serial decoding which become more efficient within the first three years of learning to read the transparent German orthography.

The Dice are Cast: The Role of Intended Versus Actual Contributions in Responsibility Attribution

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Keywords: responsibility; attribution; intentionality; outcome bias; experimental game.

How much are people's responsibility attributions affected by intended versus actual contributions in group contexts? A novel experimental game paradigm allowed dissociating intended from actual contributions: good intentions could result in bad outcomes and bad intentions in good ones.

Experiment

Participants acted as external judges and attributed responsibility to individual players for their group's performance. On each round, three computer programmed 'players' formed a group. Each player chose to roll one of three dice. These dice differed in terms of price and probability distribution which were both common knowledge. The cheap die was biased towards lower outcomes, the medium die was fair and the expensive die was biased towards higher outcomes. The group won if the sum of the players' outcomes exceeded a fixed threshold. In case of a win, prize money was equally distributed between the players. Each player's payoff was hence a function of the price for the chosen die and whether the group won or lost. The employed payoff scheme created a social dilemma: for any given group outcome, the expected individual payoff of choosing the cheapest die was highest but the probability of winning given that each player had chosen that die was very low.

Results

The results showed that both intended contribution, reflected in the choice of die, and actual contribution, reflected in the outcome of rolling the die, were determinants of participants' responsibility attributions. Individual regression analyses with choice of die and outcome of roll as predictors revealed that participants could be classified into two distinctive groups – an intention-based group versus an outcome-based group. However, contrary to previous evidence (Cushman, Dreber, Wang and Costa, 2009), more participants based their attributions on the intention rather than the outcome. The implications of these findings for psychological theories of responsibility attribution in group contexts are discussed.

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Towards Cognitively Adequate Tactile Maps

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Keywords: spatial learning; tactile map; cognitive adequacy; map construction.

Spatial Knowledge Acquisition with Tactile Maps

Tactile maps, as external representation of the environment, have been used as alternative to visual maps. They convey meaning about geographic environments via the sense of touch. Acknowledging prior work on human perception and cognition involved in touch, this dissertation project focuses on the cognitive aspects of haptic interaction with tactile maps for pre-trip planning which aims to convey survey knowledge. The implicit task is to learn the structure of the depicted environment from a tailored tactile map, that should be cognitively adequate (Strube, 1992). Such a map enables spatial learning by providing to inducing a mental representation that enables the map reader to successfully solve spatial reasoning tasks without the map. The principles behind the construction of cognitive adequate maps are in focus of this research project.

A Model of Cognitive Complexity as Stand-In for Cognitive Adequacy

After elaborating on the cognitive requirements on interpreting tactile maps I introduce and relate the concept of cognitive adequacy (Strube, 1992) with the concept of cognitive complexity, both applied to tactile map reading. I present a model that hypothesizes which factors influence cognitive complexity, namely geometric-topological factors, situational factors and individual factors. Then I develop a research agenda of experiments whose results can show that the model captures relevant factors in the usage of tactile maps. Results from one study that examines a subset of geometric-topologic factors are examined (Graf, to appear). They support further work to validate the model.

Future Work

The model is discussed and how the quality of the proposed factors, for example, their independency, could be investigated. Eventually, this work will provide experimentally well supported principles and guidelines for constructing cognitively adequate tactile maps to be used in pre-trip consultation.

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Linguistic Analysis of Problem Solving Processes in Object Assembly

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Keywords: problem solving; think aloud; discourse analysis; object assembly

Think aloud protocols have been widely used to gain insight into human problem solving (e.g., Duncker, 1935). These were mainly based on logical problems and the analysis of the recorded protocols was primarily content-based. In my dissertation project I want to expand on this approach by systematically analyzing linguistic features of verbal reports. Furthermore the data has been collected in an experiment in the area of unaided object assembly. A content-based analysis shows that problem solving processes, as described for logical problems in the literature (Newell and Simon, 1972), can also be identified in the given assembly problem. All protocols show a global structure consisting of beginning, middle, and end. The actual problem solving process takes place in the middle part consisting of explorative hypotheses, false leads, dead ends, fresh starts (Palmer, 1977), and actions. In addition further processes, e.g., recognition of object features, are identified. The linguistic analysis is based on discourse analytical categories such as verbs (Halliday, 1994) and markers (Schiffrin, 1987). In a sample of the data it shows that some discourse particles are more frequently used in some processes than in others, e.g., the temporal marker *jetzt* in actions. Furthermore verb categories are differently distributed between processes.

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Using Top-Down Information in Semantic Mapping

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Keywords: robot maps; cognitive robotics; spatial representation; top-down information; semantic mapping.

Semantic Maps

One of the classical tasks of a mobile robot is building a map of its environment. This has led to a large body of work on the problem of simultaneous localization and mapping (SLAM). Traditionally, those maps are used mainly for navigation purposes, which only requires geometric information. However, more demanding applications of mobile robots (e. g., service or rescue robots) require semantically meaningful structures in the environment to be extracted, a process known as semantic mapping (Galindo, Fernandez-Madriral, González and Saffiotti, 2008). Semantic maps can be useful for a variety of tasks, such as humanrobot communication or planning goal-directed interaction with objects in the environment.

Top-Down Information

We propose a concept for integrating high-level semantic knowledge into the mapping process. An important feature of our system is that the data flow is not solely bottom up. Our claim, inspired by results from cognitive psychology (Biederman, Mezzanotte and Rabinowitz, 1982), is that topdown semantic knowledge is essential for more basic perceptive functions. Expectations about typical size, position and spatial relations to other objects can be used to disambiguate noisy object classifications or guide an active search for undetected objects.

System Architecture

The proposed system consists of three layers: the sensor layer, which uses data from a 3D laser scanner to model the geometry and classify objects; the local context layer, which generates prior probabilities of expected objects, using a Bayesian Network; and the global conceptual layer, which represents objects, aggregates and places using a Description Logic ontology. In the talk, we will discuss the structure of our approach to semantic mapping and present first results.

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Simon Effect by Words with Spatial Meaning: Testing in Eye Movement and Subliminal Masked Priming

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Keywords: Simon effect; spatial words; stimulus-response compatibility; eye movement; saccade latencies; masked priming

Simon effect is the facilitation or inhibition in processing responses to the spatial stimuli due to stimuli location information, even when the response feature of the stimuli is location irrelevant. In our first series of two experiments we tested whether the Simon effect due to spatial words can be observed in eye movement, and whether the effect is present only in eye movement saccades or also in manual responses (reaction times) to the same set of stimuli. Here we also varied response axis vertical or horizontal. In our second series of two experiments we used masked priming paradigm to investigate Simon effect produced by words with spatial meaning. In the first experiment of our second series we used neutral target words that were not related in meaning to the priorly presented prime words and to look the effect of prime words on responses to these targets. In the second experiment of our second series we used a mix of neutral words and words related in meaning to priorly presented masked primes and looked whether the compatibility effect produced by the prime words was enhanced.

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Neuroscience and the Mind-Body-Problem

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Keywords: mind-body-problem; reduction; non reductive physicalism; mechanisms; neuroscience.

The Mind-Body-Problem

The mind-body-problem has long been regarded to be a purely philosophical problem. During the last few decades this view has changed: modern neuroscience addresses questions that are crucial for a possible solution to this old problem. In answering these questions neuroscientists usually adhere a specific explanatory practice. This practice is best described

by an approach that has become popular in the philosophy of science: the *mechanistic approach* (cf. Machamer, Darden and Craver, 2000). In my talk I want to address the question: Given that neuroscientific explanations can be reconstructed mechanistically, what kind of relation between mind and brain is suggested by neuroscientific practice?

Mechanisms Supporting Non-Reductive Physicalism

I will argue that the mind-body relation that is best supported by neuroscientific practice (on the basis of the mechanistic interpretation) is a version of non-reductive physicalism (NRP). Roughly, NRP can be characterized as the view that (1) mental properties are distinct from physical properties, (2) mental properties depend on physical properties, and (3) mental properties are causally efficacious (cf. Baker, 2009).

I will argue for the claim that NRP is supported by neuroscience by first pointing out how the mechanistic approach captures neuroscientific practice. Second, I will show that the mechanistic approach implies assumptions that mirror the three theses of NRP: Mechanists hold that (i) mechanisms are composed of entities at different levels whereby the entities are not identical, (ii) the different levels stand in a part-whole-relation, and (iii) entities at a higher level can causally interact with entities at the same level and at higher and lower levels.

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The Reality of Categorical Rules in Language

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Topics: Linguistics, Cognitive Neuroscience, Artificial Intelligence/Cognitive Systems
Keywords: rules, connectionism, innateness

My PhD project (1st year) is concerned with the question of whether there are categorical rules in language and cognition more generally. I'm especially interested in whether such rules are acquired or innate. The method is a literature review of the relevant debate.

By categorical rules I mean rules that a) apply to every member of a category, and b) apply based only on membership in the category and no other properties. A classic example of a candidate for such a rule is the rule for forming the regular past tense of English verbs. E.g. the following verbs are regular:

- 1) drag/dragged
- 2) walk/walked

3) flow/flowed

The past tense form of these verbs is formed from the present tense form by adding the suffix –ed to the verb stem. The rule is categorical in the sense that it applies to every verb stem that belongs to the regular class regardless of the phonetic form or the semantics of the verb. 1), 2) and 3) are not phonetically very similar, but still the regular rule applies to all of them. In addition, phonetically similar verbs aren't necessarily regular (cf. 3):

4) blow/blew

The view that such categorical rules exist has been challenged by connectionism. One aim of the PhD project is to examine in detail if connectionist networks can adequately represent rule-like behaviour. It has been claimed that they can't, e.g. for the reason that they lack the means to represent the sort of categorical abstraction described above.

If such rules can't be learned by, for example, standard connectionist methods, the question immediately arises where the rules came from. A simple answer to this question is that they are not learned at all, rather they are innate. Arguments for innateness in language have been challenged by the claim that innateness would require representational nativism, i.e. synaptic prespecification in the genes, which in turn seems unlikely in view of recent knowledge about neural development. This issue remains controversial, however.

A Person Memory for an Artificial Interaction Partner

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Keywords: ECA; Episodic Memory; Long-Term Interaction; Person Memory

Until now interaction with an agent is often limited to a short period of time, in that relevant information is stored during the ongoing interaction and discarded afterwards. In order to establish a long-term interaction, episodes have to be stored in a way that they can be recalled in later interactions. This should allow the agent to take up topics or to present new information the interaction partner might be interested in (see e.g. the Companions EU Project1).

The goal of this PhD project is to conceptualize a person memory for an embodied conversational agent that enables the agent to recall information from past encounters with his interlocutors. Following Hastie et al. (1980), the proposed person memory goes beyond the common understanding of person memory as a mere name/face storage. In addition to basic information about a person, like her name, age, and number of interactions, significant episodes may be linked from the episodic memory of the agent to his record building an impression of the person (Hastie et al., 1980, p. 126). Our idea is to extract information from

the episodes, like discussed topics, and to combine them with the inferred <http://www.companions-project.org/> emotions of the interlocutor. This would enable the agent to infer mutual interests and relate people (e.g. with respect to their acquaintances) to each other. Besides appropriate emotional reactions to interactants (Kasap et al., 2009), the agent will be able to introduce new topics to an interlocutor utilizing these relationships.

Whereas the focus of most projects dealing with long-term interaction is to get an agent to adapt to one single human interactant (e.g. Castellano et al., 2008) this project aims at creating an agent that is able to interact with a broad range of people. Storing information about the agent as well, will enable him to not only evaluate situations in regard to the interlocutor's but also to his own point of view (e.g. the agent's emotional attitude towards a topic) leading to a more humanlike interaction with the artificial agent.

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Metacognition of Web Users: What Attracts Users' Visual Attention and How Much do They Know About This?

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Keywords: Human-Computer Interaction, Metacognition, Visual Attention, Interface Design for Web.

Introduction

This document presents a PhD project currently in development that deals with cognitive processes during internet browsing and web users' metacognition about this phenomenon. The main goal is finding guidelines for web advertising campaigns that focus on social interests (in contrast to pure consumerist advertisement).

Goals

The placement of links in websites is determining for advertisers, who want people to access their sites (Bachofer, 1998). However, measures to control the deviation of attention (e.g. blinking banner ads) can annoy the viewer. One well-known consequence is that experienced web surfers have developed "banner blindness" (Benway and Lane, 1998) as strategies to escape the attractive force.

We investigate users' awareness of their own strategies and metacognitive beliefs. The idea is to convert this annoyance into an interest for the advertisement by implementing attractive

elements that contain important information. This conversion might change the users' awareness, and they might form new strategies and metacognitive beliefs on web advertising.

Method

The empirical research will be divided in three parts. First, a questionnaire will identify elements of web-marketing which users believe influences their attention when visiting a website.

The second part is an eye tracking experiment, which presents selected websites, each one with variations in bottom-up (Itti and Koch, 2001) aspects. The intention is to extract information about users' behavior when visiting a website.

Tullis and Albert (2008) suggest a recall test to assess participants' metacognition. Therefore, after finishing their tasks, participants will take part in a recall test.

Each research method helps obtaining specific results for the corresponding phase. The combination of the methods allows reasonable comparisons and analysis to be fulfilled.

The experimental design is still in development, so first data should be collected in the next months.

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May I Guide You? – Context-Aware Embodied Cooperative Systems in Virtual Environments

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Keywords: Embodied cooperative systems; BDI; episodic memory; event-indexing model.

The objective of this PhD project is to improve the behavior and assistance of virtual humanoid agents by adding cognitive capabilities of awareness and memory of goals and executed actions. Our first scenario embraces a human discovering a virtual world (e.g., scenic places) in cooperation with an embodied agent having knowledge about the virtual world. The agent accumulates further knowledge from joint experiences (e.g., places visited, statements uttered) and tries to support the human in reaching joint goals (e.g., to visit as many scenic places as possible in a given time).

Our starting point, besides a feature rich virtual world, is an agent architecture building on the belief-desire-intention model (BDI) of rational behavior. We want to extend this cognitive architecture with an episodic memory, where a joint experience is conceptualized as an event in which a sequence of events forms an episode.

To be able to search through episodes and to compare events, we want to embed the event indexing model of Zwaan, Langston and Graesser (1995) into our current BDI architecture. This model describes how humans construct representations of situations in simple narratives. Thereby, events are focal points of situations and are connected in memory along five dimensions: *time*, *space*, *causality*, *intentionality*, and *protagonist*. These dimensions store the answers to the questions of what happened when, where, why and how, and who was involved. To round off the memory we want to combine the event-indexing model with a computer-implemented approach by Tecuci and Porter (2007) conceptualizing a generic episode in three dimensions: *context*, *contents*, and *outcome*. Context is the general setting in which an episode happened, contents is the ordered set of events, that make up the episode, and outcome is an evaluation of the episode's effect.

This project is supported by the Cognitive Interaction Technology Excellence Center (CITEC).

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The Influence of Individual Interest on Eye Movements in Reading

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Topics: Psychology

Keywords: reading, motivation, interest, eye movements

Cognitive processes in reading have been intensively studied via eye movement recordings in past decades. However, research has mainly focussed on the influence of the stimulus material (i.e., different text properties). The aim of the present study is to take a closer look at intra- and interindividual differences depending on readers' motivation by examining the influence of individual interest on reading fixations. Two groups of students with different individual interests participated in an eyetracking experiment with a natural reading task. The results are based on fixation data from 26 subjects interested in soccer and 27 subjects interested in classical music recorded on a sentence corpus comprising 180 sentences and structured in three parts (sentences on soccer, sentences on classical music, and neutral

sentences). Sentence reading times did not show the expected effect of individual interest. However, a closer look into the data revealed a significant first-pass reading time interaction between interest and corpus. In first-pass reading, sentences on soccer were read faster by subjects interested in soccer and sentences on classical music were read faster by subjects interested in classical music. Effects of individual interest were also present for single and first fixation durations. While analyses are still running, it already can be concluded that motivation exerts an early influence on the reading process.

Seeing Structure in the Point Cloud - First Attempts at 3D Symbols for Mobile Robots

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Keywords: robotic mapping, 3D symbols, loop detection, feature extraction, object recognition.

Robotic Mapping

This work is concerned with introducing semantics into robotic mapping at different scales. To make profitable use of a mobile robot, it needs a map of its environment. Until now, these maps are mostly geographical or topological. For example, taking a 3D laser scanner yields a 3D point cloud of all structures in the observable environment of the robot. For the future, these maps need to be enriched by semantics, to give the robot real knowledge about its environment and to enable it to communicate this knowledge to others, be it humans or robots.

Symbol based Mapping

However, instead of integrating a given object representation onto the sensor data, I want to take a different direction, that is, abstracting 3D features from the point cloud generated by the laser scanner to gain a symbolic representation.

Loop Closing

As a first result, we have published the ELCH Algorithm (Sprickerhof et al., 2009), which detects loops in the robot path and corrects them using the local map of the start and end as a grounding for its closure.

Symbol Extraction

For the next step, I plan to condense the raw sensor data into abstract symbols to improve the acquired maps at different scales. At a local scale, this would permit a faster and higher quality of connection of different sensor measurements to a consistent map. On the other side, calculating unique symbols from the sensor data would make it possible to identify unique structures, which would not only help place recognition and loop detection algorithms like ELCH, but could be used as a starting point for a higher level object recognition.

In my talk, I will present first findings on how to infer these symbols and how this improves the mapping process.

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Talks / Vorträge

About Good and Bad: Role Modification in Adjectives

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Keywords: linguistics; non-intersective adjectives; events; manner modification; habituality

This paper examines a class of adjectives like skilful and good that are special insofar as they predicate relative to a certain role of the individual. This comes out in the fact that these adjectives are compatible with as-phrases that make explicit the relevant role, e.g. being a good teacher normally means that one is good as a teacher.

It has been demonstrated that good-class adjectives cannot be given an extensional analysis in terms of properties of individuals, based on substitution failures with co-extensional terms (Parsons, 1968). Traditional semantic approaches to adjectives take substitution failure as evidence for an analysis of good-like adjectives as intensional modifiers (Siegel, 1976).

I argue against an intensional analysis that appears to have a number of flaws. One flaw is that it reduces the set of possible roles, relative to which good-like adjectives predicate, to only one suggested by the intension of the modified noun. This is, however, at odds with the data. The relevant role can be provided by the context overriding the one suggested by the noun (Beesley, 1982). Furthermore, the intensionality theory is not able to explain why good-class adjectives are easily transformed into corresponding adverbial counterparts that modify the verbal predicate denoting the relevant role.

I suggests an alternative analysis of these adjectives as manner modifiers of roles of the referent, whereas roles are modelled as eventualities of the type activity in the scope of a habitual quantifier. Thus, this analysis implies that nouns like teacher can also denote roles, i.e. habitual activities.

The proposed analysis accounts for the fact of adverbial paraphrases and avoids the problems of the intensionality theory: It does not bind the relevant role to the meaning of the modified noun. The fact of substitution failures with manner adjectives is accounted by assuming a hidden event argument, rather than by resorting to intensionality.

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Flow of Affective Information Between Communicating Brains

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Keywords: cognitive neuroscience; decoding; emotion; communication; facial expression; embodied simulation

When people interact, affective information is transmitted between their brains. Modern imaging techniques permit to investigate the dynamics of this brain-to-brain transfer of information. Here, we used information-based functional magnetic resonance imaging (fMRI) to investigate the flow of affective information between the brains of senders and perceivers engaged in ongoing facial communication of affect. We found that the level of neural activity within a distributed network of the perceiver's brain can be successfully predicted from the neural activity in the same network in the sender's brain, depending on the affect that is currently being communicated. Furthermore, there was a temporal succession in the flow of affective information from the sender's brain to the perceiver's brain, with information in the perceiver's brain being significantly delayed relative to information in the sender's brain. This delay decreased over time, possibly reflecting some 'tuning in' of the perceiver with the sender. Our data support current theories of intersubjectivity by providing direct evidence that during ongoing facial communication a 'shared space' of affect is successively built up between senders and perceivers of affective facial signals.

Consistency vs. Flexibility of Spatial Perspective

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Keywords: psychology; spatial perspective; priming

Spatial perspective refers to the use of reference systems in extended spatial descriptions. Choice of perspective (e.g., external or survey perspective vs. embedded or route perspective) has been shown to depend on several individual, environmental, and learning factors on perspective choices. In two experiments we examine whether spatial perspective selection is subject to priming by another speaker's previous use and whether choices remain consistent after a perspective switch by the other speaker.

Participants and confederates took turns describing routes on schematic maps. The confederate's scripted descriptions involved the manipulation of spatial perspective in an

early and a later block—perspective was either consistent or the confederate switched to the alternative perspective between blocks. In experiment 1, the confederate spoke first and described the first and third block of routes. In experiment 2, participants spoke first and described the first, third, and fifth block of stimuli.

Participants' choices of spatial perspective were primed by the other speaker's perspective and aligned with them on the block immediately following their partner's first set of descriptions. They remained consistent when their partner did not switch perspective but they changed significantly when the other speaker switched from the dominant route (embedded/egocentric) to the survey perspective, though not when the switch was from survey to route. Priming occurred both in the presence and absence of an initial description of participants themselves. We discuss the implications of these findings with respect to spatial language priming and within the interactive alignment framework.

The Development of Counting and Numerical Representations

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Keywords: grounding; ontogenesis of counting; numerical representation; reflective abstraction; mathematical thinking

Cognitively and ontogenetically plausible concepts of abstract thinking are rare. Actually, there are at least three major problems considered to be crucial: 1) how thinking is grounded in experience, 2) which processes enable for generalisation from specific instances, and 3) how these lead to mental operations and representations.

To enlarge upon these questions we study the development of counting and the corresponding concept of number. Profiting from a huge amount of experimental studies in mathematics education we claim in accordance with current ideas from AI, philosophy, and psychology that mathematical thinking can be plausibly traced back as deriving from elementary actions (Lakoff and Núñez, 2000), thereby tackling the grounding problem, and leading to an evolutionary sensible concept of dynamic representations based on mental operations (Glaserfeld, 2006).

We consider elementary actions to develop in an enactivism inspired model of learning via environmental interaction. Going beyond classic enactivist accounts, which do not envisage representations, we argue that through an additional step discovering regularities *in* sensorimotor behaviour the abstraction of concepts takes place. The most promising mechanisms for this are Piaget's *reflective abstraction* and Fauconnier and Turner's *conceptual blending*, which allow us to progress from prenumerical abilities to numerical representations.

In the case of understanding the concept of number, representations of individual numbers are of little value. We claim that mental representations of numbers consist of the abstracted regularities of how to operate with them. It is thus the collection of operations (allowing for productivity and systematicity) which defines the object of thought.

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Language Teaching Through Multimedia – A Study

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Keywords: human-computer-interaction; enhancing confidence; teacher's adjustment; adequate computer skills

Constant renovation and development of various knowledge and economy, talents of compound, high quality and high skills are in urgent need in society. Many educational reforms are made in teaching courses using multimedia including computers, films, DVD, Mp3 etc. Many students are becoming stronger in their curiosity for knowledge and comprehension for acquiring English language. Though we belong to computer age, many teachers confront with great challenges in using multimedia in English classroom.

1. How to make the audio-visual class an effective learning process?
2. How to make students participate?
3. How to develop listening and speaking skills in the class?
4. How to build confidence among students?

So the purpose of this paper is to introduce some useful and practical methods to build students' confidence in learning English through multimedia. This paper explores the role of multimedia as effective tools and suggests recommendations for teachers' adjustment, more participation of students and adequate computer skills.

You Think it's Hi-fi – Yet Your Brain Might Spot the Difference: An EEG Study on Subconscious Processing of Noisy Audio Signals

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Keywords: electroencephalography; speech; transmission quality; subconscious processing; shrinkage LDA

In telecommunication research, subjective listening tests are commonly used to measure the perceived quality of speech stimuli. Disadvantageously, these approaches do not provide information about possible subconscious processes which could prime for slowly growing dissatisfaction with an audio transmission. Here, we propose to analyse brain EEG activations related to stimulus quality. This objective information could be informative particularly for minor degradations of auditory hi-fi stimuli where reports of quality differences are notoriously subjective and variable. Accordingly, we ran an EEG study (N=11) using an auditory oddball paradigm: subjects pressed a button whenever they detected a noise disturbance in a set of naturally spoken vowel /a/ stimuli which either were left unmodified (non-targets) or were modified by adding signal-correlated noise at four intensity levels (targets). Most remarkably, in five subjects we found a striking similarity in the averaged EEG patterns elicited by marginally noisy stimuli (mean noise perception rate 43%) which were either missed (no button press) or consciously recognized (button press). Consequently, we trained a classifier based on shrinkage LDA to distinguish between single-trial EEG patterns of hits (detected targets) and nontargets for a given subject. Notably, these classifiers were found capable to distinguish also between misses and non-targets in the same subject - two events which are seemingly similar at the behavioral level (i.e., no button press). Thus, EEG-based classifiers are able to identify instances where an audio stimulus is labeled 'hi-fi' consciously - neurally, however, its actual noise contamination is nonetheless detected, possibly affecting the long-term contentment with the transmission quality.

Impairing Somatosensory Working Memory Using TMS

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Keywords: working memory; somatosensory processing; TMS

IFG and somatosensory WM

The neural mechanisms of somatosensory working memory (SWM) – studied in humans and monkeys alike – have been associated with activity in several brain regions, including inferior frontal gyrus (IFG). However, most of the neuroanatomical claims stemming from these studies are based on correlational analyses, which typically do not deal with causal involvement of specific areas. For that reason, whether sustained neural activity in IFG has a causal role in a successful maintenance of somatosensory information, is a question yet to be answered.

In order to test this, we applied repetitive transcranial magnetic stimulation (rTMS) to disrupt the ongoing neural activity in IFG, while participants were maintaining somatosensory information about an oscillatory vibration. We showed that applying rTMS to IFG caused a drop of performance in a SWM task (from 68% to 61% correct, $p < 0.05$), but not in a control perceptual task. Impairing SWM could be achieved by stimulating IFG in either hemisphere, although a lateralisation trend could be observed (interaction TMS intensity x stimulation side: $p = 0.06$; accuracy drop larger by tendency after right IFG stimulation). Our results show that sustained neural activity in IFG is critical for successful working memory performance in the somatosensory modality.

The Primacy of Graded Grammaticality

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Keywords: linguistics; psychology; grammaticality; language use; magnitude estimation; judgments; language production

The widespread recognition that grammaticality comes in degrees has raised two questions. How does graded grammaticality relate (i) to traditional binary grammaticality judgments and (ii) to language use? To address these questions, we present a formal model based on two experiments and an associated corpus study. The experiments investigated identical sentence materials with two procedures: continuous ratings (magnitude estimation - ME) and binary grammaticality judgments (BGJ). The sentence materials covers 120 ditransitive verbs in different syntactic contexts, including the so-called bekommen passive which is known to be

subject to lexical variation. The experiments and the corpus study confirm this lexical variation for the 120 verbs in the bekommen passive:

- * ME (z-transformed acceptability scores): range = -1.63 - 2.15
- * BGJ (percentages of grammatical judgments): range = 19% - 100%
- * Corpus frequencies: range = 0-2500

Our model makes two assumptions: (1) During language comprehension, sentences are automatically assigned continuous grammaticality values. When required by the task, these values are mapped directly into binary grammaticality judgments in the way of Signal Detection Theory. (2) During language production, the probability of a sentence is determined *inter alia* by its continuous grammaticality score.

A logistic regression analysis predicting BGJ results from ME scores revealed a good fit ($C=.79$), confirming assumption (1). A Poisson regression analysis predicting bigram frequencies from verb frequencies and ME scores showed that both predictor variables lead to significant and substantial reductions in deviance, confirming assumption (2).

Our view that usage frequencies do neither affect graded nor discrete grammaticality contrasts with the claim of usage-based models that perceived grammaticality is a function of language use. We will present further statistical analyses showing the superiority of our model over alternative accounts.

Accessing and Characterizing the Competence Grammar: Double Dissociations in Neural and Behavioral Responses to Linguistic Ill-Formedness.

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Keywords: linguistics; cognitive neuroscience; statistical learning; competence grammar; brain-behavior dissociations; selective attention; sub-symbolic representation

Generative linguistics is built on the assumption that the competence grammar is accessible via performance measures such as introspective judgments or (more recently) experimental assessments of acceptability. In this paper we review evidence that this belief is likely ill-founded. Electrophysiological research points to a double dissociation of brain and behavior in assessments of linguistic well-formedness: the brain both responds to ill-formedness that is behaviorally detected only at chance levels (Tokowicz and MacWhinney, 2005) and ignores ill-formedness that is behaviorally salient (Bornkessel et al., 2003; Cowles et al., 2007).

In our study, we created an artificial SOV language and trained participants for an hour on a split-ergative agreement system encoded within the verb phrase. Participants were also passively exposed to auxiliary selection restrictions tied to verb class and transitivity differences across individual verbs. Behavioral results showed that participants detected trained-upon subject-verb agreement errors with 70% accuracy but were insensitive to the untrained-upon errors of auxiliary selection and transitivity. Overall, the brain did not appear to respond to any type of violation, the opposite pattern from Tokowicz and MacWhinney (2005).

When participants were divided according to behavioral accuracy during training, however, more subtle dissociations emerged. Subjects who learned successfully during training were also successful at detecting trained-upon violations during testing, but showed no brain responses to any type of violation. In contrast, subjects who were less accurate during training were also less accurate during testing, but showed large brain responses to all three violation types.

Our conclusion from this and other studies is that the notion of a competence grammar and how best to access it is in need of revision: should it be defined at the neural level, the behavioral level of objective acceptability measurements, or the subjective, introspective level of global assessment?

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Expecting Coreference: The Role of Alternative Constructions

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Keywords: sentence processing; anaphora resolution; coreference; expectation-based language processing.

We present two experiments showing that distributional properties and expectations about alternative constructions play a crucial role in anaphora resolution.

In a questionnaire, we obtained different coreference patterns for Portuguese sentences with a (semantically similar) subordinating or coordinating temporal conjunction: in the case of coordination (depois: after that, 1a) there is a preference for the pronoun to co-refer with the

subject of the preceding clause, while for the subordinating conjunction (*antes que*: before, 1b) we observed a strong object preference.

To explain that, we propose that comprehenders use a Gricean or expectation-based strategy: in Portuguese, for sentences with *antes que* (1b) there is a highly frequent alternative infinitive construction (*antes de abrir*: before opening), which only allows coreference with the subject of the preceding clause. Upon seeing the subordinate construction, comprehenders may assume that the speaker intended coreference with an antecedent other than the subject.

To exclude an explanation in terms of coordination and subordination, we conducted a self-paced reading experiment with unambiguous sentences, where we varied the kind of subordinating conjunction, one having an alternative construction (*antes que*: before, 2a/b), the other one not (*quando*: when, 2c/d).

On both the pronoun and the spill-over, we found a reliable interaction, in a way that for the subordinate clause with an alternative infinitive construction there is a clear decrease in reading times in the object coreference condition, whereas this difference was not found in the cases with no alternative construction.

Our results suggest that the effects found in both studies can be attributed to comprehenders' using a Gricean or expectation-based strategy in anaphora resolution. We will discuss whether these strategies are at work in on-line processing or whether they reflect the comprehenders' experience with referentially ambiguous and unambiguous constructions.

Materials

- (1a) O polícia viu o espião. Depois ele abriu a porta.
'The policeman saw the spy, before he opened the door.'
- (1b) O polícia viu o espião, antes que ele abra a porta.
'The policeman saw the spy. After that he opened...'
- (2a/b) O polícia viu a atriz, antes que ele/ela abra a porta.
'The policeman met the actress, before he/she opened...'
- (2c/d) O polícia viu a atriz, quando ele/ela abriu a porta.
'The policeman met the actress, when he/she opened...'

On the Production and Perception of Iconic Gestures: Insights from Computational Modelling and Empirical Studies

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Keywords: iconic gestures; gesture production; gesture perception; idiosyncrasies; commonalities

The production of speech-accompanying iconic gestures in humans is, on the one hand, characterized by *commonalities* that account for an agreed sign system, and on the other hand, by *idiosyncrasies* that make for a coherent individual style. In a computational model, we simulate the production of iconic gestures accounting for both idiosyncrasies and commonalities: we have proposed GNetIc, a gesture net for iconic gestures, to automatically derive novel gestures from contextual demands (Bergmann and Kopp, 2009).

Analyzing the modelling results enables us to gain novel insights into the production process of iconic gestures: differences in the resulting networks reveal that individual differences are not only present in the overt gestures, but also in the production process they originate from. Whereas gesture production in some individuals is, e.g., predominantly influenced by visuo-spatial referent features, other speakers mostly comply with the discourse context.

Finally, we will present results from a study analyzing how human users perceive a virtual agent endowed with such gestural expressiveness. Results show that automatically GNetIc-generated gestures help to increase the perceived quality of object descriptions given by a virtual human. Moreover, gesturing behavior generated with individual speaker networks is rated more positively in terms of likeability, competence and human-likeness (Bergmann et al., 2010).

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Mental Rotation of Primate Hands: Human-Likeness and Thumb Distinctiveness

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Keywords: handedness recognition; mental rotation; primate hands; thumbs

Mental rotation of human hands has been found to differ essentially from mental rotation of objects. In mental hand rotation tasks, reaction times are influenced by the comfort and familiarity of the displayed hand position (Parsons, 1987). Similarity of the presented stimulus to the subject’s own hand, in which size and shape of the thumb often play a crucial role, has not been investigated to great extent. Gawryszewski et al. (2007) applied hands of humans and other anthropoids as stimuli in a mental rotation tasks and found an effect of stimulus orientation, but not of hand identity. The authors concluded that anthropoid hands are equivalent for handedness recognition in humans and ascribe this effect to activity in the human mirror neuron system.

In contrast to Gawryszewski and colleagues (2007), we used primate hands that varied extensively in human-likeness, from human and very similar (squirrel monkey) hands to very dissimilar (ayeaye) hands, as stimuli in a mental rotation task (N=19). Previous to the mental rotation experiment, five out of 24 hands were chosen based on a questionnaire study (N=43) for their scores in human likeness and specifically for distinctiveness of the thumb.

Results of our study revealed effects of orientation ($p < .01$) and hand identity ($p < .001$) on reaction times, as well as a trend for their interaction. For accuracy (measured as percentage of correct answers), results showed effects of orientation ($p < .01$) and hand identity ($p < .01$), as well as an interaction between both factors ($p < .05$). The human hand showed the highest accuracy and shortest reaction times, whereas the almost thumb-less Colobus hand showed lowest accuracy and longest reaction times.

We conclude that the similarity to the human hand, and specifically a distinctive thumb that decreases hand symmetry and serves as “orientation landmark”, facilitates mental rotation.

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Motor Synergies in Grasping Real and Virtual Objects

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Keywords: manual action; grasping; motor synergies; object representation; PCA

In manual action, the large number of degrees of freedom (DOF) in the human hand has to be controlled efficiently, and it has been proposed that hand control is organized in a modular way. Several studies have supported the notion of motor synergies (i.e., DOF coupled into functional groups) in the control of manual action, and principal component analysis (PCA) has proved to be a useful tool to extract such motor synergies (e.g., Tresch et al., 2006). We investigated the kinematics of grasping real versus virtual spherical objects of different size. The kinematic data was analyzed using PCA in order to extract motor synergies and to determine invariant movement characteristics of real and virtual object grasping.

Subjects (N=10, right-handed, 24-39 years, 3 women) grasped spherical objects while wearing a wireless data glove (Immersion CyberGlove II) that allowed for recording whole hand kinematics (22 DOF). Hand trajectories were tracked using a 14 camera VICON motion capture system that monitored three retro-reflective markers on the back of the data glove. In Experiment 1, 8 white plastic spheres varying linearly in size were presented on a holding device in pseudorandomized order. In Experiment 2, corresponding images were displayed on a computer screen behind the empty holding device, and subjects were instructed to imagine the displayed object lying on the holding device. Based on pooled joint angle time courses, we computed PCA for each experiment separately in order to extract motor synergies and compared the results of the two experiments.

Results indicate that on average 80% of the variance of both the real and virtual grasping movements can be described by 3 principal components, indicating strong linear relationships between the involved joints. Most subjects use similar motor synergies during real and virtual grasping, and these synergies tend to reflect the physical properties of the grasped object in a straightforward manner. These findings allow for a compact description of grasping movements in terms of motor synergies.

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Equipping a Conversational Agent with Access to Wikipedia Knowledge

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Keywords: embodied conversational agents; Wikipedia; human-agent conversation; dialog topic

The online encyclopedia Wikipedia has become a popular source of knowledge and often constitutes the first choice for humans looking up information on the internet. Thereby, additional characteristics like the categorization of articles and the allocation of disambiguation pages support Wikipedia users in their search for the relevant article. By representing this information in an adequate format, machines are already able to process and use these additional hints as well.

In the KnowCIT¹ project we focus on extending the conversational abilities of the embodied conversational agent Max by accessing Wikipedia as an external source of information (Breuing, to appear). This allows Max to look up information on Wikipedia similar to humans and to employ encyclopedic knowledge on request. More precisely, if the human dialog partner asks for information about a term which is not contained in the agent's present knowledge base so far, the system searches for an adequate Wikipedia article. A successful article search leads to the extraction of the most term-descriptive information of the article text and hence to a suitable answer for the user.

The search for the relevant Wikipedia article is implemented by text search rules including a mapping of the user's requested term to the articles. In addition, we endowed Max with topic detection abilities to limit the search for the Wikipedia article depending on the current dialog topic. Thus, ambiguous terms are topically restricted which improves the article discovery. Finally, to present a summarized description of the requested term, the short abstract of the article most conforming is extracted and sent to the agent's behaviour generator afterwards.

As a result, the conversational agent Max has access to an external knowledge source containing terminologically classified and collaboratively maintained information ascertainable via look-up abilities. A first informal evaluation of the quality of the search algorithm gave hints on how to improve the search for better performance.

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Predicting the BOLD Response with a Computational Model of Deductive Spatial Reasoning

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Keywords: cognitive modeling

ACT-R is both a theory of cognition and an architecture for the simulation of human behavior. Recent research aims to explain, predict, and integrate behavioral data with brain activations found in fMRI studies. Central to this research is the modular organization of the ACT-R architecture on the one hand and the modular organization of the brain on the other; for each module ACT-R 6.0 implements the (restricted) BOLD-function that allows to model the different levels from neurological evidence to symbolic modeling.

So far, however, predominantly cognitive processes involved in algebraic transformations have been investigated. For a theory that claims to be a universal approach, other cognitive tasks remain to be tested.

Our work aims to generalize current findings on deductive spatial reasoning, another prominent human mental ability. In particular, we analyze transitive inferences during the spatial reasoning process (e.g. A is to the left of B and B is to the left of C; therefore A is to the left of C). Behavioral findings suggest that reasoners tend to incrementally construct a mental model from the premises, which they in turn use to inspect to draw inferences.

Previous fMRI findings revealed certain brain activation patterns that formulate the goal for the presented modeling task. Using the (restricted) BOLD-function our cognitive model can partially replicate and explain the fMRI results.

Integrating neurological findings have a main advantage for cognitive modeling: The goodness-to-fit can be extended far beyond the behavioral data and help to further establish ACT-R as a cognitive theory and provide support that can be interpreted as plausible from a neurologically perspective. The findings, limits and potentials of the current representation of the Bold-function in ACT-R will be discussed.

Belief Revision beim räumlichen Denken

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Stichworte: Philosophie; Psychologie; räumliches Denken; belief revision; mentale Modelle; mentale Repräsentation; Inkonsistenz-Entdeckung

Menschen müssen ihre Vorstellungen darüber, was der Fall ist, wie etwas aussieht oder wie sich etwas zugetragen hat, häufig ändern. Wie revidieren Menschen bereits existierende Vorstellungen im Lichte neuer Informationen? Wann halten sie an gegebenen Vorstellungen fest und wann sind sie bereit ihre Annahmen zu ändern? Wir berichten aus einem Projekt, in dem diese Fragen am Beispiel des räumlichen Denkens untersucht werden. Ausgangspunkt des Projekts ist die Hypothese, dass der "Glaube" darüber, wie Objekte im Raum angeordnet sein können, auf die Konstruktion und Inspektion mentaler Modelle zurückgeht. Die Modelle sind kognitive Repräsentationen („mentale Vorstellungen“) der in dem räumlichen Problem beschriebenen Gegebenheiten. Individuen bleiben bei ihren Annahmen, solange sie mit diesem Modell konsistent sind. In mehreren Experimenten haben wir untersucht, wie Menschen die Konsistenz zwischen unvereinbaren räumlichen Informationen erzeugen und welche Informationen sie bereit sind zu widerrufen, um Konsistenz wieder herzustellen. In den Experimenten wurden zunächst zwei Prämissen präsentiert, aus denen eine konsistente Repräsentation konstruiert werden konnte. Anschließend wurde ein drittes Statement eingeführt, das dieser Repräsentation widersprach. In dem Vortrag werden experimentelle Befunde vorgestellt, die zeigen, (1) dass Probanden sehr gut darin sind, Inkonsistenzen zwischen einer bereits bestehenden mentalen Repräsentation und einer neu verfügbaren – widersprechenden - Information zu erkennen. Außerdem zeigen wir, (2) dass es spezifische Präferenzen gibt, welcher Teil der Repräsentation (des „beliefs“) erhalten und welcher Teil aufgegeben bzw. revidiert wird. Die Ergebnisse werden zu konkurrierenden „Belief Revision“-Theorien in Beziehung gesetzt.

Curiosity in Learning Sensorimotor Maps

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Keywords: artificial intelligence/cognitive systems; motivation; curiosity; sensorimotor maps; ideomotor principle; information gain

The main postulate of the ideomotor principle is that learning to act goal-directed is based on learning forward-inverse models of sensorimotor correlations. Reflex-like actions are supposed to lead to the learning of initial rudimentary correlations. However, soon the developing sensorimotor knowledge is used to trigger goal-directed actions. By definition, such goal-directed actions must be guided by an envisioned goal. In autonomous, cognitive agents it can be expected that these goals are activated dependent on the current urge of system-inherent motivations.

In our current work, we are particularly interested in intrinsic motivations that have the goal to improve the sensorimotor knowledge itself. We ground this intrinsic motivation on the expected information gain, terming the resulting motivation curiosity. While the idea of curiosity based on information gain is not new, it remains unclear how the concept of information gain may be incorporated into developing sensorimotor spatial structures. Thus, we integrate the curiosity motivation concept into self-organizing, population-encoded spatial representations that are learned by the time-growing neural gas (TGNG) algorithm, which builds such a sensorimotor-grounded spatial map from scratch learning iteratively online.

The goal of the current work is to compare the suitability of different forms of information gain measurements and approximations thereof within the context of self-developing sensorimotor maps. We investigate the learning performance in a continuous and noisy maze learning task. It is hoped that this work will lead to a fundamental theory on how curiosity may be grounded in emerging sensorimotor structures and how, in retrospect, consequent curious behavior may shape sensorimotor structures more behaviorally suitable.

Toward a Computational Cognitive Model of Human Translation Processes

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Keywords: linguistics; artificial intelligence/cognitive systems; psychology; modelling; human translation processes; cognitive architecture of translation; divided and alternating attention

Current models of human translation processes explore and describe elements of cognitive processes in translation, but up to data no attempts have been made to integrate the findings in a coherent computational cognitive architecture. To overcome this shortcoming, the paper grounds empirical findings in human translation processes research in the ACT-R cognitive architecture.

We have collected activity data of student and professional translators (i.e. gaze and keyboard data) from 24 translations sessions. Source text (ST) reading, target text (TT) production and translation planning processes are described as processes in the ACT-R architecture. At the highest level, translation is modelled as a planning task consisting of three phases: a skimming phase, where dictionary retrieval cues are activated; a drafting phase where sequences of words are read and translated in a loop process; and a post-editing phase, where the translated text is re-read and (post) edited.

The paper focuses on formalizing and modelling the translation drafting phase: Novice translators generally show larger ST reading effort than experienced translators while expert translators show less fragmented typing behaviour. The ACT-R architecture can explain this reduced effort of experts by compiling several production rules into one rule, transforming declarative into procedural knowledge which allows experts to produce translations in shorter time, with a lower effort, a lower number of production units and more instances of divided attention than novices do.

Does Purpose of Language Use Affect the Processing System of the Native Language?

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Keywords: sentence processing; ERP; N400

The aim of several studies investigating the complexity of sentence processing is to find the source which causes the processing complexity. The main aim of this study is to explore brain responses during on-line sentence processing in two groups of university students with Turkish as their L1. Hence, we attempt to find out the effect of the purpose of using the language and will investigate whether this might have an influence on brain responses during on-line sentence processing of university students of language departments and technical departments. Our assumption is that a difference might be due to an unconscious sensitivity in analyzing the language itself in students studying languages. Our analysis makes use of the components of the event-related brain potential (ERP), the N400 and P600. The N400 is known to vary in amplitude with semantic and lexical manipulations (for a review see Kutas and Federmeier, 2000) and to reflect processes of lexical-semantic integration (Bentin et al., 1995; Chwilla et al., 1995). The more difficult it is to integrate the eliciting word with the representation of the ongoing context, the larger the associated N400 with all other factors (frequency, repetition, imageability, word class) held constant (Moreno and Kutas, 2005). The second ERP component, the P600, has generally been associated with syntactic processing difficulty and with reanalysis processes (Kaan et al., 2000).

Event related potential signals from 20 electrodes were recorded. The students were presented two sets of sentences. The first set consisted of 200 semantic congruent and incongruent Turkish sentences. In the second set 200 syntactically violated and correct sentences were presented in random order. The first results of the ongoing study indicate that the groups differ in their event-related brain potential measurements. The brain responses of the students who study in technical departments showed a larger N400 component as the student studying languages. As the N400 is suggested to be sensitive to processing complexity (Monetta et al., 2003) it might be concluded that even processing the native language is different in requirements of cognitive resources.

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Weak Referentiality: Linguistic Evidence for Cognitive Constraints

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Keywords: linguistics; definite reference; conceptual structure; semantic incorporation; semantic enrichment

In this paper we investigate a subclass of German prepositional phrases (PPs), which oppose the unitary account of definiteness that is largely suggested in the linguistic and philosophic literature on definite reference. These PPs require certain conceptual structures and are thus governed by particular cognitive constraints.

PPs in German often have the same structure as English PPs (cf. the regular PP in (1a)). But German also has another type of PP that is headed by forms (cf. the contracted PP in (1b)), that look like contractions of prepositions and determiners. Note that both (1a) and (1b) translate into English as in (1c).

(1) a. Anna ging zu dem Supermarkt. b. Anna ging zum Supermarkt.
c. Anna went to the supermarket.

These two types of PP cannot in all contexts substitute for each other without leading to ungrammaticality or incoherence. We suggest that the difference between these two types is semantic in nature, and this difference emerges when the sentences in (1a) and (1b) are continued with a VP-anaphor like "und Bob auch" ("and Bob did too"): While (1a) requires Anna and Bob to have gone to the same supermarket, this requirement does not hold in (1b). It seems that contracted PPs do not involve properly referential uses of the definite noun phrases. We thus call them weak referentials and, in contrast to regular PPs, analyse them as semantically incorporated into a larger predicating constituent. Such incorporation can only succeed, however, if a concept is available that can be used to interpret the complex constituent. We take it that the construction of an appropriate concept is governed by cognitive rather than lexical constraints. The incorporation hypothesis is further supported by the observation of semantic enrichment that comes with weak referentials: going to the supermarket is not just going to some supermarket, but also performing one or the other activity typically performed at supermarkets.

Online Comprehension of Desiderative-Mood Sentences: Evidence for an Immediate Activation of the Approach System

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Keywords: language comprehension; sentence mood; grounding; approach/avoidance

This study addresses the comprehension of sentences describing desired situations. It is an extension of previous work that explored the nonmetaphorical (cf. Barsalou, 1999) experiential grounding of desiderative sentence mood. Drawing on the distinction between the approach and avoidance system (for an overview, see Elliot, 2008), it was hypothesized that processing desiderative-mood sentences involves activating the approach system. Findings from several experiments (in German) support this assumption. Responses to desiderative-mood sentences (see 1) were found to be faster when responding required an approach action (pulling) compared with an avoidance action (pushing). Crucially, response times for factual-mood control sentences (see 2) did not differ between the two response conditions.

- (1) *Lea will in einer Hängematte liegen*
[Lea wants to rest in a hammock]
- (2) *Lea hat in einer Hängematte gelegen*
[Lea has rested in a hammock]

The goal of the present experiment was to gain some insight with regard to the onset of the effect. Does it occur immediately when processing the mood marker or not until sentence wrap-up?

Participants' task was to read sentences, word-by-word, self-paced. To advance from the current word to the next word, participants either had to pull (approach) or to push (avoidance) a joystick. Each experimental sentence had two versions that differed with regard to sentence mood: desiderative (see 1) and factual control (see 2).

Analyses of the reading times yielded a significant interaction of sentence mood and joystick direction for the mood marker (wants/has) but not for any other word of the sentences. Reading times for the desiderative mood marker *will* [wants] were shorter in the approach condition than in the avoidance condition. Reading times for the factual-control word *hat* [has] did not differ between the two conditions. The pattern of result suggests that processing a desiderative mood marker immediately triggers the activation of the approach system and indicates that the effect may be short-lived.

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If It's the Case that if an Animal is a Dog, then It Barks, do all Dogs Bark?

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Keywords: psychology; deductive reasoning; conditionals; quantified statements

Two experiments aimed at comparing the meanings of conditional ("If p then q") and universally quantified ("All p are q") statements. We hypothesized that conditionals are understood as the conditional probability $P(q|p)$, independently of the number of instances referred to, and that quantified statements may have two interpretations: (1) equivalent to the probabilistic understanding of conditionals, or (2) deterministic, such that a statement is considered false in the population when there is an exception to it. Since the probability that a sample includes an exception increases with its size, estimates would decrease as sample size increases. Mathematically, this decrement would be exponential. We predicted interpretation (1) to be endorsed when statements refer to a sample drawn from a population in which the relation holds as a general law (exp. 1) resp. to a relation holding in the population in general (exp. 2), and interpretation (2) when referring to a sample drawn from a limited group of elements for which the relation coincidentally holds (exp. 1), resp. to a sample of limited size (exp. 2).

Subjects were asked to estimate the probability of statements on the basis of the truth or falsity of their constituent propositions p and q. The statements were embedded in short context stories of fictive content.

It was found that estimates for conditionals were in accordance with the conditional probability. Quantified statements decreased as sample size increased, irrespective of whether a general law or a casual contingency was referred to. They were lowest when addressing the population in general. The decrement was shallower than expected by an exponential function. In addition, mean estimates for quantified statements were lower than for conditionals.

It can be concluded that whereas the meaning of conditionals can be understood as probabilistic, that of universally quantified statements may be better described through a deterministic framework.

Zur Interaktion zwischen Sprache und Motorik: Wortbasierte Kompatibilitätseffekte

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Stichworte: Embodiment, Simulationstheorie, ACE, Kompatibilitätseffekte

In der Sprachverstehensforschung mehrtsich die Evidenz, dass die beim Sprachverstehen und bei der nicht-sprachlichen Kognition gebildeten Bedeutungsrepräsentationen prinzipiell von derselben Art sind (Simulationstheorie des Sprachverstehens). Ein anschaulicher Beleg dafür ist der *Action-Sentence Compatibility Effect* (Glenberg und Kaschak, 2002): Sätze, die eine Bewegung implizieren, werden schneller als sinnvoll eingestuft, wenn die dafür benötigte Bewegung mit der beschriebenen Bewegung übereinstimmt. Ähnliche Interaktionseffekte wurden auch gefunden, wenn statt Sätzen einzelne Wörter gezeigt wurden (z.B. Estes et al., 2008).

Wort-basierte Kompatibilitätseffekte sind der Gegenstand der vorliegenden Studie. In zwei Experimenten wurden je 39 Probanden in einem Lexikalischen Entscheidungsparadigma jeweils 60 Nomen und 60 Pseudowörter mittig präsentiert. Die Hälfte der Nomen bezeichnete Objekte, die gewöhnlich unten in der Welt auftreten (z.B. Wurzel), die andere Hälfte solche, die oben anzutreffen sind (z.B. Dach). Auf einer vertikalen Tastatur war für eine korrekte Antwort entweder eine Bewegung nach oben oder nach unten erforderlich. In beiden Experimenten zeigte sich eine signifikante Interaktion zwischen der Lokation in der Welt und der Antwortrichtung, und zwar in Form einer Erleichterung bei Kongruenz. Im zweiten Experiment wurde zusätzlich untersucht, ob das Hinzufügen eines weiteren potentiell positionsrelatierten Merkmals die Effekte beeinflusst. Die Wörter wurden in einem braunen oder blauen Kasten präsentiert, da Blau eher mit Objekten oben im Gesichtsfeld (Himmel) und braun eher mit Objekten unten im Gesichtsfeld (Erde) assoziiert sein könnte. Es zeigte sich kein zusätzlicher Effekt der Farbe.

Die Ergebnisse der beiden Experimente demonstrieren eine Interaktion zwischen sprachlichem Inhalt und Motorik bei der Verarbeitung isolierter Wörter und stützen damit die Annahme eines gemeinsamen Repräsentationsformats für sprachliche und nicht-sprachliche Kognition.

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Impairment of Muscarinic Acetylcholine Receptor Signaling in Human Epileptogenic Neocortex: Implications for Cognitive Deficits?

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Keywords: neurobiology; cognition

A wealth of evidence indicates a crucial role of cholinergic transmission in cognitive processes. However, the cellular effects mediated by muscarinic acetylcholine receptors (mAChRs) are poorly understood in the neocortex. We characterized the effects of mAChRs activation in slices by recording field potentials and intracellularly from pyramidal neurones. The cholinergic agonist carbachol (CCh) and selected antagonists (atropine, pirenzepine, AFDX116) were applied. Both rat neocortex and human neocortical tissues (obtained from patients operated for epilepsy or brain tumours) were used. Our data from rat neocortex revealed that 1) activation of M1-mAChR increased the neuronal firing via a blockade of M-currents, 2) activation of M2-mAChR decreased GABA_A receptor-mediated responses and 3) activation of M4-mAChR decreased glutamate receptor-mediated responses. In human epileptogenic cortex, M1-mAChR activation also increased neuronal firing, this increase was relatively small, though. In control conditions, the firing of neurones from epilepsy tissues was larger than in human “control tissues”, suggesting alterations of M1-mAChR effects. The firing was larger in neurones from patients with a longer history of epilepsy, but was not linked to the severity of the disease. The M4-mAChR-mediated depression of glutamatergic transmission but not the M2-mAChR-mediated depression of GABAergic transmission was detectable in human epileptogenic tissue. In conclusion, our data indicate a triade of CCh effects on intrinsic and synaptic processing in the healthy neocortex by pharmacologically distinct mAChRs. The depression of glutamatergic transmission and increase of neuronal firing would improve the signal to noise ratio and may represent a basis of “neuronal attention”. In addition, the depression of GABAergic inhibition would facilitate long term potentiation. It remains to be tested whether cognitive performance of the epilepsy patients relate to efficacy of mAChR signalling.

Comparative Concepts

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Keywords: philosophy; comparative concepts; categorisation; natural properties, conceptual spaces; Voronoi tessellation

Comparative concepts (such as ‘greener than’ or ‘higher than’) are fundamental to our grasp of associated categorical concepts (‘green’, ‘high’, respectively). Some comparative concepts seem natural, whereas other ones seem rather gerrymandered---e.g., compare ‘x is greener than y’ and ‘x and y are such that either (i) x and y are inspected before midday and x is greener than y, or (ii) x and y are inspected after midday and x is bluer than y’. What kind of cognitive structures underlie our ability to order objects? And why do we order objects the way we do, and not in other ways? The aim of this talk is to outline an account comparative concept within a conceptual spaces framework. The account bears for one on the account of naturalness for comparative concepts. For another, it bears on the theory of gradable concepts, i.e., the type of categorical concepts expressed by gradable terms in natural language. The approach is novel in that it carries some basic assumptions from Peter Gärdenfors' conceptual spaces account of categorical concepts over to comparative concepts (Gärdenfors, 2004). The offered approach is more general both (i) in that it supplies a framework for motivating various types of categorisation rules for gradable concepts, and (ii) in that it gives a model that subsumes ungraded categorisation as a limiting case. Time permitting, also some implications with empirical content and some applications to the theory of imprecision in mind will be highlighted.

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Lernen konditionaler Information

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Stichworte: Linguistik; Philosophie; Konditionale; Bayesianische Bestätigungstheorie; Konditionalisierung

Einige Informationen erhalten wir in konditionaler Form. So lernen wir zum Beispiel, dass wenn es weiterhin regnet, das Spiel morgen abgesagt wird oder dass wenn die Emission von Treibhausgasen nicht zurückgeht, mit Wüstenbildungen in Teilen Europas zu rechnen ist. Wie sollte man den eigenen Glauben updaten, falls man Informationen dieser Art erhält? Gegeben

die Bayesianische Bestätigungstheorie ist im Großen und Ganzen eine adäquate normative Lerntheorie, kann diese Frage wie folgt umformuliert werden: Wie soll man die eigenen (subjektiven) Wahrscheinlichkeiten updaten nachdem man konditionale Information erhalten hat? Es ist verwunderlich, dass dieser Frage in der Bayesianischen Literatur bisher wenig Aufmerksamkeit geschenkt wurde. Nach Standard Bayesianischer Auffassung sollen wir nach dem Erhalten von einer Information so updaten, dass wir auf sie konditionalisieren. Doch wie Brian Skyrms anmerkt: „wir haben keine genaue Vorstellung davon wie man auf ein Konditional zu konditionalisieren vermag“. In der Präsentation möchte ich innerhalb des Bayesianischen Rahmens bestimmte normative Einschränkungen zum Umgang mit konditionaler Information vorschlagen. Ich argumentiere dafür, dass, zumindest für eine große Klasse von Konditionalen, der Umgang mit dem Lernen von Konditionalen auf Überlegungen zu Erklärungszusammenhängen beruhen sollte.

Disentangling Topicality from Order of Mention in the Resolution of the German Subject Pronouns *er* and *der*: Off-line and On-line Data

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Keywords: psycholinguistics; pronoun resolution; information structure, eye-tracking

Using comprehension questionnaires and visual-world eye-tracking, this study investigates how the topicality of the antecedent candidates guides German native listeners in interpreting the personal pronoun *er* and the d-pronoun *der*. In previous studies, it has been reported that the personal pronoun is preferentially used for topic continuation, while the use of a d-pronoun signals topic shift. However, this has only been tested using contexts which always present the topic antecedent in the first position and the non-topic antecedent in the second position conflating order of mention and topicality information (Bosch et al. 2007; Wilson, 2009).

This study disentangles topicality from other factors, namely order of mention and grammatical function by contrasting two antecedent structures for *er* and *der*: double nominative comparative constructions as in (1a) and coordination as in (1b). Both constructions present the antecedents in nominative case and in the same order of mention, but they differ with regard to the topicality relation (topic-non-topic as in (1a), topic-topic as in (1b)). Results from the off-line comprehension questionnaire show an overall first-mention (topical) interpretation for the two pronouns following comparative antecedent structures. For coordination, the two pronominal forms showed no preference. At the same time, the on-line eye-tracking data analyses reveal a second-mention resolution preference for the d-pronoun across construction types. We will compare the off-line and on-line results, and we will discuss our findings with reference to current models of pronoun resolution and online processing.

Sample Item:

(1) a. Comparative Antecedent Structure

Der Schrank ist schwerer als der Tisch. Er/ Der stammt ...

The cupboard is heavier than the table. It (er/ der) originates ...

b. Coordination Antecedent Structure

Der Schrank und der Tisch sind schwer. Er/ Der stammt ...

The cupboard and the table are heavy. It (er/ der) originates ...

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Probability Estimation of Rare Events in Linguistics and Computational Neuroscience

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Keywords: linguistics; cognitive neuroscience; significance testing, Zipf's law, frequency counts, natural language, spike patterns

In many subdisciplines of Cognitive Science, researchers are confronted with frequency counts involving large numbers of rare event types, whose highly skewed frequency distribution adheres to the Zipf-Mandelbrot law. Notable examples include word frequencies and other linguistic phenomena, as well as neural spike patterns.

Standard hypothesis tests used to assess the statistical significance of frequency data are unsuitable for this situation. The primary reason is that they have been designed for single event types, but are now applied to the group of all rare events observed in a sample. In our talk, we show how the very large number of possible rare event types that could have occurred, their Zipfian probability distribution, and the discrete nature of frequency counts combine to inflate the risk of a false rejection (type I error) drastically.

We propose a posterior, group-adjusted significance test, which is not based on the probability of a type I error for an individual event type, but rather on the expected number of such type I errors in the group of all event types that occur with a certain frequency in the sample at hand. An important ingredient of this test is a model for the prior distribution of event type probabilities, derived from the power-law rank-frequency relationship stipulated by the Zipf-Mandelbrot law.

The new significance test is illustrated with applications to word frequency data and neural spike patterns. We compare the results to those of standard hypothesis tests and to adjusted probability estimates such as Good-Turing and Lidstone's law.

From Smart Materials to Cognitive Materials – Requirements and Challenges

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Keywords: smart materials, artificial intelligence, application

Smart materials are materials that are either capable of changing some of their properties according to external stimuli (e.g., light or electric impulse) or to provide sensorial perceptions from sensors integrated within the material itself. The latter is also called *sensorial material* (Lawo et. al., 2009). Recently, this kind of materials is gaining increasing importance in application fields as for example automobile construction, production engineering, or wearable computing.

Smart and sensorial materials provide a variety of new possibilities for intelligent applications. For example, a work piece in production could have embedded sensors to measure the pressure put on it. However, at the current state, it is more this application than the material itself that can be considered being "smart". In this contribution, we proceed some steps beyond the state of the art in smart materials and look at the requirements for making them extend their current capabilities and become what we call *cognitive materials*. Cognitive materials must provide more than to deliver a big and unstructured amount of sensor data or to adapt themselves in a closed-loop control process triggered by external stimuli. Instead, they must become an integral part of decision making in the overall system – may it be completely computer-driven or a shared human-machine environment.

New challenges emerge from this requirement: Cognitive materials must be enabled to make decisions autonomously, according to a task at hand. In our example, the work piece should decide on its own whether it can bear more pressure or not – and this might also depend on past experiences that have to be stored and considered appropriately. Cognitive materials have to provide a tight coupling between perception and intentions and loop decisions back to the sensory level. In particular, the material must be able to shift its attention and abstract from irrelevant details to become able to conceptualize its current state and to deliberate about actions to take to fulfill a particular purpose. How much of these decision competences can be shifted from external computing systems into the materials themselves is a challenging field of future research.

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Self-Oscillator Model of Bistable Perception Explains Reversal Rate Characteristics of Interrupted Ambiguous Stimulus

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Keywords: artificial intelligence/cognitive systems; ambiguous stimulus, cognitive bistability, modeling, interrupted stimulus, fatigue

Experiments with periodically interrupted ambiguous stimulus (e.g. the Necker cube) with short off-times (< 1 s) exhibit a maximum of the percept reversal rate of $R \approx \text{ca. } 36 \text{ min}^{-1}$ at stimulus-off time $t_{\text{off}} \approx \text{ca. } 200 \text{ ms}$ (with $t_{\text{on}} = \text{const} = 300 \text{ ms}$ (Orbach et al., 1966)). It is shown that this result can be explained by a nonlinear dynamics attention fatigue model with delayed feedback (adaptive gain) which was recently used for explaining long range correlations of the reversal time series (Fürstenau, 2010).

A cosinoidal phase oscillator equation describes the transfer characteristic of the perception state with feedback through the attention (gain) control parameter. It was shown earlier that the present model, correctly predicts a number of features of multistable percept dynamics, e.g. the hysteresis behavior between stationary perception states and the Gamma-distribution density function of the dwell time statistics. Here we demonstrate that also the stimulus - off induced percept stabilization and reversal rate maximum of interrupted stimulus experiments is correctly predicted. The maximum separates the nonstationary regime with $t_{\text{off}} \leq \text{percept transition time} \approx \text{ca. } 200 \text{ ms}$ from the stationary percept stabilization regime ($t_{\text{off}} > 200 \text{ ms}$). The absolute t_{off} -value at maximum R is determined by the transfer characteristic of the three coupled perception-attention-memory (PAM-) equations, together with the fatigue time constant of $1 - 3 \text{ s}$, and the feedback delay ($T = 40 \text{ ms}$). A mapping of the PAM equations to re-entrant Thalamo-Cortical reentrant loops is suggested.

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Toward a Grounded Model of Person Reference: The Curious Case of 'the Cat'

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Keywords: grounded models of meaning, Person reference, dialogue

Orthodox approaches to person reference typically employ either sentence-based, grammatical models of names (ignoring fragmentary forms of actual use), or else static notions like *rigid designation*. Yet, forms of referring in dialogue are far more dynamic and complex than such accounts seem to presume, taking some surprising forms in actual interaction, e.g. 'the cat' in the request 'Can you feed *the cat*?'; cross-linguistic data on this (e.g. one particularly widespread strategy being possessed kin terms), suggests need for a more general account of person reference, grounded in actual situations of use.

Blending ideas from formal linguistics (von Heusinger, 2004; McCawley, 1996), cognitive psychology (Valentine et al. 1996) and anthropological linguistics (Enfield and Stivers, 2007), we propose a fresh take on this: (i) that such underspecified forms of reference are enriched through a potentially unbounded process, in either the immediate (linguistic) context or the longer term (cognitive) context (e.g. memory), and (ii) that enrichments may be stored and reused on subsequent occasions for referring to the same individual, motivating our suggestion that names are *routine designators*.

We model this by extending a dynamically oriented grammar formalism, Dynamic Syntax (Kempson et al., 2005), which uniquely accounts for dialogue phenomena using only core resources of the grammar. The result is a grounded model of meaning (Glenberg and Kaschak, 2002), whereby underspecified symbols organised by the grammar can be at least partly enriched with nonlinguistic identificatory information (e.g. images, etc), that can be stored for later reuse. Further, we suggest how the notion of *cognitive context*, seen in light of recent proposals for simulation semantics (Bergen, 2007), might in fact be extended to account for other types of figurative language such as metaphors and metonymy.

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Links oder rechts? Wie emotionale Prosodieverarbeitung bei Morbus Parkinson durch die Seitigkeit der motorischen Symptome beeinflusst wird

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Stichworte: kognitive Neurowissenschaft; emotionale Prosodie; Morbus Parkinson; ereigniskorrelierte Potentiale

Behaviorale Studien sprechen dafür, dass Parkinsonpatienten Probleme beim Erkennen emotionaler Prosodie haben. Da jedoch meist eine emotionale Kategorisierung abgefordert wird, sind die Ergebnisse stark durch kognitive Variablen beeinflusst. Die vorliegende Studie nutzt die Technik ereigniskorrelierter Hirnpotentiale, mit denen die Verarbeitung der Stimuli auch unter impliziten Aufgabenanforderungen betrachtet werden kann. Besonderes Augenmerk lag auf der Seitigkeit der motorischen Symptome, da emotionale Prosodieverarbeitung vorwiegend der rechten Hirnhemisphäre zugeschrieben wird und demnach linksbetonte Patienten stärker beeinträchtigt sein müssten. Unsere Stichprobe bestand aus 20 Parkinsonpatienten und 20 Kontrollen. Wir präsentierten lexikalische Sätze und Sätze in Pseudosprache in fünf emotionalen Kategorien (Ärger, Ekel, Angst, Freude, Neutral). Die Verarbeitung des Materials wurde unter impliziten (lexikalische Entscheidung) und expliziten Bedingungen (emotionale Entscheidung) untersucht. Nach dem EEG-Experiment wurden einige der Sätze noch einmal in einem behavioralen Kategorisierungsexperiment präsentiert. Bei den rechtsbetonten Patienten war die N100, bei den Linksbetonten die P200 vergrößert. Die emotionale Salienzdetektion (P200) sah für beide Patientengruppen normal aus. In der behavioralen Studie zeigten sich wie erwartet Defizite für die Patienten im Vergleich zu gesunden Kontrollen. Unsere Daten sprechen eher gegen ein Defizit in der emotionalen Prosodieverarbeitung bei Morbus Parkinson, zumindest bei rechtsbetonten Patienten. Die vergrößerte N100 spricht mehr für eine allgemein veränderte Informationsverarbeitung. Linksbetonte Patienten zeigen eine intakte emotionale Salienzdetektion, jedoch mit größeren Amplituden. Dies könnte bedeuten, dass die emotionale Salienzdetektion für diese Gruppe erschwert ist und würde dafür sprechen, dass – wenn überhaupt – eher linksbetonte Parkinsonpatienten ein Problem beim Verarbeiten emotionaler Prosodie zeigen.

Interindividuelle Unterschiede und logisches Denken: Beeinträchtigungen durch bildliches Vorstellen

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Stichworte: kognitive Stile; bildhaftes Vorstellen; relationale Inferenz-Probleme; interindividuelle Unterschiede; visual-impedance-effect; logisches Denken

Obwohl es klare Unterschiede im bildlichen Vorstellungsvermögen gibt (Blazhenkova und Kozhevnikov, 2009; Richardson, 1977), bleiben bei vielen Untersuchungen zum logischen Denken interindividuelle Unterschiede meist unberücksichtigt (Bacon, Handley und Newstead, 2003; Ford, 1995; Roberts, 1993). Aus diesem Grund beschäftigte sich diese Studie mit dem Zusammenhang zwischen kognitivem Stil, bildhaftem Vorstellen und dem Lösen relationaler Inferenz-Probleme. In einem Experiment mussten Verbalizer, Object-Visualizer und Spatial-Visualizer und eine Kontrollgruppe, relationale Probleme lösen, die leicht oder schwer visuell oder räumlich vorstellbar waren. Die Differenzierung zwischen Object- und Spatial-Visualizer beruhte dabei auf unterschiedlich starkem visuellen bzw. räumlichen Vorstellungsvermögen anhand der Skala von Blazhenkova und Kozhevnikov (2009). Es konnten zwei Effekte gefunden werden. Als erstes konnte der „Visual-Impedance-Effect“ (Knauff und Johnson-Laird, 2002) repliziert werden: Probleme, die visuell einfach vorzustellen waren, erforderten längere Bearbeitungszeiten, als Aufgaben die keinen visuellen Charakter hatten. Der zweite Effekt war, dass insbesondere Object-Visualizer längere Bearbeitungszeiten zeigten als die anderen Gruppen. Verbalizer und Spatial-Visualizer lösten die Probleme hingegen schneller und besser. Diesen Effekt des kognitiven Stils bezeichnen wir als „Impeded-Visualizer-Effect“. Die Wichtigkeit der Berücksichtigung solcher interindividueller Unterschiede, weitere Forschungsperspektiven, sowie mögliche Anwendungen solcher Erkenntnisse werden diskutiert.

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Working Memory Influences on Eye Movements During Reading

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Keywords: psychology; working memory; eye movements; reading; individual differences

In three experiments we measured eye movements during the reading span task to uncover how working memory (WM) processes affect reading. We applied an individual differences approach including an age factor. The reading span task is particularly suitable to reveal interactions, as participants not only have to read but also remember the last word of each sentence in a sequence. Sequence length (respectively the number of sentences and to-be-remembered words) increased across trials, manipulating memory load. Load affected fixation durations dependent on individual differences in WM capacity. Aging had no additional effect, demonstrating that reading is an automated process preserved with age. There were some modulations by age though, when comparing performance without memory load and the variance between subjects for second pass reading, indicating that other factors - perhaps the decreased perceptual span with age - contribute to differences across age groups. To sum, we demonstrated the impact of WM on eye movements by effects of load and individual differences.

How Subliminal Priming and Predictability of Action Effects Influence the Sense of Agency: An ERP Study.

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Keywords: action perception; sense of agency; sensory attenuation; event-related potentials; N1

The sense of agency refers to the experience of causing one's actions and their sensory effects and is assumed to be generated by a comparison between predicted and actual action effects. It has been suggested that internal forward model predictions based on efferent information can be used to specifically attenuate self-produced sensory effects and in this way distinguish them from externally generated effects. According to another view we infer agency from observing a coherence of prior thoughts and sensory events, independent of efferent information. Even though there is evidence for both accounts, their interrelation, that is, the

integration of low-level sensorimotor cues and complex cognitive cues to agency is so far poorly understood. The present study investigated in how far prior thoughts and predictability of sensory effects related to action modulate not only the conscious experience of agency but also self-specific attenuation of the neurophysiological response to these respective sensory effects. We measured event-related potentials (ERP) to visual effect stimuli in a forced-choice response task and a pure observation task, under different conditions of subliminal effect-priming and motor prediction. As expected, the N1 amplitude of the visual ERP was selectively reduced when sensory effects were self-generated. The attenuation of the N1 component as well as the explicit agency judgment were further enhanced by unconscious priming of the sensory effect. Moreover, we found that predictability of the action effect influenced agency judgments and modulated also later components of the visual ERP. These findings suggest that prior cognitive information about an upcoming visual effect and predictive information provided by the efference copy of the motor command can have a differential and dissociative impact on the sensorimotor and judgment level of the sense of agency.

Conceptual Blending of Fractions and Rational Numbers in Mathematical Discovery

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Keywords: mathematical cognition; conceptual blending; HDTP; analogy; anti-unification

Cognitive accounts of scientific discovery usually focus on the role of analogy for transferring existing knowledge to a new domain, e.g. transferring knowledge about the solar system to the theory of atomic structure. We propose that such knowledge transfers are only special cases of the more general cognitive capacity of conceptual blending in the sense of Fauconnier and Turner. According to this account, conceptual knowledge is organised in interconnected conceptual spaces, and conceptual blending is the process by which parts of existing conceptual spaces are mapped into a new space – the *blend space* in which existing concepts from other conceptual spaces can be combined in novel ways.

We present an account of a process by which different conceptualisations of mathematical notions of *number*, more precisely, conceptualizations of fractions and of rational numbers, can be blended together to form new conceptualizations via recognition of common features and judicious combination of their distinctive features. The accounts of number are based on Lakoff and Núñez's cognitively based grounding metaphors for arithmetic. The approach incorporates elements of analogical inference into a generalised framework of conceptual blending, using some ideas from the work of Goguen on Institutions. The ideas are worked out using Heuristic-Driven Theory Projection (HDTP, a method based on higher-order anti-unification in the sense of Plotkin). HDTP provides generalisations between domains, giving

a crucial step in the process of finding commonalities between theories. In addition to generalisations, HDTP can also transfer concepts from one domain to another, allowing the construction of new conceptual blends. Alongside the methods by which conceptual blends may be constructed, we provide heuristics to guide this process.

Modality Dependent Central Processing: Implications for Parallel Processing of Two Tasks

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Keywords: parallel processing

Mostly, when one performs two tasks at the same time, performance of one or both tasks decreases compared to the situation when one performs each task by itself. Dual-task models attribute this to the idea that response selection for the two tasks takes place serially either due to structural (bottleneck theory, Pashler, 1984) or strategic causes (Executiveprocess interactive-control theory, Meyer and Kieras, 1997). In two experiments we examined whether dual-task costs are influenced by the content specific characteristics of the two tasks. Four groups practiced their two tasks in single and dual-task condition. Tasks differed across groups with respect to the pairing of stimulus and response modalities (S-R) and to the central and response modalities (C-R). The specific pairings increased or decreased representational overlap across tasks. The results clearly showed that the effects of S-R and C-R pairings on dual-task costs were higher than one would predict according to their effects on single-task performance. The dominating models in the field of dual-task research cannot explain this result since they assume response selection to be amodal, i.e. not affected by the content of the tasks to be processed. We postulate crosstalk to have taken place at the stage of response selection for task combinations with high representational overlap. Moreover, for two groups with low representational overlap dual-task costs vanished after practice. This strongly supports the view that a qualitative switch in processing from serial to parallel was realized for task combinations with low crosstalk- an outcome that contradicts the assumptions of the bottleneck theory.

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Hilfreiche Landmarken: Ein Vergleich bildhaften, sprachlichen, akustischen und semantischen Materials bei der Rekognition und Navigation

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Stichworte: Psychologie; Raumkognition; Landmarken

Wenn von Landmarken und Ihrer Bedeutung für die Navigation gesprochen wird, wird meist implizit von einer visuellen Darbietung ausgegangen. Wie verhält es sich aber, wenn Landmarken in anderen Modalitäten oder mit anderer Bedeutungshaltigkeit präsentiert werden? Was macht also eine Landmarke zu einer „hilfreichen“ Landmarke? Um dieser Frage nachzugehen haben wir eine Serie von drei verhaltenspsychologischen Experimenten in unserer virtuellen Umgebung SQUARELAND durchgeführt (je N=20). Im ersten Experiment wurde ein Vergleich zwischen visuellen und akustischen Landmarken (Tierbilder, -geräusche) angestellt. Experiment 2 befasste sich mit visuellen Landmarken und sprachlicher Präsentation (Tierbilder; -wörter). Das letzte Experiment untersuchte einen Teilaspekt der Semantik visueller Landmarken; berühmte und unbekannte Gebäude. In allen Experimenten mussten die Teilnehmer in der Lernphase einen Weg durch ein virtuelles Labyrinth lernen, durch welches sie passiv geführt wurden. Dabei wurden an Nichtentscheidungs- und Entscheidungspunkten die jeweiligen „Objekte“ (12) präsentiert. Anschließend erfolgten eine Rekognitions- sowie eine Navigationsphase. Im ersten Experiment zeigte sich in der Rekognitionsphase eine bessere Performanz für die akustischen Landmarken als für die visuellen. Ein vergleichbares Ergebnis zeigte sich im zweiten Experiment. Hier waren die sprachlichen Landmarken den visuellen überlegen. In der Navigationsphase zeigten sich in beiden Fällen keine statistisch signifikanten Unterschiede zwischen den jeweiligen Modalitäten. Im dritten Experiment wurden bei bekannten Gebäuden die besseren Rekognitionsleistungen erzielt. Die Leistungen an den verschiedenen Entscheidungspunkten unterschieden sich in keinem der Experimente voneinander. Diese Befunde zeigen, dass unterschiedliches Material zu sehr variablen Ergebnissen und Interpretationen in Rekognitions- und Navigationsphasen führt. Dies wird im Rahmen der aktuellen Forschungsliteratur diskutiert.

Linguistic Relativity of Non-Linguistic Cognition: Are the Combinatorial Properties of Language a Key to the Old Whorfian Question?

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Keywords: Linguistics; cognitive neuroscience; philosophy; language and cognition; combinatorial mechanism; Whorfian effect

The modeling of the interface between linguistic and non-linguistic cognition is one of the most challenging tasks in cognitive science. In this context, debates about the old “Whorfian” hypothesis that linguistic properties of a language critically shape certain non-linguistic cognitive domains have heated up again. But the empirical situation is ambivalent, and the controversies far from being finite, as is most evident, e.g., in the dispute between Levinson et al. (2002) and Li and Gleitman (2002) about the influence of spatial expressions in a language on the memorization of certain spatial constellations.

In the empirical research in the field, a clear impasse can be diagnosed. In my paper, first, I will briefly recapitulate some experimental data and illustrate the conflicting conclusions they allow with respect to the relation between “language” and “thought”. A problem inherent in the discussions relates to the vagueness of the underlying question. Thus, I will devote the second part of my paper to a clarification of the cause-and-effect relations in the domain and to circularities in argumentation often leading to misinterpretations of (seemingly) Whorfian effects.

As a way out of the impasse, I will discuss an approach, which views the combinatorial properties of language as central for the functioning of certain non-linguistic domains and for conceptual productivity in particular, cf. Spelke (2003). Can we hypothesize a Whorfian effect that arises from differences in the combinatorial mechanisms languages employ? I will look at nominal composition in English vs. German and identify critical differences here. It will be shown that only English utilizes stress as an indicator of lexical listedness of novel compounds, which gives rise to distinct memorization procedures the two languages employ for novel concepts, i.e. to a Whorfian effect. The empirical implications of the hypothesis as well as first results of a pilot study will be presented.

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A Model of Agreement Processing in Sentence Comprehension

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Keywords: linguistics; psychology; psycholinguistics; agreement processing; number attraction

The processing of agreement is subject to interference effects: interference arising within the agreement controller and interference arising from material occurring between the agreement controller and the agreement target. Interference challenges the computation, storage and retrieval of agreement features, as witnessed by so-called attraction errors, i.e. agreement errors caused by an interfering NP mismatching the agreement controller in agreement features.

Here we concentrate on number agreement between subject and verb. We present a model that accounts for the two types of attraction errors described below. Crucially, the model does not assume any specific mechanism for attraction but solely works with general processes of feature computation and item retrieval, and their failure.

- The agreement specification of an NP has to be computed from the agreement features of its head. Given the recursive nature of language an NP can contain another NP with agreement features of its own. Psycholinguistic research on attraction has demonstrated that agreement errors exhibit an asymmetry: attraction is more likely for a singular head noun and an interfering plural NP than for the reverse constellation.
- Especially in verb-final clauses, computing agreement is challenged by the fact that subject and verb can be separated by several items which may themselves bear agreement features. The need to retrieve the subject on encountering the clause-final verb gives rise to interference from other NPs, e.g. an object. In a series of experiments, we found that object attraction is the more likely the more the object resembles a subject (due to ambiguous case marking as well as in terms of semantic properties). Furthermore, object attraction exhibits no singular-plural asymmetry. These findings suggest that the retrieval process operates on a content-addressable memory representation allowing for direct access based on cues and that number is not among the retrieval cues.

A Dual-Route Perspective of Dyslexic Eye Movement During Reading.

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Keywords: psychology; developmental dyslexia; dual-route model of visual word recognition; eye movement control during reading

This study assessed eye movement abnormalities of adolescent dyslexic readers during silent reading of sentences and interpreted the findings within the dual-route model of single word reading. A dysfunction of the lexical route was assumed to account for a reduced number of words which received only a single fixation or which were skipped. The consequent over-reliance on the sublexical route was reflected in an increased number of words which received multiple fixations and in a marked effect of word length on gaze duration. This pattern was interpreted as a frequent failure of orthographic whole-word recognition (based on orthographic lexicon entries). A further inefficiency of the lexical route was inferred from prolonged gaze durations even for those words which the dyslexic readers processed with a single fixation only. An additional target detection task ruled out an alternative interpretation of the abnormal eye movements of the dyslexic participants in terms of deficient visual processing. In sum, the unusual interpretation of eye movement recordings from the perspective of a model which is actually designed to account for the processing of isolated words turned out to be a very useful framework for understanding the eye movement abnormalities of dyslexic readers.

Influence of Diachronic and Text Specific Frequencies in Reading

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Keywords: linguistics; language

It has been shown in countless studies that the frequency of words is a very important factor in human language processing. Usually, the frequency values used in (psycho-) linguistic experiments are drawn from a large collection of texts called a corpus. In the past, the compilation of these corpora has very often not been given a particular attention. With the evolving of various freely available text collections in the last decade (mainly over the internet), the influence of the corpus selection on the creation and the analysis of experiments has gained more attention. Brysbaert and New (2009) pointed out the importance of text type

by using word frequencies taken from movie subtitles as predictor for reading times. The current study examines the influence of the temporal origin of a corpus (Gries and Hilpert, 2008) on frequency as a predictor of human reading behavior. We therefore used decadal sub-corpora of the DWDS-Kerncorpus (Geyken, 2007) and draw frequency values for the words of the Potsdam Sentence Corpus (PSC; Kliegl et al., 2004) and used them in an analysis of the fixation durations of younger and older adults while reading. In this context we also examine other linguistic variables provided by the dlex-project website <http://dlexdb.de>.

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Does Alignment Shape the Production of Verbal Referring Expressions?

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Keywords: linguistics; artificial intelligence/cognitive systems; alignment; referring expressions; alignment patterns; natural language generation; priming

We investigate how alignment based on priming effects influences the production of verbal object references in a task-oriented dialogue (Weiß et al., 2008b). To this end, we focus on deviations caused by over- and underspecification from the theoretically ideal description of objects. A corpus of spoken dialogues between human interlocutors was collected in a psycholinguistic experiment designed to investigate the alignment behaviour of humans in a controlled fashion. We report on two analyses: Firstly, we descriptively analysed the distribution of relevant types of noun phrase constructions according to over- and underspecified references. That way, we uncovered the process of alignment through identifying “alignment patterns” (Weiß et al., 2008a) and their development over time. Secondly, we applied natural language generation methods to build computer simulations of the observed linguistic behaviour (Buschmeier et al., 2009). That way, we developed an account of priming for natural language generation systems and we studied the effects of different conditions and parameters of alignment on the quality of the reproduced behaviour. The results of both analyses will be discussed – especially regarding the degree to which priming can account for non-optimal language use for object reference.

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Ziel oder Weg – das ist hier die Frage! Das Verstehen zielgerichteter Handlungen in 3D-Animationen im Säuglingsalter

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Stichworte: Psychologie; soziale Kognition; kognitive Entwicklung; Zielgerichtetheit; Säuglingsalter

Die Fähigkeit, zielgerichtete Handlungen zu entdecken, entwickelt sich innerhalb des ersten Lebensjahres (Csibra und Gergely, 1998). Einer Handlung wird Zielgerichtetheit zugeschrieben, wenn sie über bestimmte Belebtheitscues verfügt und zu einem salienten Effekt führt (Biro und Leslie, 2007). Können Säuglinge auch Handlungen eines 3D-animierten unbelebten Agenten als zielgerichtet wahrnehmen, wenn sie bestimmte Cues aufweisen? Und spielt dabei die Sichtbarkeit der Wege eine Rolle? Diese Fragen werden innerhalb einer Habituationsstudie mit 9- und 12-Monate alten Kindern beantwortet. Zu diesem Zweck wurden 3D-Animationen entwickelt, in denen ein unbelebtes Objekt (Ball) als Agent benutzt wird. Der Ball, dessen Bewegung Belebtheitscues aufweist, kann zwei sichtbare Ziele über sichtbare Wege erreichen und einen salienten Effekt hervorrufen. 32 neun- und 32 zwölf-Monate alten Kindern werden Filme präsentiert, in denen der Ball eines der Ziele über einen Weg erreicht, bis diese habituieren. Danach wird die Position der zwei Ziele ähnlich dem Woodward Paradigma (Woodward, 1998) vertauscht. Zwei Testbedingungen werden präsentiert: „alter Weg/neues Ziel“ und „neuer Weg/altes Ziel“. Es werden längere Blickzeiten für die Bedingung „alter Weg/neues Ziel“ bei beiden Altersgruppen erwartet, was darauf hindeuten würde, dass sie die Ballbewegung mit dem Ziel und nicht mit dem Weg in Verbindung setzen. Dies würde bedeuten, dass Kleinkinder auch in den Handlungen 3D-animierter unbelebter Objekte Zielgerichtetheit entdecken können, wenn diese bestimmte Cues aufweisen.

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Are Women Really Better at Multitasking than Men? Empirical Evidence from Language Perception.

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Keywords: language perception, sex differences, multitasking

It is a popular idea that women prevail over men when more than one stimulus has to be processed at a time because during human evolution women supposedly had to focus on more things at a time than men. Unfortunately empirical evidence for this idea is rare and inconsistent. If there is indeed female superiority in multi-tasking, it should be found in an area where females are superior over males under normal conditions, as appears to be the case for language processing. We performed a reanalysis of six dual task experiments (N = 34 women and men each), applying the PRP (Psychological Refractory Period)-paradigm in a task requiring decisions on the synonymity of noun pairs. Despite an interaction of sex and synonymity, with faster reactions on non-synonymous noun pairs in women than in men, and strong effects of task overlap, the latter were indistinguishable for the two genders ($F < 1$). Thus, the idea of female superiority in multi-tasking receives no empirical support from our language perception data. Because language perception is a domain with clearest female superiority, these findings suggest that female multitasking superiority will be hard to find elsewhere and may have to be counted as urban legend.

Appraisal of Domain Specific Stimuli and Its Outcomes Depending on the Emotion Regulation Strategy Used

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Keywords: cognitive neuroscience; psychology; emotion regulation; memory; pupillometry; skin conductance level; illiterates

The literature on illiteracy reports negative emotions and avoidance reactions of illiterates when being confronted with literacy-related stimuli (Döbert and Hubertus, 2000). However, no study has assessed these assumed negative associations objectively to date.

For this reason, this study includes measuring the implicit as well as explicit appraisal of literacy-related stimuli in illiterates using a specifically developed auditory Single-Category Implicit Association Test (SC-IAT; Karpinski and Steinman, 2006) for literacy-related word material as well as a Likert – Scale. Pupillometry and other physiological measures are used in order to create a broad picture of the physiological impact of the appraisal processes, complemented by assessing the emotion regulation strategies participants use and a memory task. This combination of measures has been chosen aiming to integrate the reports of pupil dilation as an indicator of cognitive load and emotional appraisal (Granholm and Steinhauer, 2004) with the findings of emotion regulation strategies having differential physiological and cognitive outcomes, e.g. on memory (Richards and Gross, 1999; Ochsner and Gross, 2004; Urry et al., 2006; Demaree et al., 2006; Ochsner and Gross, 2008).

The results obtained show the expected negative appraisal of literacy-related stimuli in illiterates ($n = 25$) compared to literates ($n = 25$) in the implicit as well as the explicit measure. Furthermore, an altered course of physiological activation and memory capacity depending on using reappraisal or suppression as the main emotion regulation strategy can be demonstrated for literacy-related stimuli. This constitutes an extension of the findings from studies using general emotional cues and opens up the possibility of explaining and altering appraisal processes and its outcomes in specific populations like illiterates depending on the emotion regulation strategy used.

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Placements are Easy Dependent on what You Are Told – And on what You Could Have Been Told

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Keywords: linguistics; language

If instructed with the sentence [The rabbit]LO is above [the cow]RO, in which the rabbit figures as located object LO and the cow as reference object RO, it is easy to add the rabbit above the cow in the middle of a computer display; the same task is difficult with reversed roles as in [The cow]LO is below [the rabbit]RO (Exp.1). It is assumed that the standard procedure is applied when LO is added: the place of LO is determined within a reference frame imposed on RO. Adding RO is difficult because the standard procedure fails to apply to LO. We propose that subregion partitioning is applied when RO is added: a reference line aligned with the corresponding edge of the LO picture splits up the display into two complementary subregions, one which includes LO and one in which RO is added. This assumption was supported in Exp.2: a shift of the centered picture towards the appropriate or inappropriate halfregion influenced adding RO (subregion partitioning) but not LO (standard procedure); the standard procedure was still applied faster than subregion partitioning. Exp.3 showed that the additional time indicates switching costs rather than a slow execution as the advantage of the standard procedure disappeared when its inapplicability was anticipated. Anticipation was induced by a constituent order variation of the sentences which manipulated whether LO or RO was the sentence topic (NP1 referent) and evoked presuppositions on whether LO or RO would be part of the subsequent display. With LO as topic the sentence provided a cue that the display will show the LO and, hence, that the standard procedure will fail to apply. As a result, the same sentences that produced a substantial advantage for adding LO in Exp.1 did not do so in Exp.3; the advantage, however, was now obtained with the reverse constituent order. Hence, it may be easy to add the rabbit above the cow if you are told The cow is below the rabbit – if you could have been told Below the rabbit is the cow.

Where Does Abstraction Occur in Implicit Artificial Grammar Learning? Two Computational Models of Non-Instantiated Transfer

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Keywords: implicit learning; artificial grammar; non-instantiated transfer; computational model

Without the notion of abstraction, non-instantiated transfer (NIT) in implicit AG learning can hardly be explained. Abstraction may, however, occur at different stages of the task:

(A) Abstraction in both learning and testing phases: NIT is achieved without surface-level information. In the testing phase, novel stimuli are compared with stored abstract features of learning phase stimuli.

(B) Abstraction in the testing phase only: NIT relies upon surface-level information. In the testing phase, novel stimuli are compared with stored surface-level information of learning phase stimuli.

To estimate which explanation better suits reality, two computational models were evaluated quantitatively. In both models, abstraction was achieved by a transform which preserves the sequential order of chars but no surface level information. To induce grammars both models used an inductive logic programming algorithm by Bostrom (1998). The algorithm outperforms humans in instantiated transfer (IT) tasks. Evaluation was conducted with grammars described in papers of Reber (1969) and Dienes et al. (1995).

Results show that model (B) better suits empirical data: In NIT tasks it was more accurate than (A) and exhibited the same ratio between IT and NIT performance coefficients as human subjects do. Model (A) did also perform well in NIT tasks. But no case showed a ratio between the two transfer performance coefficients similar to human subjects. A mathematical analysis showed that the overall loss of information in model (B) is lower than in (A).

These findings suggest that humans do use stored surface-level information to solve NIT problems in implicit AG learning. To verify this, future psychological studies should focus on precise quantitative measurements of the ratio between the two transfer performance coefficients.

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Motifs in Communicative Pulsed Vocalizations of Black-Sea Bottlenose Dolphins

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Keywords: bioacoustics; biolinguistics; dolphins; pulsed sounds; song

The present study is focused on the question whether motifs in pulsed vocalizations of bottlenose dolphins are specific to mating. At the phenomenological level, such motifs resemble birdsong. In both cases, stereotyped acoustic elements (syllables) are emitted in a determined order thus forming sequences (strophes). In many birds and in terrestrial mammals, this type of vocal behavior is known to play a pivotal role in defending territory and in sexual selection.

The role motifs play in the acoustic communication systems of dolphins is little investigated. In order to find out whether this type of behavior is specific to mating, two sets of audio data were created at the Reeflab in Eilat (Israel): One set was recorded before - and the other one during the mating season. All pulsed calls in the two data sets were annotated by hand and in addition by an algorithm. Afterwards, all motifs were classified, assigned to either the non-mating or the mating context and counted.

Results show, that animals possess at least nine different stereotyped motifs, each containing two to four different syllables. Most motifs are repeated inside long call sequences containing up to 200 single calls. In such sequences, roughly 50% of the calls are part of a superordinate motif. The function of the other half of the calls remains unknown. Emission rates of all motifs increased significantly during the mating season. None of the found motifs, however, was specific to mating. This result suggests that biological functions of the identified motifs do not lie primarily in sexual selection.

The question, which principles led nature to the parallel evolution of song-type behavior in avian, terrestrial and aquatic species, is of high significance to general biolinguistics. In future studies, basic grammatical competencies of bottlenose dolphins should be investigated in more detail. This could be done with the help of specifically adopted implicit artificial grammar learning experiments.

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Studying Memory-Based Information Integration via Eye-Tracking

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Keywords: psychology; eye-tracking; multiattribute decision making; probabilistic inference; take-the-best heuristic

The study of information integration in memory-based multiattribute decision making is a methodological challenge because the common methods for studying decision heuristics are indirect and less conclusive than would be required to test postulates about the underlying cognitive processes. In previous studies, decision outcomes and response time data have been used to infer the foregoing cognitive processes. Process-tracing that involves information presentation (Mouselab) is not applicable for studying the integration of memorized cue information. We demonstrate a novel process-tracing method that employs the looking-at-nothing phenomenon (Richardson and Spivey, 2000) to study memory search and cue processing via eye tracking. Participants learned cue information of decision alternatives in spatial frames and later were presented with emptied displays of two alternatives in binary choice trials. Participants' fixations on the emptied displays were recorded first, while they integrated memorized cues according to freely chosen strategies, and afterwards, while they applied instructed decision strategies. The instructed strategies included a lexicographic strategy (take-the-best) and a compensatory strategy (equal weighting). An outcome-based Bayesian strategy classification method (Bröder and Schiffer, 2003) was used to infer the freely chosen strategies and to confirm the use of instructed strategies. Fixation patterns such as transition frequencies between decision alternatives, fixation durations on former cue locations, and the sequence of fixations on former cue locations were in line with memory search and cue processing as postulated for lexicographic and compensatory strategies. Looking-at-nothing as a process-tracing method seems of wider applicability and may prove valuable for studying further memory-based information integration tasks as well.

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Perceiving Emotions from Bodies and Voices

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Keywords: multimodal perception; emotion; EEG; body language

Humans are very successful at determining others’ emotional state. While previous studies often focused on emotion perception from facial expressions or semantics, other important information channels such as body language or prosody have received far less attention. In the current study, we therefore investigated the perception of emotions from body language and interjections as well as their combination, using ecologically valid stimuli.

We presented participants with emotional (angry, fearful) and neutral stimuli in different modalities while measuring EEG. In the audio condition, participants heard interjections. In the visual condition, participants saw video clips of body language, and in the audiovisual condition, participants saw video clips accompanied by interjections. Focusing on the temporal development of emotion perception, we analyzed early (N1-P2 complex, e.g. Stekelenburg and Vroomen, 2007) as well as late (LPC, e.g. Huang and Luo, 2006) event-related brain potentials (ERPs).

Audiovisual stimuli resulted in a decreased N1 amplitude compared to auditory stimuli. Also, a difference between the sum of the unimodal conditions and the audiovisual condition was found, providing evidence for an interaction between the modalities. Additionally, we found a decrease in amplitude for emotional compared to neutral stimuli. Thus, emotional as well as audiovisual stimuli seem to allow for a facilitated processing.

Regarding later stages of processing, we observed a decrease in LPC amplitude differentiating between emotional and neutral stimuli; the largest amplitude was found for fearful stimuli, a smaller amplitude for angry stimuli, and the smallest amplitude we observed for neutral stimuli. This suggests an enhanced processing for emotional stimuli as well as a distinction between anger and fearful stimuli also at later stages in processing.

In summary, our study provides evidence for a beneficial effect of multimodal processing for natural emotional stimuli.

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The Near Miss Effect: Counterfactual Thinking or Disconfirmation of Expectancies?

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Keywords: psychology; emotion; counterfactual thinking; near miss; expectancy; proximity; disappointment; relief

Everyday experience tells us that near misses—the near-occurrence of a desired or undesired outcome—elicit more intense emotions than far misses. A prominent explanation of this phenomenon assumes that the near miss effect is due to counterfactual thinking (e.g. Kahneman and Miller, 1986). According to this explanation, (a) counterfactual thoughts have an amplifying effect on emotions and (b) the likelihood of such thoughts increases with the perceived (spatio-temporal or semantic) proximity of the actual to the missed outcome. For example, if five of the six digits of the winning lottery number agree with one's own number, it is easy to imagine that the sixth number could have been drawn as well, and this counterfactual thought intensifies the feeling of disappointment. Hence, the near miss effect is caused by retrospective comparisons between actual and missed outcomes. In contrast, the belief-desire theory of emotion (e. g. Reisenzein, 2009) assumes that, at least as concerns the emotions of disappointment and relief, the near miss effect is mediated by higher expectations of wins and losses. These two explanations of the near miss effect (counterfactual thinking versus expectancy disconfirmation) were experimentally compared using lotteries involving wins and losses. In a previous study (Junge and Reisenzein, 2010), the predictions of BDTE were largely confirmed, but we also found a small effect of proximity on the intensity of experienced disappointment and relief. To clarify this finding, we conducted a follow-up experiment using an improved design that allows a more fine-grained comparison of the two theories. Results of this study will be presented at the conference.

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Bilingualism -> Selective Attention -> Creativity: Exploring Cognitive Mechanisms Encouraging Bilingual Creative Potential

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Keywords: bilingualism; selective attention; creativity; cognitive mechanisms

This study explores the hypothesis that bilingualism encourages selective attention that facilitates an individual's creative capacity. Ninety American University of Sharjah bilingual college students participated in the study. Self-report questionnaires were used to assess participants' cultural and linguistic background. Language proficiency was assessed using a modified version of the Picture Naming Task, in which participants' knowledge of English was evaluated by scoring the number of correct responses to the pictures presented. Creative abilities were assessed with the Abbreviated Torrance Test for Adults, a standard test of divergent thinking, which provided generative and innovative capacity scores; and with the Invented Alien Creatures task, a standard test of structured imagination that provided invariants violation score. The selective attention was assessed by the Stroop test; and the fluid intelligence was assessed by the Culture Fair Intelligence Test. A series of analyses of variance revealed that participants with higher proficiency in English significantly outperformed their less proficient counterparts on the Stroop condition ($F(1, 85)=5.18, p<.05, \eta^2=.06$, for RT; and $F(1, 85)=5.53, p<.05, \eta^2=.06$, for accuracy), innovative capacity ($F(1, 88)=4.70, p<.05, \eta^2=.05$), invariants violation ($F(1, 88)=3.98, p<.05, \eta^2=.04$), and marginally significantly – on the IQ ($F(1, 88)=3.22, p=.08, \eta^2=.04$). The findings of this study shed some light on the cognitive mechanisms underlying bilingual creative performance. Specifically, it provides empirical support for the notion that selective attention and inhibition of irrelevant information facilitated by bilinguals' practice with two languages may also have a positive effect on their creative potential.

Parametric Faces in Pop-out Paradigm - When Class Information Becomes a Feature

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Keywords: object classification; visual hierarchy; high-level pop-out

Most theories of visual processing and object classification share the view that the highest levels feed directly into perception and action, whereas lower levels are seen as mere feature-detectors with the sole purpose to supply input to higher levels. This view is taken to an extreme by the reverse hierarchy theory (RHT). It sees the first feed-forward sweep through the hierarchy as implicit, leading to coarse ‘vision at a glance’ on high levels before top-down processes provide details and ‘vision with scrutiny’. One of the foundations of RHT is the existence of high-level pop-out. Despite the simplicity of the setup, however, it has not yet been possible to exclude low-level explanations for the effect. Here, we use a controlled setting based on parametric face stimuli that avoids low-level confounds. Fulfilling an important additional assumption of high-level pop-out, the exact same training paradigm was recently shown to elicit high-level class-selective receptive fields. Our analyses show that, although our subjects quickly achieve near perfect classification accuracy and search times continue to decline, the reaction times are dependent on the number of concurrently presented distractors. This absence of a pop-out effect is at odds with the predictions of RHT. In addition to this, the paradigm allows us to investigate which levels of processing contribute to the perceptual decision. Backed up by similarity judgments and intermediate stimulus tests, we show that abstract class information acts as additional feature, together with an instance-based representation. Based on these findings, we propose a novel cross-level view on perception. Central to this theory is the view that the visual hierarchy mostly serves the purpose of creating increasingly abstract and non-linear response properties, whereas the visual processing is highly distributed across the different levels that orchestrate their activity to accomplish a robust perceptual experience.

Efficient Learning of Optimal Control Functions in Voluntary Movements

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Keywords: artificial intelligence/cognitive systems; human; motion; optimisation; control; learning

Objectives

In sport science or motor control disorders it is very important to study various goal-directed motion tasks and related performance optimisation problems. The main performance requirements in such tasks are movement execution time, positioning accuracy, and energy expenditure. Control functions (neural signals to muscles) are to be (re-)learnt and optimised with respect to these performance criteria. Our approach is based on underlying principles of controlled system dynamics, optimal control theory, and movement neuroscience.

The approach

Optimal control functions have a triphasic shape and a set of key parameters is found to be necessary and sufficient for describing them. Those are intrinsic parameters human has to learn in dynamic point-to-point motion tasks. The control learning scheme has the following main steps: 1) parameterise test control functions; 2) select most appropriate pairs of control parameters and controlled outputs; 3) make corrections in the control parameters until reach the target, applying an optimal learning algorithm.

Results

Using realistic mathematical models, our motor learning approach was applied to motion tasks like reaching, sit-to-stand-up, and performing steps. We verified that the control learning rapidly converges and the number of trials is very small. In practice, experiments with fast aiming movements of the arm also confirmed the feasibility and efficacy of the proposed approach.

Conclusion

We believe the proposed control learning approach can be used to (re-)build the necessary cognitive models for optimal goal-directed movements in sport or neurorehabilitation.

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Inter-Individual Differences in Feedback-Based Learning of Phonotactic Rules in an Artificial Language

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Keywords: phonotactic rules; feedback-based learning; inter-individual differences; implicit learning

Learning from feedback is essential in many cognitive domains (Seger, 2008), yet its role in the extraction of language regularities is less clear (Ellis, 2002).

This study explores whether phonotactic rules in an artificial language can be learnt by feedback-based learning. After exposure to one category of pseudowords, subjects (N = 99) had to decide by button press whether visually presented stimuli belonged to this category or not. Subsequently, they received visual feedback indicating correctness.

Results show an increase in mean accuracy of 13% between the first and the last of eight blocks. Subsequent inspection of individual mean accuracy scores revealed a sample split into two groups; one with very high and the other with low accuracy scores in the last block. Whilst in the high accuracy group the increase in accuracy scores across the experiment was as high as 32% (last block: M=95%), the change in the low accuracy group was only 4% (last block: M=54%) suggesting that learning occurred only in the high accuracy group. Reaction time (RT) analysis showed a significant benefit for correct responses over incorrect responses only in the high ($t(34)=-4.123$, $p<.001$, one-tailed), but not in the low accuracy group ($t(63)= -0.324$, $p= .747$). Equally, post-error slowing was only observed in the high accuracy group.

Our results show that our sample can be subdivided into two groups that differ in accuracy as well in RT patterns. We interpret those data as differences in feedback processing that lead to successful learning of the rule in one group but prevent learning in the other.

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Maintaining Optimism in the Face of Reality: A Learning Bias

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Keywords: optimism; bias; decision-making; dlPFC; ACC.

Humans tend to make overly positive predictions about their future in domains ranging from personal relationships to financial markets. Given that humans frequently encounter information that challenges their optimistic beliefs, it is puzzling how unrealistic optimism is generated and maintained. Learning theory assumes that positive and negative information are given equal weight when updating predictions, which should lead to realistic, not optimistic, expectations. Here, we reveal a novel learning bias which supports optimism. We collected fMRI data while participants estimated the likelihood of experiencing 80 different negative life events (e.g. cancer, divorce, robbery). After each trial participants were presented with the average probability of that event occurring to a person in the same socio-economic environment. We then assessed whether participants used the information provided to update their predictions by asking them again to estimate their likelihoods of experiencing the events in a second session. Results show that participants selectively learned from information that enforced optimism. When subjects had over-estimated the probabilities of a negative event (i.e. gave a pessimistic estimate and received desirable information) they were more likely to update their expectations than when they had under-estimated the probability (i.e. gave overly optimistic estimates and received undesirable information). fMRI data revealed an error signal in key frontal regions (MFC/ACC, dlPFC) that coded the difference between participants' estimate and the feedback they received. Strikingly, this signal was larger when the participant received desirable information relative to undesirable information. The study uncovers a neural mechanism supporting differential processing of desirable and undesirable information about the future.

When Our Brain is Impressed but We do not Notice it – Evidence for Unconscious Reliability Estimation of the Perceptual Outcome

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Keywords: cognitive neuroscience; perception

The unchanged visual input of an ambiguous figure gives rise to two or more mutual exclusive percepts that spontaneously alternate with each other. This phenomenon fascinates scientists from all disciplines in neuroscience since it promises the possibility to experimentally separate vision and conscious perception.

In the present studies we asked whether and how the ERP (“event related potential”) to ambiguous figures, evoking instable percepts, differs from ERPs to unambiguous figure variants, which evoke stable percepts. Results: (1) Although the figural differences between ambiguous and unambiguous figures are tiny, a positive ERP component about 400 ms after stimulus onset (“P400”) differs dramatically between ambiguous and unambiguous stimuli. (2) This P400 was found for two different categories of ambiguous figures (Necker cube and Old/Young woman). (3) Attention to the stimuli is necessary for this positivity to occur.

Our results may indicate the existence of an unconscious neural instance that evaluates the reliability of the perceptual outcome, given limited and ambiguous visual input. High reliability may have been an evolutionary advantage for action planning, low reliability may have been a trigger for invention and cognition.

Research was supported by grants from the Deutsche Forschungsgemeinschaft (BA 877-16).

Through the Enactive Eye – Locked-in Syndrome as a Challenge for Embodied Cognition

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Keywords: philosophy; embodied cognition; locked-in syndrome; enactivism; body; brain computer interfaces

That embodiment matters for cognitive science now seems widely accepted. It is, however, not clear what embodiment amounts to – there is a wide range of different notions of “the body”. Some claim that the body’s structure itself is what determines cognitive processes, although it is often unclear whether this determination is constitutive or historical. Others maintain that cognition requires a mastery of sensorimotor skills or adopt a functionalist conception of the body as a contingent (but useful) part of a larger information processing system. Locked-in syndrome (LiS) patients, who suffer from severe bodily impairment and are yet capable of retaining cognitive skills, confront us with the fact that we still don’t have a clear understanding of embodiment. These patients cannot move their bodies, except in some cases for their eyes. Communication is restricted to eye-blinking movements. Brain Computer Interfaces (BCI) facilitate communication and augment the scope of actions of LiS patients by using voluntarily produced brain patterns to control computers or other external devices. LiS presents a challenge for embodied cognitive science. How can it account for the fact that cognition is preserved without actually relying on body structure or particular sensorimotor contingencies? We first unpack this challenge in detail. We show that the abovementioned notions of embodiment fall short of providing a satisfactory answer to the challenge. We propose a notion of the “enactive body” as a precarious autonomous identity capable of meaningful engagements with the world and others and show how it is at play in LiS patients. Finally, we outline a possible account of the progression of cognitive skills in LiS based on the essential roles of experience and the exercise of intersubjective engagements. LiS doesn’t refute the embodied perspective, but provides an opportunity for its clarification in terms of enactivism and thereby for further development of this new paradigm.

Individual Differences in Dual Task Performance: The Influence of Risky Behavior, Behavioral Inhibition and Behavioral Approach

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Keywords: dual task; risk; behavior

The present study examines the relationship between individual differences in personality and dual task performance. Specifically, it examines the influence of individual tendencies to engage in risky behaviour, behavioural inhibition and behavioural approach on dual task performance. In a typical dual task situation, participants were required to perform a letter discrimination task and a tone discrimination task. Subsequently, participants had to complete two questionnaires -the DOSPERT-G (DOmain-SPEcific Risk-Taking - German version) scale and the BIS/BAS (Behavioral Inhibition Scale/Behavioral Activation Scale). In order to examine response pattern of participants, the dual task was combined with a rewarding, punishing or neutral credit point system determined by means of speed and accuracy of responses. As expected, participants with high scores on BAS responded faster but less accurate, whereas participants with lower scores on BAS responded slower but more accurate. Surprisingly, this response pattern was not related to risky behaviour. Results suggest that the regulation of appetitive motives seems influence the style of response during dual task performance.

Resource Allocation in Mathematical Cognition: Evidence from Pupillometry and fMRI

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Keywords: cognitive neuroscience; mathematical cognition; resource allocation; fmri; pupillometry

Recruitment of neural processes underlying mathematical cognition is based on the utilization of computation resources. Math-specific resources rely on parietal activity (Dehaene et al., 2003). Math-supportive resources rely on frontal lobe activity (Grabner et al., 2007). The relation between these activations underlying mathematical cognition and the allocation of computation resources is insufficiently understood. The present study investigated how cognitive resource allocation contributes to brain activation underlying mental multiplication.

Fifteen participants were tested in a multiplication verification task with varying difficulty once in an fMRI scanner and three months later in a pupil laboratory where evoked pupillary responses were recorded.

The difficulty differentiation was confirmed since reaction times, error rates, peak dilation, and latency to peak dilation increased with increasing task difficulty. The fMRI analysis identified a fronto-parietal circuitry that increased monotonically with task difficulty comprising the left precentral gyrus (BA 6), left pre-supplementary motor area (BA 6), right dorso-lateral prefrontal cortex (BA 9), and bilateral intra-parietal sulcus (BA 40). Correlations between pupil data and brain activations for the multiplication difficulty circuit revealed a significant association between latency to peak dilation and activations in the bilateral intra-parietal sulci.

Combining pupillometry and event-related fMRI, we confirmed the existence of a fronto-parietal network underlying mathematical cognition. More importantly, taking into account individual differences in latency to peak pupil dilation augmented sensitivity when characterizing resource allocation and neural activity in the bilateral intra-parietal sulci. This supports the notion that a multi-method approach could improve the understanding of dynamical changes in mathematical abilities as a function of training and development (Krueger and Grafman, 2008).

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Gaze in Wonder: Memory Encoding Does not Need Our Eyes

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Keywords: psychology; memory; attention; eye-movements; cognitive control

How is attentional allocation related to memory encoding and retrieval? Digits were presented visually at different locations on the screen. Either the numeric identities (verbal task) or the spatial positions (spatial task) had to be recalled in serial order. Eye-movement recordings showed that fixation probabilities decreased with serial position, following the well-known serial position effect of accuracies in serial recall. However, fixating an item did not correlate with correct recall, indicating that encoding of item information does not require allocation of

the gaze. In an extension of the task a concurrent distractor occurred on the screen and changed its position rarely throughout the experiment. The gaze was captured in the verbal and the spatial task, but memory performance decreased in the spatial task only. Both, temporal dynamics of the gaze and related memory errors did not fully explain memory impairment, showing associations and dissociations between attentional allocation and memory performance.

Implicit Sequence Learning in Children

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Keywords: psychology; implicit learning; sequence learning; gender-specific learning; persistence

Sequence learning is an underlying ability in many cognitive tasks. Children would not be able recognize whether a sequence is random sequence of individual events, or whether the same events were actually repeated, if they cannot conceptualize sequences. The current study investigates the ability of school children to extract a 4-digit-sequence of 0s and 1s (also used in the AND-OR-XOR problem) of non-visible stimuli with 4 button presses (left = 0, right = 1). Children were given three sequences which they had to identify in multiple trials with feedback only. N=109 children (9-12 years) were given feedback that was incorrect 15 % of the time. All age groups improved with practice, with each repetition of a sequence, and with each new sequence, but 9-year-olds' learning showed an inverted U-shape trend, with performance deteriorating towards the end of the experiment. Boys were more likely to improve fast, and more, than girls, but even 12-year-old boys' performance was likely to deteriorate towards the end of the experiment in the same fashion as in the youngest boys. Girls' performance was improving more slowly, yet 11- and 12-year old girls' learning appeared to be less prone to collapse, as they maintained their level until the end of the experiment. A control condition with 100 % correct feedback is in progress in order to disentangle the effects of false feedback vs. persistence to learn.

Procedural Sequence Learning in a Motion Coherence Discrimination Task: Motor or Perceptual?

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Keywords: psychology; sequence learning; perception; sensomotoric

The serial reaction time task (SRTT, Nissen and Bullemer, 1987) is a standard task used to investigate procedural sequence learning. Whereas implicit learning of motor sequences is well-established, few and disputed results support learning of perceptual sequences. Mayr (1996) reported parallel learning of perceptual and motor sequences using manual responses to object identity. However, because objects appeared at widely separated locations, object identification required eye movements--confounding the "perceptual" location sequence with an oculomotor sequence.

Can perceptual sequence learning be established in the absence of eye movements? Here we adapt a motion coherence discrimination task (Newsome and Paré, 1988) to the sequence learning paradigm. A large number of moving dots are presented centrally, and each dot is either red or green with equal probability. Whereas most dots move independently, a small number of dots of the target color move coherently in one direction. Unbeknownst to the subject, the between-trial sequence of coherent motion directions is statistically predetermined by a set of transition probabilities. Subjects are asked to report either the color or the direction of the coherent dots, or both. The new task has two advantages, (1) the stimulus is presented at fixation, thereby obviating overt eye movements, and (2) by varying coherence, a perceptual threshold measure is available in addition to the performance measure of reaction time.

Results from a series of experiments suggest that motor response relevance of the sequence is necessary for sequence learning to occur, that the amount of sequence knowledge varies with the ease of encoding the motor sequence, and that sequence knowledge, once acquired, has the ability to modify perceptual thresholds.

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The Development of Visual Short-Term Memory During Childhood: The Influence of Verbal Strategies

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Keywords: visual short-term memory; childhood development; phonological and visual suppression; verbalization

Introduction

Recent studies point to a change from a visual strategy in short-term recall of visual stimuli, to a mixed strategy, using visual as well as verbal codes, to a verbal recoding strategy during childhood (e.g., Palmer, 2000). Moreover, naming stimuli during encoding can promote recall and verbal strategy use in younger children (e.g., Hitch et al., 1991). The aims of our study were twofold: (1) to replicate developmental transitions in strategy use with a new experimental approach; and (2) to assess age-related changes in the usefulness of naming strategies across childhood development.

Method

Three-hundred 5-, 7- and 9-year-old children had to remember objects (black-and-white line drawings). They were assigned for this task to five different groups: group 1: naming the visual stimuli; group 2: phonological suppression (repeating unrelated words); group 3: visual suppression (regarding unrelated pictures); group 4: performing a motor task (foot tapping) and group 5: no additional task (control group).

Results and Discussion

Our results show that (1) naming enhances recall performance in younger children, but not older children; and (2) the phonological suppression effect increased with age while the visual suppression effect decreased with age, in line with the expected developmental transition from visual to verbal recoding strategies.

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An MDA High-Level Language Implementation for ACT-R

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Keywords: cognitive modeling, ACT-R, high-level languages, MDA, model transformation

Introduction

High-Level Languages (HLLs) are supposed to simplify the modeling process for both experienced and inexperienced developers (Ritter et al., 2006). HTAmap uses task analysis to create higher-order language elements for cognitive modeling, but does not implement a graphical notation. Herbal implements a graphical user interface for the target architecture but does not provide an abstraction from the original modeling elements.

This talk will describe a new HLL implementation for the target architecture ACT-R. Using state-of-the-art technologies from the Model-Driven Architecture (MDA) paradigm, it has been implemented as a hierarchy of metamodels using the Eclipse Modeling Framework. The HLL's qualities benefit from the MDA paradigm's usage.

Description

Similar to HTAmap, the HLL uses task analysis as entry point to modeling, but with a graphical notation. The user specifies parameterized and reusable tasks, which itself are containers for processes, which describe sequences of atomic actions and conditions, and may be designed requiring only little knowledge of ACT-R modeling. The generated graphical HLL editor provides live error-preventing constraint validation. The HLL model is transformed into a Low-Level (LL) model comparable to Herbal, as the LL metamodel is a one-to-one representation of the ACT-R grammar and provides classes for elements such as productions or buffer tests. The LL model may be separately edited and augmented. Finally, the LL model is serialized into an executable ACT-R model file.

Conclusion

It is possible to complete all assignments from the ACT-R tutorials with the HLL. After the two-step transformation process, all models are executable within the ACT-R environment. The usability and extensibility of the resulting software system are improved by the consequential use of MDA techniques and technologies.

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Learning in Analogical Reasoning: Greedy and Ubiquitous or Context-Dependent?

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Keywords: artificial intelligence/cognitive systems; psychology; analogical learning; proportional analogies; analogical generalization; meta-analogical transfer

Analogical learning, that is transfer effects between episodes of analogical reasoning, is empirically well established. However, there are different accounts for the phenomenon: One possibility is that analogical learning is an inherent component of the analogy-making itself, another that learning occurs only additionally to analogy-making and hence does not necessarily accompany it. An intermediate position is the proposal of meta-analogical transfer to take place, that is analogy-making only between directly succeeding analogy problems.

In the experiment we describe, we aimed at evaluating these alternatives by testing under which conditions analogical learning occurs. We presented subjects with three succeeding proportional analogy problems from the letter string domain: the initial problem was presented in two variants, inducing two different rules for constructing the solution. Afterwards, subjects had to solve two further problems, which were ambiguous in a way that both induced rules were applicable and yielded distinguishable answers. Hence, we were able to determine from the subjects' answers to the second and third problem whether learning had occurred or not.

For letter string proportional analogies, there is no reason for subjects to assume that learning will facilitate performance on later problems. Therefore, we were able to investigate the conditions of transfer effects taking place by manipulating the instructions: One group of subjects was just told that they have to solve some letter string problems, a second group was given a hint, that the first problem is helpful for solving succeeding problems, a third group was given the initial analogy together with its solution as an example. Results show that for the hint and the example condition the second problem was solved by transferring the rule from the initial problem. For the third problem, only under the example condition a large proportion of subjects still applied the initial rule.

Modeling Spatial Behavior for Socially Intelligent Agents

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Keywords: proxemics; social spaces; socially intelligent agents; knowledge-based reasoning

People's spatial behavior when interacting with other people has been intensively researched in social and environmental psychology: Crowding effects resulting from invading people's personal space are described for many situations of social encounter (Hall, 1966; Altman, 1970). Only recently in human-computer interaction the concept of personal space has been transferred to the case of people interacting with robots (Hüttenrauch, 2007; Walters, 2008) and virtual agents (Rehm et al., 2005). These studies demonstrate that people expect intelligent embodied systems to consider personal space and to position themselves appropriately in task-specific manner.

I present a formal model for specifying spatial behavior for socially intelligent agents. The model discriminates different social spaces such as personal space, activity space, affordance space, modally intruded space and territory. Placing social goods or agents to places constitutes social spaces (Löw, 2001). Appropriate behavior in social spaces is based on cognitive processes integrating perception of spatial constellations, knowledge about interpersonal relations and expectations, personal preferences and common sense. Thus, the model fosters an approach to modeling spatial behavior inspired by social role theory. Within the proposed framework, an agent's permissions and responsibilities as related to social space appropriation and usage can be formally defined. Reasoning procedures upon this knowledge enable an intelligent agent to reason about social adequateness of intended actions. The conceptualization can be integrated into state-of-the-art action and motion planning within robotic architectures in order to improve intuitiveness of human-robot encounters.

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Neuronen und Halluzinationen. Schizophrenie im Angesicht des psychophysischen Problems

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Stichworte: Philosophie; Psychologie; Schizophrenie; Epiphänomenalismus; Interaktionismus; Physikalismus; Funktionalismus

In meinem Beitrag geht es um einen Brückenschlag zwischen empirisch fundierter psychologisch-psychiatrischer Forschung und philosophischer Reflektion zum Leib-Seele-Problem. Dass die im Falle der Schizophrenie beobachteten neuronalen Manifestationen in einer bedeutsamen Beziehung zu den psychischen Störungscharakteristika wie eben Halluzinationen stehen, kann als Faktum gelten. Was dagegen fraglich ist, ist, wie genau diese Bereiche zusammenhängen. Welche Ausgestaltungsformen sind hier denkbar und sind diese mit den empirischen Forschungsergebnissen und den hierauf basierenden Modellannahmen zur Schizophrenie konsistent? Inwiefern kommt es andererseits zu einer Variation des Krankheitsbildes der Schizophrenie?

Die zwar intuitiv plausiblen dualistischen Lösungskonzeptionen zum Leib-Seele-Problem erweisen sich sowohl im Hinblick auf ihre begrifflich-theoretische Stimmigkeit als auch im Hinblick auf die empirische Datenlage zur Schizophrenie als problematisch. Einen vielversprechenden Ansatz stellt die Konzeption der Identitätstheorie dar (genereller bzw. partieller Physikalismus). Sie widerspricht nicht der kausalen Geschlossenheitsannahme der physischen Welt bzw. dem Energieerhaltungssatz. Weiterhin kann aufgezeigt werden, dass die in der Pathogenese der Schizophrenie vielfach postulierten Interaktionsprozesse zwischen psychischen und physischen Aspekten von der Identitätstheorie integriert werden können. Auch der Funktionalismus weist eine Reihe an Vorzügen auf. So lassen sich mit Rückgriff auf funktionalistische Erklärungsansätze viele pathogenetische Facetten der Schizophrenie verständlich machen. Problematisch erscheint hier allerdings der Umstand, dass die konkreten im Krankheitsgeschehen der Schizophrenie beobachteten neuronalen Prozesse als wenig bedeutsam eingeschätzt werden. Es wird abschließend für ein tragfähiges Forschungsparadigma argumentiert, das sowohl identitätstheoretische als auch funktionalistische Prinzipien in sich vereint.

Können wir Gefahren im Straßenverkehr durch subtile Aufmerksamkeitssteuerung reduzieren?

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Stichworte: Warnsystem; Fahrer; spatial cuing; Aufmerksamkeit; subtil; subliminal; Verpassen; inattentional blindness

Im anwendungsnahen Kontext (z.B. Straßenverkehr) sind perfekt funktionierende Warnsysteme aus technischen Gründen meist nicht realisierbar. Deutlich wahrnehmbare „Falsche Alarmer“ können jedoch zu Leistungseinbußen in der Hauptaufgabe führen und die operator compliance beeinträchtigen. Deshalb sollte in unserer Untersuchung die Möglichkeit geprüft werden, mithilfe von subtilen räumlichen Hinweisreizen die Entdeckungsleistung für plötzlich auftretende Ereignisse zu verbessern, ohne die Leistung in der Hauptaufgabe zu beeinträchtigen. Um die zugrunde liegenden Prozesse präzise untersuchen zu können, wurde die Untersuchung in einer möglichst kontrollierten Umgebung durchgeführt, die dennoch die zentralen Aspekte des Fahrens in einer abstrakten Form beinhaltet. Zum einen wurde hierfür eine kontinuierliche, beanspruchende Monitoringaufgabe mit dynamischen Reizen aus dem Bereich der inattentional blindness -Forschung verwendet. Auf das plötzliche Erscheinen eines salienten Zielreizes, der zu einem zufälligen Zeitpunkt während der Hauptaufgabe auftrat, sollten die Probanden mit Tastendruck reagieren. Die Umsetzung des kurz zuvor präsentierten, subtilen räumlichen Hinweisreizes wurde aus den Experimenten von Treccani, Umiltà und Tagliabue (2006 [JEP:HPP]) übernommen. Es konnte gezeigt werden, dass der Hinweisreiz keine messbaren Einbußen in der Leistung der Hauptaufgabe hervorrief. Die kongruenten Hinweisreize führten aber im Vergleich zu inkongruenten Hinweisreizen und einer neutralen Kontrollbedingung zu einem signifikant reduzierten Anteil zu langsamer Reaktionen („Verpasser“).

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Spontane Kausalinduktion bei der Steuerung komplexer Systeme

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Stichworte: Psychologie; spontane Kausalinduktion; Steuerung komplexer Systeme; Eye-tracking; kausales Lernen; Entscheiden

Bei der Steuerung komplexer Systeme können Personen verschiedene Strategien einsetzen. Eine dieser Strategien ist das Erlernen der kausalen Struktur und der Parameter des kontrollierten Systems. In zwei Experimenten wurde zunächst untersucht, ob Personen bei der Steuerung eines dynamischen Systems ohne explizite Aufforderung spontan Kausalmodelle induzieren.

Im Gegensatz zu vielen früheren Studien wurde im Anschluss an die Steuerungsaufgabe das Kausalsystem ohne Vorankündigung manipuliert und die Probanden wurden gebeten, für dieses neue System Entscheidungen zu treffen und Systemzustände vorherzusagen. Kausales aber nicht instrumentelles Wissen erlaubt es, solche Vorhersagen zu machen. Die Ergebnisse zeigen, dass Probanden die Struktur des Systems gut erlernten, aber erstaunlich wenig Wissen über die Parameter des Systems erwarben wenn die einzelnen Teilprozesse nicht separat wahrnehmbar waren (Experiment 1). Das Parameterwissen nahm erheblich zu, wenn diese Prozesse getrennt präsentiert wurden (Experiment 2).

Durch die Modellierung verschiedener Strategien wurde zwischen kausalen und nicht-kausalen Lern- und Entscheidungsstrategien differenziert. Die Ergebnisse zeigten, dass die Antworten der Probanden am besten durch spontane kausale Induktion erklärt werden können, auch wenn das Parameterwissen gering war.

In einer weiterführenden Eye-tracking Studie wurde untersucht, ob die Unterschiede zwischen Struktur- und Parameterwissen in Zusammenhang mit Prozessen der visuellen Aufmerksamkeit stehen. Hierzu wurden Probanden zeitgleich Informationen über die Systemstruktur sowie über die Konsequenzen verschiedener Interventionen innerhalb dieses Systems präsentiert. Letztere Informationen sind notwendig für die Bestimmung der Parameter des Systems. Die Ergebnisse dieser Studie zeigen, inwiefern Probanden bei einer Systemmodifikation ihre Aufmerksamkeit auf Struktur des Systems bzw. die der Parameterschätzung dienenden Daten lenken.

Suffix Combinations in Derivation: A Cognitive Approach

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Keywords: morphology; derivation; word class; suffix combinations; cognitive approach; English; Bulgarian

Of all possible combinations of affixes in a language, a relatively limited number exist, which gives rise to questions about the factors responsible for the combinability of affixes. Such questions are among the central ones in morphological theory (see Manova and Aronoff, 2010).

This paper discusses the further derivation of already derived words and proposes a cognitive explanation of the way suffixes combine. It will be shown that there is a systematic relationship between the derived base (terminating in SUFF1) and the word class of the SUFF2 suffixes that attach to it. Specifically, there is a clear tendency for a SUFF1 to select only one particular SUFF2 of a major syntactic category (word class), i.e. noun, verb and adjective. If more than one SUFF2 with the same word-class specification exist, either one of the SUFF2 suffixes applies by default (i.e. most of the derivatives exhibit that suffix) or semantic rules differentiate between the different SUFF2 suffixes and allow the attachment of only one particular SUFF2 each time. Moreover, since derivation is prototypically word-class-changing, SUFF1 and SUFF2 usually have different word-class specifications. The word-class specification of a suffix is seen as based on the speaker's cognitive knowledge about the world. Data from English (Aronoff and Fuhrhop, 2002; Plag and Baayen, 2009) and Bulgarian (cf. Manova, 2010) illustrate the argument.

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Conceptual Structure as Mediator in a Computational Model for Vision-Language Interaction

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Keywords: linguistics; artificial intelligence/cognitive systems; conceptual structure; vision-language interaction; syntactic disambiguation; context integration; cross-modal reference resolution; parsing

Ambiguity is an inherent property of natural language. Despite the high frequency with which ambiguity occurs in unrestricted natural language, most ambiguities pass unnoticed (Ferreira et al., 2002; Ferreira and Patson, 2007), mainly because human cognition automatically and unconsciously works to resolve ambiguity. A central contribution to this disambiguation is the integration of non-linguistic information from readily available cognitive sources such as world knowledge, discourse context or visual scene context.

In this talk we present a cognitively motivated computational model for the cross-modal influence of visual scene context upon natural language understanding. We argue for a model that employs semantic mediation to establish cross-modal referential links between words in the linguistic input and entities in a given visual scene context (McCrae, 2007; McCrae and Menzel, 2007; McCrae, 2009a,b). Cross-modal referential links are assigned on the basis of conceptual compatibility between the concepts activated in the linguistic modality and the concepts instantiated in visual context. Attachment decisions in the linguistic analysis are modulated based on thematic relations from the visual scene representation.

The model architecture is based on Jackendoff's Conceptual Semantics as an overarching theory of cognition (Jackendoff, 1983, 1990, 1992, 1996). The proposed model implements the central tenet of Conceptual Semantics that all cross-modal interactions of non-linguistic modalities with language are mediated by Conceptual Structure as the single, uniform representation of linguistic and non-linguistic semantics. Non-linguistic modalities such as visual or auditory understanding project into Conceptual Structure. Their semantic representation interacts with syntax via correspondence rules in the syntax-semantics interface that map between these representationally encapsulated levels of representation (Jackendoff, 1996).

We demonstrate how this computational model successfully integrates information from representations of visual scene context into linguistic processing. Experiments show that context integration in our framework robustly effects syntactic disambiguation for notoriously hard-to-parse global ambiguity phenomena such as PP attachment and subject-object ambiguity.

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Co-ordinating Intentions in Dialogue: Interleaving Actions and Utterances

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Keywords: linguistics; psychology; dialogue; joint intentions; alignment; (mis)communication; clarification requests

Successful use of language in conversation requires both co-ordination of content and process. While the former has been studied extensively, there has been a paucity of studies on the latter. This paper investigates procedural co-ordination in dialogue by examining how sequences of interleaved talk and actions are established and sustained by interlocutors.

Formal models of dialogue, e.g. Grosz and Sidner (1990), emphasize interlocutors' explicit articulation and full recognition of intentions and plans. By contrast, Clark's (1996) grounding model describes how sequential co-ordination emerges collaboratively as solutions to co-ordination problems faced by interlocutors. Further, existing models provide different accounts of which mechanisms are involved: the interactive alignment model (Pickering and Garrod, 2004) prioritizes tacit co-ordination provided by priming, while in Grosz and Sidner's and the grounding model, explicit co-ordination is seen as most effective.

To address these issues, we report a variant of the maze-task experiment (Garrod and Anderson, 1987), used in combination with a novel chat-tool (Healey and Mills, 2006). All turns generated by participants pass through a server that introduces artificial probe clarification questions that appear, to participants, to originate from each other. The probe questions are designed to elicit participants' descriptions of their intentions – ("why?", "why that?", "what for?").

This paper presents global and local patterns in maze-task dialogue that are not readily explained by existing models of dialogue. We show how intentions become "embedded" in sequences of interleaved actions and utterances, allowing the rapid development of highly elliptical and constrained interaction. We sketch an approach that emphasizes how intentions are co-ordinated in dialogue, and are best characterized as an outcome, not precondition, of successful interaction.

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The Semantic Network of the Individual is a Small-World but Not Inevitably Scale-Free

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Keywords: psychology; semantic networks; semantic development

The structure of associative semantic networks sampled from adult individuals is suggestive of the processes through which the networks may have developed over the life-span. In these networks, words are represented as nodes connected by links that represent a non-zero probability of a word being named as an associate in response to a cue. Since not all mechanisms may result in the emergence of the observed adult structure, this structure can serve as a basis for building up candidate models of semantic development.

Past work modeling the process of semantic development relied on structural analyses of associative networks based on datasets which aggregate across the associates of many people. However, these aggregate associative networks do not necessarily preserve the characteristics of the individual networks, and so they may be misleading in revealing the process of semantic growth of an individual's life-span. Driven by this concern, the present study analyses the structure of adult associative semantic networks built from individual data.

The networks of individuals were sampled via a new experimental procedure, derived from the snowball sampling technique. This procedure uses the associates generated by an individual as cues for "recruiting" their semantic neighbors such that, over time, the word sample grows much like a rolling snowball.

The results showed that the semantic network of the individual exhibits small-world properties, namely short global distances between words and strong local clustering. In addition, the distribution of links follows a truncated power law, with most words having few connections joined together by a few hub-like words with many, but not too many connections.

These results are not entirely consistent with those reported for previously studied aggregate associative networks, and suggest ways of extending past modeling work in order to better capture the process of semantic development of an individual's life-span.

How Does the Level of Interaction Mediate the Benefit of Gaze Transfer in a Cooperative Puzzle Task?

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Keywords: Human-Computer Interaction; communication; cooperation; eye movements

Cooperation in object-based tasks requires effective strategies for grounding verbal references in the shared workspace. For the processing of object-based tasks, possible ambiguities can be resolved by using deictic references. Eye movement transfer reliably indicates a person's visual attention and has been found to facilitate task completion. However, it is still unclear how gaze based communication affects the interplay between gaze and speech. Most studies used post-hoc gaze-overlay for training purposes. Here, we examined gaze transfer in co-present cooperation, manipulating the communication modality and the level of interaction.

A novice and an expert had to solve puzzles together, in which the expert used one of four communication modalities to help the novice: gaze transfer, speech transfer, a combination of both or a combination of mouse and speech transfer. Only the novice could move the puzzle pieces and was either asked to closely follow the expert's instructions (Experiment 1) or to act autonomously as well (Experiment 2). Gaze transfer reduced performance time as well as the complexity of the verbal communication compared to the speech-only condition in both experiments. Gaze transfer also changed eye movement characteristics, resulting in increased fixation durations and smaller saccadic amplitudes. Performance was similar for gaze transfer and mouse transfer in Experiment 1, but better for mouse transfer if the interaction was less structured, as in Experiment 2. In conclusion, here we found that both, gaze and mouse transfer in cooperation is better than speech-only, but the level of interaction influences the interplay between visual guidance (eye or mouse transfer) and verbal interaction and hence the efficiency of gaze transfer compared to traditional mouse pointing.

Shaken, not Stirred: Information Acquisition Optimizes Probability Gain

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Keywords: optimal experimental design; experience-based learning; information search; probabilistic learning; visual attention

Medical diagnosis, scientific hypothesis testing, and visual perception are examples of many domains in which careful choice of which piece of information to acquire is important. Several optimal experimental design statistical theories of the value of information, including probability gain (error minimization), information gain, Kullback-Liebler distance, and impact, have been equally in agreement with available data on human choices of what information to acquire (Nelson, 2005, 2008). We designed several experiments to identify which among these theories, and an additional heuristic theory, best captures human information search.

In our experiments, subjects first learned environmental probabilities via their own experience in a probabilistic categorization environment, involving simulated biological plankton stimuli. The species of each plankton specimen (A or B) depended probabilistically on two binary features. In each trial, subjects categorized a randomly sampled plankton specimen as species A or B, and were given immediate feedback. In a subsequent test phase, subjects were only allowed to view a single feature of their choice to categorize the stimulus. We designed the environments via computer optimization so that the different theoretical models of the value of information would maximally disagree about which feature is most useful. Experiment 1 showed that probability gain explains subjects' search behavior better than the other models. Experiments 1 and 2 showed that people behave differently when environmental probabilities are conveyed via words and numbers, rather than personal experience. A final experiment showed that participants' desire to maximize probability gain is strong, and that the other models appear to offer little if any contribution to people's search behavior.

In further work we consider the relationship of eye movement and behavioral information acquisition strategies, and the neural bases of the value of information.

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Determinants of Driver Stress and its Effects on Lane Keeping

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Keywords: driver stress; appraisal; traffic environment; lane keeping.

It has been shown that people with high scores in the dislike of driving (DIS) trait, i.e. who show slightly anxious reactions to driving, exhibit poorer lane keeping performance when confronted with stressful situations (e.g. Matthews, 1996). To link this line of research to motivational driver theories, we formulated a belief-desire model that contrasts safety motivation and driver skills with perceived situational risk to produce a stress response. Drivers with high DIS scores should thus have stronger safety motivation and/or lower perceived skill level and react to risky driving conditions with a stronger stress reaction (anxiety and worries), which in turn leads to impaired driving performance.

To test these assumptions and explore the hypothesis that environmental factors (e.g. lighting conditions) are sufficient to elicit stress reactions in subjects with high DIS scores, we conducted a driving simulator quasi-experiment. 48 subjects were divided into low and high DIS groups, respectively, based on a questionnaire that also measured safety motivation and driving skills. Each subject then completed two trials with different levels of environmental risk in a driving simulator. State anxiety and worries were assessed after each course; lane keeping was recorded during trials. The data showed the hypothesized relation between dislike of driving and safety motivation/driving skills. However, comparing anxiety, worries and lane keeping performance of both DIS groups, no interaction with risk condition was found. The results support the belief-desire-model, but environmental risk factors alone apparently are not sufficient to elicit stress reactions that impair driving performance.

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How do We Understand Other Human Beings? The Person Model Theory

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Keywords: philosophy; person model theory

For decades we had an intense debate between Theory-Theory (TT) and Simulation-Theory (ST). The central claim of TT is that the process of understanding others is essentially relying on a *theory* (e.g. Carruthers). Some representatives have an additional claim about the way we acquire this theory, namely that it is parallel to process of learning a scientific theory (Gopnik). The main problem with the central claim is that we have clear evidences of intuitive understanding of others which does not rely on a theory (in any plausible sense of *theory*). Simulation-Theory (ST) can be distinguished *negatively* in contrast to Theory-Theory (TT) by rejecting the belief in a psychological law, but it can also be *positively* characterized by positing a two stage-process of mindreading, namely the simulation stage and the projection stage (Goldman, 2006). Although it is an advantage of his recent view that he distinguishes low-level and high-level mindreading, Goldman does not show how these forms are connected.

I argue that the person model theory is a fruitful alternative. I suggest that we develop “person models” of ourselves, of other individuals and of groups of persons. These person models are the basis for the registration and evaluation of persons having mental as well as physical properties. Since there are two ways of understanding other minds (non-conceptual and conceptual mindreading), we propose that there are two kinds of person models: Very early in life we develop non-conceptual *person schemata*: A person schema is a system of sensory-motor abilities and basic mental dispositions related to one human being (or a group of humans) while the schema functions without awareness and is realized by (relatively) modular information processes. Step by step we also develop *person images*: A person image is a system of consciously registered mental and physical dispositions as well as situational experiences (like perceptions, emotions, attitudes, etc.) related to one human being (or a group).

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Re-Representation as an Effect of Analogical Mapping

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Keywords: psychology; analogy; mapping; re-representation; categorization

We carried out an experiment to assess whether an analogy can trigger the re-representation (conceived as redescription or recategorization) of a target analog (TA). More precisely, the experiment was designed to test: 1) whether a TA not initially regarded as a member of a category can be perceived as belonging to such category as a result of being paired with a base analog (BA) independently tested as a prototypical exemplar, and 2) whether a TA considered as a marginal example of a category can be perceived as a more typical example as an effect of the analogical mapping.

Participants in the analogy group read 12 analogies (e.g., Peter gave a perfume to Mary, what made her feel uncomfortable. The next day Peter played a joke on Mary, and she felt uncomfortable for an analogous reason as the day before) and were asked to explain the effect of the TA of every one of them (e.g., Why did Mary feel uncomfortable this second time?). Then they had to rate on a Likert scale (1= not representative at all, 7= the most representative case) the typicality of the TA as an instance of the category that the BA was established as typical case (e.g., how typical is playing a joke on a girl as an example of seduction). Participants in the no-analogy group received the BAs and TAs as separate situations and they had to explain the effect of the TAs and rate their typicality.

The majority of the no-analogy group did not evoke the tested category in the TAs' descriptions. In contrast, in the analogy group participants used the tested category to refer to the TAs in most of the cases. Participants in the analogy group rated higher (i.e., more typical) the TA as an instance of the tested category than participants in the no-analogy group. In sum, the data supports the idea that mapping sometimes leads to a re-representation consisting in a novel categorization of the TA or in an increase in the perception of typicality of a situation as a member of a certain category.

Information Structure Constrains Syntax: The Case of Split Topicalization in German

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Keywords: syntax; information structure; split topicalization; movement; topic

The claim of this talk is that properties of German split topicalization (ST) follow from the interplay of information structure and syntax. ST creates discontinuous DPs; the topicalized part (TOP) acts as a contrastive topic, the stranded part (REM) as a focus:

- (1) Bücher hat Peter bisher nur wenige gelesen.
books has Peter so-far only few read

I argue that TOP is a predicate modifying REM; consequently, TOP must not contain definite/quantificational material (Fanselow, 1988). ST allows for mismatches between TOP and its base position; however, standard diagnostics reveal a movement dependency (van Riemsdijk, 1989). I propose that ST-constructions are derived from symmetric small clauses in argument position, which must be asymmetricized by movement (Moro, 2000). (3) is the SC underlying (1):

- (3) [[DP diese drei *e*] [NP französische Bücher]]

Expressing a predication, (3) is interpretable “as is”. At the same time, the structure is problematic, since there is no asymmetric c-command relation, required by the LCA. Therefore, either member of the SC must move. Consider the outputs:

- (4) Französische Bücher hat Peter diese drei gelesen.
French books has Peter these three read
- (5) *Diese drei hat Peter französische Bücher gelesen.
these three has Peter French books read

Jacobs (2001) shows that topics set up a “frame” to which the comment is restricted. DP in (5) fails to do so, unlike NP in (4); English *as for*-constructions show the same contrast, even though no movement is involved (*As for French books, Peter read these three* vs. **As for these three, Peter read French books*). Frame-setting likewise constrains cases of ST in which DP is not elliptic:

- (6) Gefährliche Raubvögel hat Peter nur drei Falken gesehen.
dangerous birds-of-prey has Peter only three falcons seen
- (7) *Drei Falken hat Peter nur gefährliche Raubvögel gesehen.
three falcons has Peter only dangerous birds-of-prey seen

The analysis predicts movement effects while allowing for mismatches/overlaps and explains why TOP cannot surface *in situ* (symmetry-breaking movement). These and other properties are shown to derive from external factors: interface conditions (linearization/predication) and information structure.

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Rationale Imitation - die "schlauere Art" zu imitieren?

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Stichworte: Psychologie; soziale Kognition; Imitation; Vorschulkinder; Altersunterschiede

Studien haben gezeigt, dass einjährige Kinder situationale Beschränkungen wahrnehmen und ihr Imitationsverhalten an die gegebene Situation anpassen. So stellten Gergely, Bekkering und Király (2002) fest, dass 14 Monate alte Kinder in der Bedingung, in der die Hände des Modells frei waren, die beobachtete ungewöhnliche Kopfbewegung des Versuchsleiters imitierten. Waren die Hände des Modells nicht frei, imitierten die Kinder „rational“, indem sie das Licht mit ihren Händen anschalteten (gewöhnliche Handlung). Ziel unserer Studien war es, alterskorrelierte Veränderungen des Imitationsverhaltens bei Vorschulkindern zu untersuchen. Es wurden neuartige Imitationsaufgaben und der Einfluss verbaler Hinweise des Modells während der Handlungsdemonstration auf das Imitationsverhalten untersucht. In einer Pilotstudie mit N = 23 Kindergartenkindern (M = 54.54 Monate) wurden vier unterschiedliche Aufgaben in jeweils zwei unterschiedlichen Bedingungen präsentiert (mit Beschränkung vs. ohne Beschränkung des Modells). In einer weiteren Untersuchung mit N = 100 Kindern (M = 54.00 Monate) wurde der Einfluss der verbalen Hinweise überprüft. Vorläufige Ergebnisse weisen darauf hin, dass auch Kindergarten-Kinder rational imitieren, d. h. abhängig von der Beschränkung des Modells eher die ungewöhnliche oder die gewöhnliche Handlung zeigen, dies jedoch in Abhängigkeit der spezifischen Aufgabe. Des Weiteren scheinen die verbalen Hinweise des Modells das Imitationsverhalten der Kinder zu beeinflussen.

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A Social Turing Test: Ascription of Humanness to a Virtual Character is Based on Contingency and Valence of Gaze Behavior

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Keywords: psychology; social cognition; interaction; joint attention; gaze following; turing test

Our bias to follow other people's gaze and to share their attention is crucial for our ability to read their minds. To unravel the dynamics underlying the ascription of humanness on the basis of gaze behavior, we used a novel eye-tracking paradigm allowing participants to interact with an anthropomorphic virtual character via eye-movements. In a series of experiments, participants were asked to decide whether the character had been controlled by another participant or a computer. In fact, all interactions were computer-controlled and the second participant a confederate. Interaction took place in blocks of six trials in which the character would either follow the participant's gaze or look away whenever the participant fixated one of two objects. We systematically varied the number of gaze-following trials ranging from zero (high contingency, negative valence; i.e. character always looks away) to six out of six (high contingency, positive valence; i.e. character always follows). Results showed that the ascription of humanness increased linearly with valence, but not with contingency if the confederate was introduced as naïve to the task, thus suggesting a default expectation of affiliative gaze-following behavior. When the confederate was introduced as cooperative (i.e., supposed to facilitate the ascription of humanness), participants' ratings of humanness increased with increasing contingency, irrespective of valence. A closer look clearly revealed two strategies: Participants either based humanness ratings only on positive contingency, or, alternatively, on high contingency alone, irrespective of value. Introducing a competitive confederate made it impossible for participants to distinguish between human and computer. In summary, contingency and valence constitute the two factors that underlie our ability to ascribe humanness to others, which can be modulated by explicit assumptions about the cooperative or competitive behavior of the interactor.

Statistical Models of Non-Randomness in Natural Language

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Keywords: linguistics; statistical models; natural language; non-randomness; term clustering

Accurate estimates for the occurrence probabilities of words and other linguistic phenomena play an important role in computational modelling of the human language faculty, as well as in natural-language processing applications. Researchers have long been aware of the fact that the random sampling assumption made by standard significance tests does not hold for language data. One particularly serious problem is term clustering, i.e. the tendency of topical words and expressions to be used repeatedly in a single text. Our goal is to model such term clustering effects using generalized linear models (GLM), by treating each text as an autocorrelated time series of word occurrences.

In our model, we map texts to binary sequences of indicator variables with respect to a given word or expression W . Each indicator variable shows whether W occurs in a specific position in the text. We then predict the occurrence probability of W at each position as a conditional probability based on its previous usage and other parameters (such as overall position in the text, position relative to the current sentence, text genre, domain, etc.). Our model is therefore strictly causal, meaning that only past events are considered to explain the occurrence patterns of W . To estimate its parameters we use a generalized linear model (GLM). We implement the conditioning on temporal structure, i.e. clustering, based on cubic spline basis functions. Goodness-of-fit is assessed by cross-validation using deviance and the time-rescaling theorem to evaluate predictability of temporal structure.

To identify important components of the model we employ L1 regularized generalized linear models in a second step. L1 regularized solutions are sparse. We use this sparsity to devise a reduced model using only components with large parameters that indicate greater importance.

Characterization and Correction of Eye Movement Artifacts in EEG Data

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Keywords: cognitive neuroscience; eye movements; EEG; artifact correction; ICA; microsaccades

Eye movements introduce large artifacts to electroencephalographic recordings (EEG) and thus render data analysis difficult or even impossible. Trials contaminated by eye movement and blink artifacts have to be discarded, hence in standard EEG-paradigms subjects are required to fixate on the screen. To overcome this restriction, several correction methods including regression and blind source separation have been proposed. Yet, there is no 'automatic' standard procedure established.

By simultaneously recording eye movements and 64-channel-EEG during a guided eye movement paradigm, we show that eye movement artifacts consist of several components, which arise from different sources. These include corneo-retinal dipole changes, pre-saccadic spike potentials and eyelid movements. Moreover, we demonstrate that depending on electrode site, gaze direction and choice of reference these components contribute differently to the measured signal. Therefore they cannot be removed by regression-based correction methods, as they inevitably over- or under-correct individual artifact components. Finally we propose a correction procedure based on Independent Component Analysis (ICA). This procedure uses eye-tracker information to reliably and objectively identify eye-artifact related ICA-components in an automated manner. This pertains to different kinds of eye movements including microsaccades. In this way it allows removing or substantially reducing artifacts without affecting the signal originating from brain sources.

In conclusion the proposed method not only provides a tool for detecting and correcting eye artifacts in standard EEG-paradigms but it also permits to study EEG-activity during eye-tracking experiments and thus to investigate neural mechanisms of eye movement control and visual attention under natural conditions.

Mathematical Modelling of Cognitive Processes Underlying the Stimulated Idea Generation During Brainstorming

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Keywords: artificial intelligence/cognitive systems; psychology; modelling; brainstorming; idea generation; stimulation; simulation

A mathematical model is proposed to simulate the cognitive processes that take place during stimulated idea generation on a specific brainstorming topic. Based on a modified version of the theoretical process model SIAM (Search for Ideas in Associative Memory by Bernard A. Nijstad and Wolfgang Stroebe (2006)), the model assumes that idea generation includes a repeated search for ideas in associative memory, which proceeds in two stages: activation of knowledge in long term memory and idea production in working memory. A third stage is added to include the widely discussed opportunity of stimulation by own or others' ideas.

The main parts of the model are the activation of contents in long term memory and the generation of ideas (i.e. choosing ideas from a database). Both were modelled using a probabilistic evaluation algorithm. The implemented model simulates, within the framework of our theoretical process model, the results of real life experiments as far as possible given the strong inter-individual variance. The model allows conclusions regarding the design of cognitive stimulation in practice which are to be verified in future experiments.

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Food Deprivation Sensitizes Pain Perception

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Keywords: psychology; short-term food deprivation; pain threshold; pain tolerance; sympathovagal balance

Objectives

While food deprivation has known effects on sympathovagal balance, little is known about hunger's influence on the perception of pain. Since autonomic activities influence many cognitive and emotional processes, this suggests that food deprivation should interact with the perception of pain. This study analyzed the possible effects of short-term food deprivation on pain sensitivity in healthy participants.

Methods

This study was comprised of 22 healthy female participants who underwent a 48-hour inpatient hospital investigation. Prior to testing, heart rate (HR) and heart rate variability (HRV) were assessed. After a standardized breakfast, day one measurements were taken and then no food intake was allowed again until the following evening. Pain threshold and tolerance were assessed at 10:00 am on both days using a pressure algometer. Additionally pain experience was examined.

Results

Food deprivation significantly reduced pain thresholds and tolerance scores. Additionally, the sympathovagal balance changed, characterized by a decrease in parasympathetic and an increase in sympathetic activation. Higher vagal withdrawal after food deprivation was associated with higher pain sensitivity. Furthermore, perceived unpleasantness and pain intensity increased for threshold and tolerance stimuli after food deprivation.

Conclusions

Our data demonstrate that short-term food deprivation sensitized pain perception in healthy females. An imbalance in sympathovagal activation evoked by food deprivation accounted for this effect. Our results might be attributable to a hypervigilance to visceral signals and might be a pathogenic mechanism for the development of emotional difficulties associated with disturbed eating behavior.

Emotional Stimulation Alters Perceived Odor Intensity and Modulates Activity in Neural Networks Underlying Olfactory Perception

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Keywords: cognitive neuroscience; olfaction; emotion; fMRI

Emotions have a strong influence on the perception of visual and auditory stimuli. Concerning the olfactory system, empirical data suggest that olfactory sensitivity is reduced by inducing a negative and positive emotional state. Nevertheless only little is known about possible neural correlates interacting as interfaces between mood and olfaction perception. The present study aimed at identifying brain regions in which emotion induction interacts with olfactory processing. Using fMRI the neural activation during olfactory processing of a neutral odor was assessed in 17 subjects (9 male). Prior to odor application pleasant, neutral and unpleasant pictures from the IAPS were presented using a block design. Perceived odor intensity and valence were assessed after each block. Positive and negative emotion induction led to significantly decreased odor intensity perception and to a trend towards a reduction of perceived odor valence after unpleasant picture presentation. Pleasant and unpleasant emotion induction was accompanied with a reduced activation in piriform cortex while unpleasant emotion induction was related to increased activity in the anterior cingulate. We conclude that inducing affective states reduces perceived odor intensity and leads to a change in perceived odor valence which is mirrored in concomitant activity modulations both on primary as well as secondary processing levels.

Fluid Intelligence Modulates Cerebral Correlates of Processing Geometric Analogies

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Keywords: fluid intelligence; geometric analogies; fMRI; BOLD

Fluid intelligence is the ability to think flexibly and to understand abstract relations and enables high performance in cognitive tasks (Horn and Cattell, 1966). Persons with high fluid intelligence (hi-fluIQ) perform better in analogical reasoning than persons with average fluid intelligence (avefluIQ; Hofstadter, 1997). Previous studies report involvement of parieto-frontal brain regions in geometric analogical reasoning (Wharton et al., 2000; Wartenburger et al., 2009). We aimed to characterize the cerebral correlates of geometric analogical reasoning in students differing in fluid intelligence.

There was a main effect of intelligence-group: Hi-fluIQ showed better behavioral performance and greater BOLD-signal changes in the superior parietal lobes than ave-fluIQ. Ave-fluIQ showed greater BOLD-signal changes in the anterior cingulate and the medial frontal gyrus. We also found a main effect of task difficulty: The parametric contrast of task difficulty revealed increasing BOLD-signal changes in the superior parietal and left frontal cortices. Furthermore, there was an interaction of intelligence-group by task difficulty in the left precuneus, indicating greater BOLD-signal changes with increasing task difficulty for the hi-fluIQ than for the ave-fluIQ. In a follow-up study one year later hi-fluIQ had improved their behavioral task performance without cerebral signal changes.

High fluid intelligence enables for a better task performance and is related to increased resource consumption in parietal brain regions as compared to average fluid intelligence. Increasing task difficulty generally manifests in increasing BOLD-signal changes, indicating a demand for stronger executive control and working memory processes in the more difficult trials. A more efficient resource utilization of the fronto-parietal network enables to improve behavioral performance.

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Heidi, James & Igor. Inductive Rule Acquisition for a Philosophically and Psychologically Founded Autonomous Agent

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Keywords: cognitive neuroscience; artificial intelligence/cognitive systems; philosophy; psychology; autonomous agent; inductive rule acquisition; IGOR; Heidegger; Psi-theory

The grounding, relevance (and definition) of symbols has been an area of research and debate for 20 years now. Inspired by ideas from Heidegger, we derive a philosophical framework (as proposed by Sun, 2000) for handling an autonomous agent's (AA) states and actions of its sensors and motors. Using concepts of Dörner's Psi-theory (1999), including his example of the motivated AA James, we integrated building blocks that, albeit rudimentary, allow for notions of motivation and emotion. Building on the time-line memory concept described by Klahr & Wallace, which is also present in Dörner's theory as a protocol memory rooted in sensorimotor experiences, we constructed the psychologically plausible agent Heidi that is in-the-world and generates iconic and categorial references.

This is not possible without assumptions and biases; however, as no machine learning is possible without at least some form of inductive bias, this is not regarded as drawback. No higher living being can be regarded independent from unsupervised phylogenetical shaping and instructed ontogenetical learning. We see such assumptions as necessary and valid prerequisite for any AA. By utilizing IGOR (Schmid, 2009), a means for inductive program synthesis, Heidi is able to detect patterns in its history of sensory, motor and internal states--- thus generating explicit (and human-readable) rules that mirror Heidi's situated experiences.

In our view this ability to explicitly structure reality is at the bottom of Heidegger's *Sorge* and of meaningful cognitive processes (like the forming of analogies). So our agent shall be the foundation for a new look at symbol grounding and its interaction with situated cognitive modelling.

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Semantic Richness Modulates Early Word Processing Within Left-Lateralized Visual Brain Areas and Enhances Repetition Priming

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Keywords: visual word recognition; lexical access; semantic processing; repetition priming; ERPs

Repetition priming has been shown to be modulated by prior knowledge about structural regularities (Stark and McClelland, 2000). Here, we examined influences of higher-level semantic knowledge, more specifically the richness of semantic representations, on repetition priming.

The EEG was recorded while twenty-four participants performed a visual lexical decision task on 160 words and 160 pseudowords. Within the word stimuli, we orthogonally manipulated two measures of semantic richness, namely the number of semantic features (McRae et al., 2005) and free associations (Nelson et al., 2004); the whole stimulus set was presented twice.

The number of semantic features modulated the amplitude of the posterior N2 component over left occipito-temporal areas. This effect arose only about 30 ms after the onset of lexicality effects on left-lateralized N170 amplitudes, presumably reflecting visual word form processing within the fusiform gyrus. Thus, word form and meaning are accessed in rapid succession within left-lateralized visual brain regions.

Repetition priming was consistently enhanced for words with many semantic features in both performance and ERP data, suggesting a role for feature-based semantic richness in word repetition priming.

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A Space for Affect: Is the Vertical Representation of Affect Automatically Activated?

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Keywords: embodiment; affect; spatial representation

The linguistic metaphor theory posits that abstract concepts like affect, are represented in terms of concrete dimensions such as space (Lakoff and Johnson, 1980). Recent research has found a spatial mapping for affect (e.g., Meier and Robinson, 2004), in which good and bad are linked to higher and lower spatial positions, respectively. However, it is still not clear whether evaluative processing of the content is necessary for the association (e.g., Eder and Rothermund, 2008) or whether this association is automatic (e.g., Chen and Bargh, 1999). The present study examines the spatial mapping for affect and specifically whether the association between affect and the vertical dimension of space is automatically activated. Participants were presented an affective word in the middle of the screen for 250 ms. After a variable time interval (50, 350 and 950 ms) a white square appeared centered either in the upper or the lower position of the screen. Participants had to press a higher or a lower response key in order to decide whether the square appeared in the upper or the lower screen position. Evaluative processing of the content of the word was not required. If the association between affect and the vertical dimension is automatically activated then a faster response is expected when the affective content of the word is congruent with the position of the square (i.e., good up, bad down). Contrary, if evaluative processing of the word is needed, it is expected that no interaction between affective content and space appeared or it only appeared in trials with longer time intervals. A repeated measures ANOVA was performed on participants' reaction times. A main effect for SOA and affect was found and, most important, the expected congruency effect between affect and vertical position appeared. In general, the results suggest that the spatial representation of affect is automatically activated.

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Emotional Valence and Physical Space: Limits of Interaction

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Keywords: embodiment; body-specificity hypothesis; emotional valence

Based on the assumptions of the theory of embodiment, Casasanto (2009) developed the body-specificity hypothesis, which states that right-handers tend to associate positive ideas with the right side and negative ideas with the left, whereas for left-handers, the reverse holds true. Casasanto (2009) found evidence for this assumption in a series of experiments that required emotional judgments. Our aim was to investigate whether we can still see an association between emotional valence and physical space if attention is not drawn explicitly to valence.

We conducted four RT studies with right-handers, who performed left and right hand responses to words with emotional valence. If valence and space are associated, a spatial congruency effect in RT studies along the lines of the SNARC-effect (see Hommel and Prinz, 1997) is expected, i.e., facilitation for negative words and a response to the left, and for positive words and a response to the right.

In Exp. 1 – 3, participants saw words associated with positive or negative emotions, neutral words and non-words. Words were mapped to a left side response and non-words to a right side response, or vice versa. In Exp. 1, participants reacted, according to trial, with their left or their right hand. In Exp. 2, participants conducted actual movements to the left or to the right with their right hand, and in Exp. 3 with their right or their left hand. In all experiments, RT was shorter for positively connoted words and a response associated with right space. No interaction between valence and space emerged.

Exp. 4 investigated an explicit relation between valence and space. Participants reacted to a positive word with their left and to a negative word with their right hand, and vice versa. Reactions to positive words, but not to the right, were faster. A valence-by-space interaction emerged, with faster reactions with the right hand to positive words, and with the left hand to negative words.

Taken together, the results indicate that the association between valence and space is not activated automatically.

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The Context of Basic Communicative Acts (BCAs)

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Keywords: computational pragmatics; context; affordances; embodiment

Introduction

Humans are believed to be the only species which is naturally able and motivated to interact via overtly intentional ("Gricean") communicative acts, such as utterances and controlled gestures. How does the human brain comprehend such acts? This has turned out to be an extremely hard question for empirical and theoretical research (Csibra, 2010).

BCAs

A strategy for tackling it which has not yet been explored systematically is to focus on cognitive mechanisms for the comprehension of 'basic communicative acts' (BCAs), such as the pointing gesture, prohibition / inhibition ('no'/'stop!'), affirmation, summoning and so on. Despite their simplicity, BCAs can be used to convey complex pragmatic meanings. Pointing, for instance, can be used to help the addressee, to request objects etc. A reasonable hypothesis is thus that context plays a dominant role in the comprehension of BCAs.

Context and affordances

What is context? Recent research on embodied and interactionally situated cognition provides several important constraints for tackling the structure and role of context in the comprehension of BCAs. In face-to-face interaction, BCAs like pointing etc. exploit the fact that the human brain is predisposed to perceive objects, persons and spatial regions in terms of the action affordances that they furnish for the agent as well as copresent agents.

This leads to a computational model according to which BCA-comprehension is a surprisingly simple cognitive process that is built 'on top of' an older and more complex scene-recognition system (fully developed in our primate cousins) that constantly monitors the environment and keeps track of 'things that can be done' on currently present objects, regions, social activities and social relationships. Comprehension of a BCA such as 'pointing' exploits this scene-recognition system by providing *candidate actions* which the speaker might want the hearer to perform after comprehension. In this way, pointing at, say, an apple (rather than, say, a lion) can be comprehended as 'give me that apple so that I can eat it' via *search* through the space of candidate actions, to give only one simple example.

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CBDTE: A Computational Belief-Desire Model of Emotion

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Keywords: artificial intelligence/cognitive systems; philosophy; psychology; emotion; artificial agents; BDI; mental representation

CBDTE is a proposal for a computational explication of the belief-desire theory of emotion, a variant of cognitive emotion theory. According to CBDTE, a core subset of emotions are products of hardwired mechanisms whose primary function is to subserve the monitoring and updating of the central representational system of humans, the belief-desire system. The posited emotion-producing mechanisms are analogous to sense organs; however, instead of sensing the world, they sense the state of the belief-desire system and signal important changes in this system, in particular the fulfillment and frustration of desires and the confirmation and disconfirmation of beliefs. Because emotions represent this information about the state of the representational system in a nonconceptual format, emotions are nonconceptual metarepresentations. It is argued that the conceptual closeness of CBDTE to the BDI (belief-desire-intention) agent framework should facilitate the integration of emotions into BDI-type artificial agents, as well as into other cognitive architectures that have affinities to the BDI approach.

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Bayesian Model Comparison of Cognitive Computational Learning Models

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Keywords: implicit learning; statistical learning; computational modelling; Bayesian model comparison

The fields of implicit and statistical learning have produced a large body of experimental evidence. Moreover a number of computational models have been applied for the modelling of single studies. Many such modelling results, however, cannot be easily compared due to methodological differences. There is little empirical evidence from large-scale comparisons of

different models within a single methodological framework across different experimental findings. The aim of this study was to provide such a comparison.

Five frequent (algorithmic, connectionist, or probabilistic) models from the implicit/statistical learning field were selected, implemented and compared within a single framework: Competitive Chunker (Servan-Schreiber and Anderson, 1990), PARSER (Perruchet and Vinter, 1998), Markov models (Pearce and Wiggins, 2004), Simple Recurrent Network (Elman, 1990), and Hidden Markov Models (Rabiner, 1989; Visser et al. 2002, 2007). Using a parameter grid method each model was evaluated for a range of realistic free parameter combinations in multiple replications. The evaluation replicated the human experimental procedure of the respective studies.

21 central studies for implicit and statistical learning were replicated for the evaluation. The models were evaluated based on the comparison with characteristics of human behaviour and using Bayesian Model comparison.

Generally, most models performed well in learning artificial grammars, but failed to reproduce human behaviour of learning of non-local dependencies; Markov and HMM models learned best but outperformed humans by far. Competitive Chunker and SRN models matched characteristic human performance best, followed by PARSER, HMM and Markov models. In general, results suggest that even though some models achieve very good results for particular studies, there are a number of human patterns of behaviour that can not be explained by any of the models employed.

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Acknowledgements

We would like to acknowledge the funding by Microsoft Research and the AHRC.

Different Performance Strategies for Different People: The Influence of Personality on Optimization Strategies in PRP

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Keywords: PRP; optimization; personality

The Psychological Refractory Paradigm (PRP) requires participants to perform two successively but temporally overlapping choice reaction time tasks. Therefore, two stimuli are presented in rapid succession and require separate responses. The typical finding is that the reaction time to perform the second task diminishes as the interval between both stimuli increases. This PRP effect is often attributed to a structural bottleneck in the central stage that involves response selection (Pashler, 1994). However, the results of different studies suggest an optional bottleneck. For example, Miller, Ulrich and Rolke (2009) suggest a strategic bottleneck in order to minimize the total reaction time. Based on this optimization account, the present study examines the influence of individual differences in behavioural approach and inhibition (using BIS/BAS, Behavioral Inhibition Scale/Behavioral Activation Scale) on performance strategies. For that purpose, participants were required to perform two similar or two different time-consuming tasks. Based on the optimization account it is expected that in the condition with different time-consuming tasks, participants would tend to process the less time-consuming task first even when the more time-consuming task is first presented. In the condition with similar time-consuming tasks participants would tend to process the tasks in a first-come, first-served basis. Second and more important, it is expected that individual differences in behavioural approach and inhibition will influence this result pattern. Whereas the mentioned result pattern is expected for approach sensitive participants, it is expected that inhibition sensitive participants process both conditions in a first-come, first-served basis. The results support the notion of the optimization account. Further, high scores on behavioural approach seem to be strongly related to the degree in which participants optimize.

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Awareness of Emotions: Movement Behaviour as Indicator of Implicit Emotional Processes in Participants with and Without Alexithymia

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Keywords: alexithymia; emotional awareness; emotion; gesture; non-verbal behaviour

Alexithymia is the cognitive-emotional deficit for identifying and verbalising emotions. About 8% of the population show this deficit and it co-occurs with interpersonal problems and disorders, such as autism, posttraumatic stress disorder, and depression. In their model of emotional awareness, Lane and Schwartz (1987) postulate a developmental process in five stages or levels to consciously perceive and differentiate emotions. Level I (bodily sensations) and level II (action tendencies) are defined as levels of implicit processing of emotions, levels III – V as levels of explicit processing of emotions with increasing differentiation. The categorisation – also into levels I and II – occurs by means of emotional scenarios (Levels of Emotional Awareness Scales, LEAS). Participants are asked to describe the supposed feelings of the people in the scenarios. However, we argue that the underlying hypothesis of LEAS that individuals categorised on levels I and II process emotions rather implicitly, can only be validated by means of a direct measure of implicit behaviour. Thus, the aim of our study within the cluster of excellence “Languages of Emotion” in Berlin is to analyse implicit movements of the hands (gestures and selftouches).

Do alexithymic participants show more implicit emotional movement behaviour than nonalexithymic participants? We analysed hand movements of 34 male, right-handed alexithymic and matched control participants during their responses to emotional questions (LEAS) and –as a control situation inducing primarily cognitive stress the Hamburg-Wechsler intelligence test–from videos with the NEUROGES-ELAN coding system (Lausberg & Slöetjes, 2009). The results show differences of the implicit movement behaviour between the two groups and are discussed with respect to the relationship of emotional experience, cognition, and movement behaviour.

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Towards Objective Measures of Different Levels of Mindless Reading

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Keywords: reading; eye movements; mind wandering; comprehension monitoring; signal detection theory

It sometimes happens that we finish reading a page of text just to realize that we have no idea what we just read. Interestingly, during these episodes of mindless reading our eyes move across the text but our mind is elsewhere. Here, we propose an error detection approach to measure different levels of mindless reading. Sitting in a comfortable recliner, 30 participants each took about 3 hours to read 50 boring short stories while their eyes were tracked. Episodes of mindless reading were defined as overlooking inconsistencies in the text material. Inconsistencies ranged from lexical errors to context errors and gibberish text. Generally, the deeper the processing required for detecting an error, the less likely subjects were to notice it. Further, mindless reading was associated with (i) shorter gaze durations on phrase- and sentence-final words and (ii) a considerably reduced word frequency effect on fixation times for long words. These findings validate the sustained attention to text task (SATT) as a signal detection measure of mindless reading. In addition, fixation durations on very long words predicted detection of lexical errors, yielding an objective behavioral online-indicator for mindless reading.

Enactive Social Cognition

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Keywords: cognitive neuroscience; philosophy; psychology; social cognition; enactive account; mindreading; intentionality

There has been a paradigm shift in the cognitive sciences towards an enactive and embodied/embedded understanding of cognition. To explain cognition and consciousness, we need to appreciate neural activity as embedded in the larger context of an organism's bodily actions and interactions with its environment. Cognition is facilitated by the sensorimotor coupling between agent and world—by a dynamic pattern of interaction among brain, body, and world (Thompson, 2007; Noë, 2009).

In this talk, it will be shown how central ideas from the enactive approach to cognition can be applied to the social domain and support a second-person account of understanding other minds (Ratcliffe, 2007; de Jaegher and Di Paolo, 2007). Both classical views, the Theory-Theory (Gopnik and Wellmann, 1992) and the Simulation Theory (Goldman, 2006) neglect the important distinction between a) merely observing someone and b) being directly engaged with another in social interaction (Wheeler, 2005). The intuition that social cognition is fundamentally different in these two conditions can be accounted for by the view that our primary source of social understanding is based on direct interaction and engagement with others from a second-person-perspective (Gallagher, 2001; Ratcliffe, 2007; Reddy, 2008).

The fundamental kind of social understanding is thus a skilful ‘know-how to deal with others’, constituted by strategies below and before mindreading. It manifests itself in appropriate actions and reactions that lead to a reciprocal relationship with another agent in social encounters, resulting inter alia from the perception of social affordances. Because autistic patients lack this implicit know-how, they are impaired in social cognition, although they are capable of explicit mindreading when prompted to do so (Senju et al., 2009). In this new framework, explicit ‘offline’ mechanisms such as theoretical inference and simulation only come into play in extraordinary situations (Newen and Schlicht, 2009).

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Machine Learning in Auditory Psychophysics: System Identification with Sparse Pattern Classifiers

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Keywords: audition; psychophysics; system identification; sparse classifiers; statistics

The identification of critical features (cues) of the input stimulus on which observers base their decisions is a main objective in psychophysics. In auditory experiments, a number of cues are typically available. For direct cue identification, multiple regression analysis has been established exploiting correlations between features and responses (Ahumada and Lovell, 1971). This method is prone to emphasise non-critical features, however, when they correlate with critical cues. Recent methods from Machine Learning, in particular pattern classifiers, provide a powerful alternative for quantitatively modelling behaviour (Macke and Wichmann, 2010).

We propose a general approach applicable to a broad class of auditory tasks: Using the outcome of psychophysical experiments, i. e., stimuli as input and subject decisions as output, we train pattern classifiers in order to mimic observer responses. When algorithm and observer show similar behaviour, we presume the underlying decision mechanism and employed cues also to be similar. Here, we focus on the classical paradigm of Tone-in-Noise (TiN) detection by H. Fletcher. As yet, it has not been conclusively demonstrated, which cues observers rely on to solve this task (Davidson et al., 2009).

In simulations, we show that both a linear Support Vector Machine and Logistic Regression with sparse regularisation can explicitly identify different observer strategies, across a wide range of psychometric performances and even for noisy observers. In contrast to multiple regression, the reconstruction of employed cues is mostly unaffected by correlating features. We then analyse a massive data set collected with naive observers performing TiN detection in a Yes/No paradigm. Employing classically proposed and newly established feature sets, we investigate observer cues and cue switching strategies and demonstrate how psychophysical measures, such as response times and sensitivity, are incorporated into our statistical analysis.

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The Role of Position Codes and Item-Position Associations in Implicit Serial Learning

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Keywords: cognitive neuroscience; psychology; implicit learning; serial position; memory; modeling; SRN

Introduction

The study of serial learning is commonly regarded as one of the most fundamental topics in the study of memory (Crowder, 1976). The general object of investigation in this field is the ability of animals to learn sequential information. Behavioral (Young, 1968), computational (Burgess and Hitch, 2006) and neuroimaging (Marshuetz, Reuter-Lorenz, Smith and Jonides, 2006) studies using verbal serial learning paradigms support the notion information about an item's position within the sequences are used during sequence learning (a positional code). Yet it is unclear in how far models from verbal serial learning are valid for the case of implicit serial learning.

The goal of this research was to investigate whether participants use positional codes in an implicit serial learning situation.

Paradigm and design

A visual search paradigm with predictable target location sequences was employed. The target screen location over successive trials was predictable. Participants were not informed about the sequential regularities of the task.

In 10 learning blocks, participants repeatedly encountered the same sequences. In a transfer block, the learned sequences of target screen locations were newly arranged. In transfer sequences, the single sequence elements could appear before, at or after the correct serial position. It was evaluated if targets appearing at screen positions at the correct serial position are faster. Next, we simulated the experiment with a powerful chaining account based on a simple recurrent network (Botvinick and Plaut, 2006). Finally, the experiment was repeated using eye tracking.

Results

The behavioral results suggest that participants did acquire associations between the sequence elements and a code of its serial position. At the same time, participants did not report any verbal knowledge. Results from simulations and eye-tracking data are discussed.

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Age-Related Changes in Binding Colors and Shapes in Visual Short-Term Memory

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Keywords: binding; visual short term memory; age-differences

In 4 experiments, we investigated how younger (20-29 years) and older (60-80 years) adults differ in their performance on visual short-term memory tasks that involve binding of colors and shapes. Experiments 1 and 2 explored age-differences in the encoding dynamics underlying the binding process, whereas experiments 3 and 4 focused on the retrieval dynamics. In experiment 1, the participants had to remember color-shape associations presented for different durations and respond to probes within a change-detection paradigm under different instruction conditions. Participants had to learn both colors and shapes in the global condition and only one feature in the local condition. The match probes were members from the stimulus display whereas the mismatch probes were combinations of an intra-list feature with an extra-list feature. Time-sensitivity functions using A' showed mismatch effect of instruction on performance, likely because both age groups were able to use the efficient strategy of responding to the probes using feature-level information only. To force participants to remember associations between features in an object, negative probes in experiment 2 were incorrect combinations of two intra-list features. The results of experiment 2 showed that both older and younger adults were equally efficient in binding features into objects. In experiments 3 and 4, participants had to remember both colors and shapes, but they either responded to single features or dual-feature objects during retrieval. Mismatch global probes were made up of extra-list features (experiment 3) or two intra-list features (experiment 4). We found that younger adults were able to modulate their memory representations strategically, using features only in Experiment 3 and bound objects in Experiment 4; older adults did not modulate behavior, using bound-object representations throughout.

Moving While Memorizing: Influence of Action Planning on Short-Term Memory Capacity

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Keywords: cognitive neuroscience; psychology; action planning; motor-memory interaction; interference; short-term memory

The ability to flexibly adapt movements to changing environments is vital. Previous research has shown that actions are measurable (Bode and Haynes, 2009) and planned in considerable detail (Rosenbaum et al., 2006) prior to motor execution. Action planning seems not to be an isolated process of the motor system but rather an active cognitive process that interacts with other cognitive processes like e.g., language (Boulenger et al., 2006) and memory (Weigelt et al., 2009).

The present study focuses on the question if and how the requirement to change an action plan during a grasp-to-place task interacts with a concurrent short-term memory task (memorizing letters of a 3x3 matrix). It is also tested whether two different precision-demanding motor tasks (namely thread a ball on a stick vs. putting it in a bowl) moderate this interaction differently. Showing that simultaneous moving and memorizing draw on common cognitive resources and characterizing the nature of this interaction therefore is the main goal of this paper.

First results indicate that changing an action plan leads to reduced availability of items in STM. Interestingly the speed of action is not influenced by the motor update, although placing movements more often result in a mistake. These data are consistent with prior findings and support the notion that “changing movement plans does not come for free” (Weigelt et al., 2009) but requires cognitive resources. This cognitive effort leads to both, modulated memory and motor performance.

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The Meaning of Movements: Crosstalk Between Semantics and Kinematics

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Keywords: action prediction; real-time simulation; semantics; action language; embodied cognition

Previous studies have demonstrated that predicting others' actions involves an internal simulation process that runs time-locked to the real action. An open issue concerns the representational format in which internal simulations may run.

Based on recent embodied theories according to which motor processes are closely linked to semantic processes, we hypothesized that action semantics play a crucial role in internal action simulation. In several experiments, our participants watched briefly occluded familiar actions performed by a point-light actor, and judged the spatial coherence with which the action reappeared after the occlusion. Behavioral performance was measured when the participants had been initially primed with verbs and concrete nouns (Experiment 1) and with verbs describing dynamic versus static actions (e.g., "to catch" vs. "to stretch"; Experiment 2) (i.e., semantic priming effect). To assess whether the effects of action dynamics are specific to verbal stimuli, the verbs were replaced by dynamic versus static perceptual stimuli (i.e., balls rotating at a fast vs. slow speed) (Experiment 3).

The results support our idea that action prediction involves an internal real-time simulation process. More importantly, they indicate that this real-time process may co-exist with a similarity-based match of internal action representations, implying that the last action pose perceived before the occlusion is statically maintained as an internal reference and then matched to the action pose appearing after the occlusion. Moreover, consistent with our expectations, action prediction performance was clearly modulated by action semantics, suggesting that internal action prediction involves not only sensorimotor representations (as highlighted by the research on the human mirror neuron system) but also more abstract semantic codes of action.

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Effects of Cultural Differences in Emotion Recognition on Visual Attention

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Keywords: visual attention; emotion recognition; cross-cultural comparison; eye-tracking

How do our experiences in the environment we grow up in influence our eye movements? It is a highly debated issue in which ways and if at all our individual cultural concepts implicitly shape the way in which we perceive the world around us. To investigate cultural differences in this respect the “bubbles”-paradigm (Kollmorgen et al., 2010) was used and performed with German and Japanese subjects. The stimuli set consisted of 4 categories, two using face stimuli (emotion / sex recognition) and two using natural scenes (open vs wide / natural vs manmade). Answer performances and fixation behavior were evaluated and analyzed.

All 4 stimuli categories showed significant group differences in accuracy as well as fixation behavior. Performance differences were obtained in our more ambiguous bubble conditions. The most striking differences were found in the emotion and in the sex recognition tasks. In the sex category a male face was better recognized than a female face. Moreover, Germans performed better than Japanese in both cases. In the emotion category subjects performed equally bad for a sad face. Japanese however, frequently mistook it for depicting a disgusted face, whereas Germans consistently categorized it as showing fear.

Regarding fixation behavior, German subjects made more fixations on the eye-region while Japanese subjects distributed their fixations more equally over the stimuli. It was already shown before that Japanese perform worse in some emotion categories than Western subjects (Ekman et al., 1987). In our study however, we found these differences to be only true in the more ambiguous bubble conditions. As soon as a stimulus gets more ambiguous, subjects rely on cultural different strategies for categorization.

The different fixation behavior is supporting this hypothesis. Thus the “bad” performance in recognizing sad faces is not due to an inability to recognize a sad face, but rather a cultural difference in the use of visual cues to infer other people's emotions.

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Complexity in Analogy Tasks: An Analysis and Computation Model

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Keywords: artificial intelligence/cognitive systems; psychology; IQ-tasks; analogy-tasks; complexity; computation model; program

For tasks like IQ-tests, reasoning difficulty is typically determined empirically: It is measured in the deviation from the mean. Although this method is successful (e.g. nearly all IQ-tests are designed this way) it is most desirable to have an inherent (formal) measure reflecting cognitive complexity.

In this article, we introduce a complexity measure for matrix tasks with respect to the kind of functions necessary to solve such tasks. The aim is to capture human reasoning difficulty. We implemented a program, which is able to solve matrix tasks and to evaluate their complexity by our measure. The results of the evaluation are compared with the empirical difficulty ranking from Cattell's Culture Fair Test and the original Evans Tasks.

Automatische Detektion phonotaktischer Constraint-Verletzungen – eine ERP-Studie

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Stichworte: Ereignis-korrelierte Hirnpotentiale; Langzeitgedächtnis; phonologisches Wissen; Phonotaktik

Mittels ereigniskorrelierter Hirnpotentiale (EKP) wurde untersucht, inwieweit sich sprachspezifische phonotaktische Restriktionen auf automatische Sprachverarbeitungsprozesse auswirken. Im Deutschen ist die Distribution des velaren („ach“-Laut) [+back] und des palatalen („ich“-Laut) [-back] Dorsalfrikativs durch das Constraint der *Dorsal Fricative Assimilation (DFA)* limitiert: Für silbeninterne Sequenzen aus Vokal und Dorsalfrikativ gilt, dass beide Laute hinsichtlich ihrer Feature-Spezifikation für [±back] übereinstimmen müssen. In einem multiplen passiven Oddball-Paradigma wurde die devianz-bezogene auditive Verarbeitung von phonotaktisch unkorrekten Kombinationen aus (1) hinterem Vokal mit palatalem Dorsalfrikativ sowie (2) aus vorderem Vokal mit velarem Dorsalfrikativ getestet. Für die Stimulation wurden 8 VC-Silben verwendet, die aus den Vokalen [ʏ œ ʊ ɔ] und den

Dorsalfrikativen [ç x] zusammengesetzt waren. Die resultierenden wohlgeformten Silben [yç œç ux ox] wurden mit den ungrammatischen Silben *[yx œx uç oç] zu je unterschiedlichen Auftretenswahrscheinlichkeiten (Standard/Deviant) in Oddball-Blöcken kontrastiert. Einziges Differenzierungskriterium zwischen beiden Silbenkategorien bildete die phonotaktische Wohlgeformtheit, da alle Silben aus demselben Set von Phonemen bestanden. Ungrammatische Deviants elizitierten eine pariozentrale Negativierung im EKP, die etwa 100 ms nach Onset des Frikativs maximal war, wohingegen wohlgeformte Deviants keinen vergleichbaren Effekt zeigten. Diese Negativierung reflektiert unseres Erachtens die Auswirkung eines phonotaktischen Evaluierungsprozesses, der die Aktivierung phonotaktischen Wissens im Langzeitgedächtnis erforderte und dessen Resultat die Detektion einer Verletzung von DFA war. Unsere Ergebnisse zeigen insofern, daß implizites phonotaktisches Wissen bereits bei automatischer Sprachverarbeitung angewendet wird.

Models of Similarity in Intertemporal Choice

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Keywords: psychology; intertemporal choice; discounting; similarity; heuristics

Trading off immediate and future rewards—intertemporal choice—is an integral part of human decision making, from diet selection and health issues to spending and investment decisions. The standard economic model of intertemporal choice (the exponential model) assumes that the value of future rewards is discounted at a constant rate. This model has not fared well empirically, however, and psychologists proposed the hyperbolic model, which accounts for preferences in both humans and pigeons. Yet, the hyperbolic model is purely descriptive and ignores the process of making intertemporal choices. Recently, Rubinstein (2003) and Leland (2002) have proposed a similarity rule for decision making in these scenarios: compare whether the values within one attribute are similar, then choose based on the other (e.g., if the two time delays are judged to be similar, choose the alternative with the largest reward). I tested discounting and similarity-based models by offering participants standard intertemporal choice tasks (e.g., choosing between €12 in 36 days or €18 in 51 days). Additionally, I collected similarity judgments for the amounts and delays used in the intertemporal choice task (e.g., rating the similarity of €12 and €18). The similarity rule predicted the data better than the other models both at the aggregate and individual level. In further support of this model, the difference between similarity ratings of amounts and delays was highly predictive of intertemporal choices. Thus, similarity provides an interesting and, importantly, a process-based explanation of temporal preferences.

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Effects of Practice in Video Games: Processing Advantage in Dual-Task Situations

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Keywords: psychology; dual-tasks; video games; practice; executive control

Video gamers show advantages in visual attention, memory, and cognitive control processing in transfer situations outside of the game context when compared with non-gamers. It remains an open issue however whether these video gamers demonstrate a processing advantage in dual-task situations with two simultaneously presented tasks. Furthermore the reason for a potential advantage in these situations is unknown: the advantage results either from an increased processing speed or from improved executive control processes to coordinate two simultaneously presented tasks.

To investigate these issues, we compared the performance of video gamers with non-gamers in a PRP dual-task situation and in single-task situations with separate task presentations. While an exclusive advantage of the video gamers in the dual-task situation indicates a dualtask advantage due to improved executive control processes, an advantage in single- and dualtask situations indicates a dual-task processing advantage as a result of an overall processing speed-up.

The results showed an improved dual-task performance in the video gamers when compared with non-gamers while there was no improved single-task performance. These findings demonstrate that there is a dual-task processing advantage in video gamers. This advantage is the result of a selective improvement of executive control processes in dual-task situations but no overall speed-of-processing advantage.

In a follow-up experiment we investigated whether experience in video games is the source of this dual-task processing advantage in video gamers. Therefore, we trained non-gamers in either a complex video game or in a simple puzzle game and tested single-task and dual-task performance before and after training. The video game trainees exclusively showed an improved performance in the dual-task situation. Thus, video game experience is the source for dual-task processing advantages due to improved executive control processing.

Computerbasierte Diagnostik von Planungs- und Problemlösekompetenz im Kindesalter

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Stichworte: Mensch-Maschine-Interaktion; Philosophie; Psychologie; Planen; Problemlösen; computerbasierte Diagnostik; Arbeitsgedächtnis; Kybernetik

Die Konstrukte „Planen“ und „Problemlösen“ bilden grundlegende menschliche Fähigkeiten ab, deren ontogenetische Betrachtung durch den Einsatz computergestützter Diagnostik wesentliche Dimensionserweiterungen erfährt. Bewegt sich der Mensch in Situationen, in denen er planen kann, greift er auf Vorwissen zurück und bemächtigt sich der Fähigkeit der Antizipation (Fenk, 1992). Situationen, in denen ausreichendes Wissen vorliegt, können als „Planungsräume“ bezeichnet werden. Sind Situation weniger informationshaltig, liegt nach Newell und Simon (1972) ein „Problemraum“ vor. Dieser kann in einer Explorationsphase, zu einem „Planungsraum“ transformiert werden. Dietrich Dörner (1979) bezeichnet die Schnittstelle zwischen Planungsräumen und Problemräumen als „Interpolationsproblem“ (Dörner, 1979, S.14), welche sich durch wohl-definierte Operatoren und Ziele auszeichnen. Die Person steht hierbei vor der Herausforderung, die Begrenztheit der bewussten Informationsverarbeitung im Arbeitsgedächtnis (Baddeley, 2003) durch angemessene Strategien zu überwinden. Sind Operatoren oder Ziele nicht wohl-definiert, tritt an die Stelle des „Bekanntes“ die Lücke des „Neuen“. Eine Modellierung kognitiver Architekturen sollte demnach Strukturen in den Blick nehmen, welche Möglichkeiten multicodaler Informationsverarbeitung zulassen. Neben der Struktur des episodischen Puffers (Baddeley, 2000) zeigen sich gerade in Bezug auf Problemlöseprozesse die Konzepte des „Cognitive Tiles“ (v. Foerster & Müller, 2008), des Registersystems „Treelet“ (Marcus, 2003) und des prospektiven Gedächtnisses (Kliegel und Jäger, 2006) als wegweisende Konstrukte. In einer Studie (N =1015) mit computerbasierten Simulationen von Planungsräumen (Turm-von-Hanoi; Zoo-Spiel DIGITAL) und Problemräumen (Zoo-Spiel DIGITAL EXPLORATION) zeigen sich insbesondere im Kindesalter, Ø 98 Monaten (SD = 11,7), signifikante Alterseffekte bezüglich der Lösungsgüte, $F(2, 1015) = 137,36$; $p < .001$, und der Qualität der Strategien.

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Attentional Modulation of Visual Short Term Memory Load in the Intraparietal Sulcus

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In the retro-cue paradigm, attention is directed to a single item of a previously presented display in a short-term memory (STM) task and leads to benefits both in reaction time and accuracy data (Griffin and Nobre, 2003). Several mechanisms have been discussed, among a reduction of effective short term memory load (Lepsien et al., 2005). In this event related fMRI study, subjects performed a visual STM task with load (2,4,6) and cue (retro-cue, neutral) as factors. It was hypothesized that retro-cueing would lead to reduction of load-related activity in the posterior part of the intraparietal sulcus (IPS), for which recently a tight correlation between behavioral capacity measures and fMRI signal has been demonstrated (Todd and Marois, 2004; Xu and Chun, 2006). Additionally, since subjects were supposed to select just a single item in the retro-cue condition, we expected an interaction between cue and load, i.e. activity for retro-cue trials should show no differentiation between levels of load. In a region of interest analysis based on previously reported IPS- coordinates, we found a right- lateralized, main effect of load. However, there was no evidence for attentional modulation. With a separate Localizer Scan, two regions in the IPS were identified which demonstrated both a main effect of cue and load. Furthermore, in a whole brain analysis, we found a region at the anterior end of the right IPS, where cue and load significantly interacted. Our results are in line with the suggestion that retro-cueing leads to effective reduction of (visual) STM load. Additionally, these data might shed light on the role of decay of irrelevant visual short-term memory information.

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Asymmetric Control of Fixation Durations: Experiments and Model

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Keywords: cognitive neuroscience; psychology; eye movements; control of fixation duration; computational modeling

Eye movements are among the best behavioral measures to study cognitive processes. Fixation durations, however, are highly variable and little is known about the event determining the duration of a fixation. While direct control theories assume a causal link between cognitive processing of the fixated location and the observed fixation duration, indirect control theories assume that fixation durations are adapted to overall task demands but are independent of the current fixation location. In two variants of a visual search task we studied the adjustment of fixation durations to a stepwise change in processing demands. As predicted by direct control theories, increasing processing demands led to an immediate prolongation of fixation durations. In contrast, decreasing processing demands did not affect the current fixation duration. In line with indirect control theories, only later fixation durations were adjusted to reduced processing demands. Our results suggest an asymmetric control of fixation durations. In general, fixation durations are initiated by an indirect control mechanism, which slowly adapts to processing demands. Increasing processing demands, however, may instantaneously prolong fixation durations. With a computational model we successfully reproduce average fixation durations as well as fixation duration distributions in both tasks. Our model is agreement with fixation duration control in continuous oculomotor tasks like reading, visual search, and scene perception.

Similarity-based Classification in Natural Language

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Keywords: similarity; comparison; gradability; semantics of German wie-phrases

Classification of objects can be expressed linguistically in two ways, either by ascribing a predicate to the object, or by comparing the object to some other entity that is already known to the addressee. In (1a), for example, we are told that Anna's height is 1,80m. In (1b) we only learn that Anna and Marie are similar with respect to height and we have to infer Anna's height from what we know about Marie. Likewise, in (2a) the student properties of Anna are explicitly expressed, while in (2b) it has to be inferred from what we know about Marie.

- (1) a. Anna ist 1,80m groß.
'Anna is 1,80m.'
b. Anna ist so groß wie Marie.
'Anna is as tall as Marie.'
- (2) a. Anna ist eine Studentin mit beachtlichen Mathekenntnissen.
'Anna is a clever Math student.'
b. Anna ist so eine Studentin wie Marie.
'Anna is a student like Marie.'

While comparative constructions involving gradable adjectives have been discussed in detail (cf. Kennedy, 1999), there are few approaches going beyond the adjectival domain. Moreover, although similarity-based classification is regarded as a basic cognitive ability of human agents and has been studied at length in Cognitive Psychology as well as Artificial Intelligence (cf. Tversky, 1977; Aamodt and Plaza, 1994), the question of how similarity is exploited in natural language is rarely discussed.

In this paper, it will be claimed that German *wie*-phrases – gradable as well as non-gradable cases – provide ad hoc categories exploiting similarity to objects known to the addressee. The formal framework will be adopted from AI approaches to similarity and classification (Saquer and Deogun, 2001) and aim at characterizing the class of inferences licensed by equative comparison statements.

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Different Kinds of Pragmatic Factors Explain Failures of Default-to-Stereotype Inferences

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Keywords: prototype theory; default to Stereotype; grice; non-redundancy; informativeness

Connolly et al. (2007) present theoretical and empirical evidence against the Default-to-Stereotype (in short: DS) inference and argue that prototype theories of concepts predict (DS)-inferences. Hence, they conclude that prototype theories of concepts are inadequate. Jönsson and Hampton (2008) argue that (A) prototype theories do in general not predict (DS)-inferences, and that (B) Gricean pragmatic effects can largely account for [1]'s empirical results. We first argue that the results of [1] pose a greater threat to prototype theories of concepts than [2] suggest. Second, we present an experiment which implies that Connolly et

al.'s (2007) findings can be solely explained by following Gricean pragmatic factors: (a) non-redundancy preferences and (b) informativeness suppositions.

In our study subjects received one of two stories on the fictive animal species long-ear kangaroo (n=65) or large-nosed grasshopper (n=64) in which a motley mixture of information was provided. Subjects were asked to rate the likelihood of unmodified (e.g. long-ear kangaroos have a striped fur), typically (with 2 babies in their pouches), atypically (with a collar) and typically+atypically modified statements according to that story. All differences were at least marginally significant ($p < .10$), except for atypically and typically modified statements. Less modifiers resulted in higher ratings. Gricean factor (a) explains subjects' preference for non-redundant statements (less modifiers) over redundant ones. Factor (b) accounts for the non-significant difference between typically and atypically modified statements: The stories' motley variety of information did not warrant informativeness suppositions, viz. that the most relevant information is provided.

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Acknowledgements

This research was supported by the LogiCCC EUROCORES program of the ESF and DFG.

Gaze Movement and Language Production when Talking About Events in Live-Recorded Video Clips

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Keywords: linguistics; psychology; cross-linguistic differences; attention; language-specificity

The study deals with the interrelation between patterns in gaze movement when watching dynamic video clips and what is mentioned at what point, when talking about *events*. Studies on this interrelation, and the factors that drive it, have centred on the production of single words when relating to events in still pictures, showing that speakers tend to fixate the entity to which they are relating (see Meyer and Dobel, 2003). There are few studies, however, on gaze movement and patterns of mention in relation to the production of full length event descriptions, based on dynamic stimuli (see e.g. von Stutterheim and Carroll, 2006; Papafragou et al, 2008). This interrelation was investigated in the present study with respect to dynamic, live-recorded video clips depicting everyday situations, taking into account the role of language-specific aspects of event representation in the allocation of attention. Focus is placed on one specific type of situation, causative actions, in which an agent is in the

process of making a specific object (e.g. *knitting a scarf; building a model airplane*). Speakers of three languages (Dutch, English, German) were asked to view the clips and tell *what is happening*. They were instructed to focus on the event only and to start to speak as soon as they recognize what is happening. Subjects' gaze movement patterns were recorded before and during verbalization, and attention distribution to different aspects of the clips were measured in two identified areas of interest: the area where the *agent* is located and the area in which the *entity* acted upon is located. Contrary to studies on the production of single words, or clauses relating to pictures, gaze movement to the areas of interest and the time at which they are mentioned are not directly linked, given real time presentations. Factors that influence patterns of attention and mention over time cross-linguistically will be presented. The findings show how language-specific factors involving grammatical determinants (e.g. topicalization of the agent or not), as well as aspectual morphology and the temporal concepts encoded (event viewed aspectually as 'in progression' or not), influence patterns of attention/mention over time.

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Logical Patterns of Contingencies: Common-Sense and Transfer

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Keywords: rationality debate; probability judgments; logic; bias and heuristics

Predication and Pattern Probabilities

It is plausible that common-sense probability judgments are closely connected to functions of predication and communication. Going beyond a logical truth criterion of valid predication, a high probability criterion warrants sentences like 'ravens are black AND they can fly', even if one is aware of exceptions. But using extensional probabilities, inadequate sentences like 'ravens are black OR they can fly or both' have at least an equally high probability: $P(B \wedge F | R) \leq P(B \vee F | R)$. Hence, this sentence equally fulfills this criterion.

According to a recently proposed model, 'Bayesian logic', one can construct a subjective probability measure of logical propositions that penalizes larger hypothesis and allows for exceptions (von Sydow, 2009). The model retains a rational high probability criterion, but predicts not only conjunction 'fallacies', but a whole system of logical inclusion fallacies.

Experiments

Before running Experiment 1, a pretest was conducted to assess frequencies that underlie logical common-sense predications. In the main study, we investigated either general or specific predications ('ravens are...' vs. 'a raven is...'). In 28 tasks participants had to choose which of 15 logical hypotheses ('...is black AND can fly'; '...is black OR can fly or both' etc.) is most probable. From the obtained frequencies (pretest), we derived model predictions. The results showed a high fit between model and probability judgments.

Experiment 2 in 4 conditions investigates the transfer of noise levels and logical patterns to situations with incomplete knowledge. The results confirmed the predictions derived from the model.

The overall results corroborate the suggestion that there is a system of pattern-based systematic inclusion 'fallacies'. The findings cannot be explained by standard theories of the conjunction fallacy. Further aspects of this system of inclusion fallacies need to be investigated in the future.

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Causal Consistency Versus Empirical Evidence

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Keywords: induction; causality; consistency; rationality; Markov condition; Bayes nets

Two Ways of Inducing Dependencies

Probability judgments about indirect causal relationships may either be inferred directly based on empirical evidence or indirectly based on causal knowledge and assumptions about consistency.

Causal Bayes nets assume the Markov condition in order to integrate single links into causal models and to reason consistently within the network. However, the philosopher Nancy Cartwright has prominently objected that the Markov assumption does not need to hold in the real world. For instance, one may have a causal chain where A probabilistically causes B, and B probabilistically causes C, but the presence of A does not raise the probability of C (cf. von Sydow et al., 2009; see also Waldmann et al., 2010). In such a situation, making inferences about indirect relations based on a causal model that obeys the Markov condition may lead to very different conclusions than making inferences on the data level.

Experiments

We addressed this issue by using trial-by-trial learning tasks, with each trial showing the state of all involved events, A, B, and C. Experiment 1 assessed the learning of probabilistic causal chains from data that did not warrant a transitive inference in the chain. During learning, participants were either only queried about the direct links in the chain or also about the indirect relation. The results show a strong influence of inferential reasoning not only in the former, but also in the latter condition. Judgments differed from a control condition. Participants seemed to stick to the Markov assumption, even if it did not hold.

In Experiment 2 we manipulated participants' assumptions about causal structure, while keeping the contingency information constant. The results show that learners' beliefs about causal structure affected their judgments regarding indirect relations. Generally, our studies indicate that people try to create consistency between structural top-down knowledge and empirical evidence when making probabilistic causal inferences.

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Switch Cost of Input Processing in Balanced and Unbalanced English-Chinese Bilinguals

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Keywords: linguistics; psychology; bilingual processing; switch cost; language dominance

Being equipped with two different languages, a bilingual naturally develops skills in resolving the interference from one language when using the other language or facilitating communication in one language by using the resources from the other language. Code-switching has been documented in Linguistics as a natural communication mode for the bilingual community, demonstrating the interchangeable use of both languages in one coherent discourse. Most experimental work supported that there was a switch cost when a speaker moved from one language to the other (e.g., Costa and Santesteban, 2004). In our current study, we aimed to investigate whether the switch cost could be observed in processing code-switched written input. A second question we pursued in the study was whether language dominance is a critical variable in determining bilinguals' processing performance. In determining the dominance variable across different bilinguals, we used the recently developed Bilingual Dominance Scale (Dunn and Fox Tree, 2009), which quantifies bilinguals' linguistic profile in different aspects. We adopted a Word Maze task (Forster et al., 2009) on both balanced and unbalanced English-Chinese bilinguals, measuring the time taken to process an English sentence compared to a code-switched sentence. The results showed

that both groups suffered from the code-switched sentences significantly. Namely, there was a switch cost in processing the written input. Importantly, the unbalanced group demonstrated a more severe cost in processing the switched sentences. This suggests that language dominance plays a critical role in the switch cost. Discussion will be framed in Grosjean's bilingual language mode model (2001) in order to understand the activation level of each language and its relation to the relative proficiency/function of bilinguals' two languages.

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Sprache und Raum zwischen Grammatik und Kognition - Eine typologische Hypothese am Beispiel der multiethnolektalen Kontaktvarietät Kiezdeutsch

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Stichworte: Linguistik; satellite-framed; verb-framed; Typologie; Kontaktvarietät; thinking for speaking

Ein Sprecher muss bei der Raumkonstitution durch Sprache in besonderem Maße sein sprachliches Wissen mit Informationen aus seinem kognitiven Bildspeicher verbinden, um eine Szenerie generieren zu können. Um Bewegungsereignisse lexikalisch zu kodieren, steht Sprachen ein unterschiedliches Set an lexikalischem Material zur Verfügung. Aus sprachtypologischer Perspektive wird hier zwischen *satellite-framed* und *verb-framed* Sprachen (Talmy, 1985, 2000) unterschieden. Eine Reihe von Studien haben bisher die Gültigkeit der Typologie crosslinguistisch untersucht und dabei gute Kandidaten für sprachrelativistische Evidenz gefunden (Slobin, 1998); weitere psycholinguistische Ansätze (Özyürek et al., 2001) untersuchen die Bewegungsereignisse begleitenden Gesten von Kindern und Erwachsenen beider Sprachentypen. Weniger untersucht ist hingegen der Sprachkontakt, welcher innerhalb von Kontaktvarietäten nicht nur den L2 Erwerb (Cadierno, 2009), sondern auch Multiethnolekte betrifft.

In meinem Vortrag soll nun der Frage nachgegangen werden, welche Konsequenzen die beiden Typen auf den Ausdruck von Bewegung in Kontaktvarietäten haben. Dies betrifft nicht nur Lernervarietäten sondern auch Multiethnolekte. Ergebnisse einer Sekundäranalyse von Korpusdaten des TP B6 im SFB 632 "Informationsstruktur" (Wiese et al., 2009/10) werden vorgestellt und der typologische Einfluss auf die Organisation spatialer Relatoren und

Bewegungsereignisse im entstandenen Multiethnolekt („Kiezdeutsch“), in dem die Typen *verb-framed* (Türkisch) und *satellite-framed* (Deutsch) aufeinander treffen, sprachrelativistisch diskutiert.

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Mental Models and Source Trustworthiness in Human Belief Revision

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Keywords: psychology; human belief revision; mental models; source trustworthiness

Research on belief revision has mainly focused on trying to identify a single belief revision strategy (e.g. Elio and Pelletier, 1997). We were interested in finding out whether there actually exist multiple strategies. We investigated whether people revise their beliefs as a function of mental models or source trustworthiness. We used Modes Ponens (MP) and Modus Tollens (MT) inference problems whereby the first two premises were uttered by persons with varying degrees of trustworthiness. The third premise was presented as a fact. The participants' task was to indicate which of the first two premises they believed more after receiving the contravening fact. We found that the conditional premise was substantially believed more in MT inference problems than in MP inference problems, which attests to the Mental Model Theory (MMT; Johnson-Laird and Byrne, 2002). However, we also found that the belief in the conditional dropped significantly when this premise was stated by a low- rather than a high-trustworthy source. This is in line with theories emphasizing the role of content and context factors in reasoning (e.g. Evans, 2008). Thus, there exist mutually exclusive belief revision strategies affecting the belief revision process simultaneously and each in their own way.

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Grundlagenuntersuchungen zur erweiterten Modellierung des Assoziativen Gedächtnisses auf der Basis von beobachteten Traummechanismen

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Ausgehend von in Freuds „Traumdeutung“⁵ dargestellten theoretischen Überlegungen zur Traumentstehung wurden Erweiterungen eines Modells des Assoziativen Gedächtnisses entwickelt. Ziel ist ein tieferes Verständnis von im Unbewussten ablaufenden Prozessen sowie ihrer Wechselwirkung mit dem Bewusstsein. In den von uns durchgeführten Modellierungen wurde das klassische Assoziative Gedächtnis, das aus einer über Merkmalsvektoren gebildeten Kovarianzmatrix besteht und durch "Hebbsches Lernen" aufgebaut wird, in zweierlei Hinsicht erweitert:

- 1.) Da es bei der vorliegenden Problematik wesentlich um das Episodische Gedächtnis geht, werden zur Darstellung von (zeitlich geordneten) Situationen/Ereignissen Fillmore-Tiefenstrukturen, also symbolisch repräsentierte semantische Situationsbeschreibungen als Merkmalsvektoren verwendet. Es hat dazu eine Integration des Episodischen mit dem Semantischen Gedächtnis zu erfolgen. Als ein auch für technische Anwendungen relevantes Ergebnis ergab sich, dass bei Eingabe einer bereits gespeicherten Situationsbeschreibung (bzw. eines Teiles derselben) nicht nur diese reproduziert wird, sondern (mit geringerer Intensität) auch zeitlich davor und dahinter liegende, wenn es Überlappungen der Eingabe mit diesen gibt (z.B. denselben Akteur). Die "Intensität" der Reproduktion wird durch die Ähnlichkeit (= Skalarprodukt der Vektoren) der eingegebenen mit der gespeicherten Situation gemessen. Durch Eingabe einer (Teil-) Situation können also ganze Episoden als "Narrativ" aufgerufen werden.
- 2.) Die zum Aufruf eingegebenen Situationsbeschreibungen wurden durch positive bzw. negative Bewertungen ergänzt, die wahrscheinlich neurobiologisch durch einen Zwischenprozess über Amygdala/Thalamus in Wechselwirkung mit dem assoziativen Cortex zustande kommen, wobei die negativen Bewertungen der Wirkung der Freudschen „Zensur“ (Verdrängung) entsprechen. Im so erweiterten Assoziativen Gedächtnis können auch mit den ursprünglich gespeicherten Ereignissen ev. mitgespeicherte Bewertungen in das Modell integriert werden. Zu den in 1.) und 2.)

⁵ Fischer Verlag 1961/64

verwendeten Repräsentationen und erzielten Ergebnissen kann eine (approximative) Interpretation durch neuronale Modelle angegeben werden.

Mit diesen Erweiterungen konnten folgende zuerst von Freud beschriebene Effekte der Traumgenerierung modelliert werden:

- 1.) Umwertung/Verschiebung durch die Zensur.
- 2.) Detektion von "überdeterminierten" Ereignissen ("Knoten"), die zu vielen anderen Ereignissen Beziehungen und dadurch eine hohe Intensität haben. Das liefert auch eine Begründung auf der Ebene neuronaler Modelle für die klassischen "Semantischen Netze" der KI, bei denen in verschiedenen Kontexten vorkommende Objekte/Begriffe nur einmal gespeichert werden.
- 3.) Mischbildung/Verdichtung (z.B. zu „Sammelpersonen“) als eine durch Rekombination von Ereignissen/Objekten entstehende Klassenrepräsentation durch einen einzelnen Merkmalsvektor, geeignet zur Minimierung von neuronaler Energie und damit Schlaferhaltung.

In weiteren Forschungsarbeiten soll die Integration von Metaphern und bilderzeugenden Prozessen untersucht bzw. modelliert werden.

Posters / Poster

Intrinsic Properties of Supragranular Pyramidal Neurons and Interneurons in the Auditory Cortex of Mice

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Keywords: auditory cortex, interneurons, whole-cell patch clamp, mice

In the neocortex, GABAergic inhibition opposes excitatory transmission, in both the spatial and temporal domain. Hence interneurons play a pivotal role in the regulation and refinement of auditory information processing, including e.g. shaping of frequency tuning, possibly by feed forward and feedback inhibition onto pyramidal neurons. Despite of their important function, the information about the intrinsic properties, the morphology and the distribution of auditory interneurons is limited.

We used the whole-cell patch clamp technique to characterize some of the intrinsic properties of supragranular neurons in the auditory cortex of mice. Dependent on the measured parameter a total number of 23-42 pyramidal neurons (average postnatal age 22.0 days) and 12-15 interneurons (22.6 days) were included in the analysis (statistics: MANOVA, SPSS). Current clamp analysis revealed a significantly more depolarized resting membrane potential, higher input resistance, lower activation threshold, shorter action potential width and a more pronounced sag in interneurons compared to pyramidal neurons. In addition, interneurons showed a smaller neuronal capacitance compared to pyramidal neurons. Voltage clamp analysis was employed to evaluate the time- and voltage-dependent kinetics of two hyperpolarization-activated currents, i.e. the fast inward rectifier (Kir) and the more slowly activating IH, consisting of a fast (IH-fast) and slow (IH-slow) component. Compared to pyramidal neurons, interneurons exhibit significantly smaller Kir currents and slower time constants for IH-fast and IH-slow. Moreover, the total current was significant lower in interneurons than in pyramidal neurons.

In conclusion, the distinct differences of intrinsic parameters between interneurons and pyramidal neurons in auditory supragranular layers are probably governed by different expression of inwardly rectifying conductance's (Kir and IH) and may contribute to the much higher excitability of interneurons.

Metropolitan Features - A Pupillometry Study

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Keywords: psychology; pupillometry, emotion, cognitive load, concepts, metropolis

The concept “Metropolis” and its specific features was the basis of this investigation. This city concept is interesting because of its ambivalence, diversity and sometimes fuzziness in academic and popular definitions, while it is used frequently in daily life, like in mass-media and advertising, as concept in urban planning and as location or metaphor in cinema, literature and other arts. Different measures like ratings, reaction time and pupillary response were used in this study. It has been shown previously that the amplitude of the pupillary dilation can be an indicator for affective valence and arousal likewise for cognitive load (e.g. Bradley et al, 2008; Heitz et al, 2008; Partala and Surakka, 2003), so the physiological and behavioural parameters can be compared with explicit assessments.

The first aim of the study was to define the valence and the arousal potential of the features of a metropolis via the rating scale “Self-Assessment Manikin”. A further aim was to show the interaction between the pupillary response to the presented features, reaction time as well as emotional (valence/arousal) and cognitive load (task difficulty) during decision making. Therefore, the participants were asked to imagine their “ideal Metropolis” and decide via button press which of the features that were presented on a computer screen they would like to have in it. After they finished this task, they were asked (rating scale) how difficult each decision was.

The results showed that all three factors, valence (positive, neutral, negative), arousal (middle/high) and cognitive load (easy/middle/difficult) had significant and specific impact on the behavioural and physiological reaction which reflected the categorisation of the metropolis-features via rating scale. In addition very positive and thus desired features in an “ideal Metropolis” as well as very negative, undesirable features could be determined. Results may help in urban planning based on resident preferences.

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Joining Selfhood and Core-Consciousness

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Keywords: cognitive neuroscience, philosophy, psychology; selfhood, immediate self-awareness, pre-reflexive self-consciousness, mineness, core-consciousness.

This study wants to elucidate the phenomenon of selfhood via a philosophical analysis of Antonio Damasio's notion of core consciousness. Selfhood is the very first phenomenal property of a conscious being and has traditionally also been called pre-reflexive self-consciousness or immediate self-awareness. Selfhood is constituted by a certain point of view, which comes with a specific subjective quality and describes the fact that we are always, immediate and error-free aware that all mental acts are lastly experienced as being ours. I will try to show that the philosophical theory of selfhood can be significantly expanded if neuroscientific approaches are taken into account.

Traditional approaches to selfhood

German philosopher Manfred Frank has provided thorough analysis of selfhood. While stating that selfhood is a necessary precondition for any act of consciousness, he was describing its features as non-propositional, non-intentional, non-directed, non-relational, non-reflexive and allover not further analyzable.

Core-consciousness and selfhood

I will try to show two things. Firstly - in contradiction to traditional views - I will claim that theories on selfhood can be further expanded if we take empirical findings into account. I will elaborate this on Antonio Damasio's model of core-consciousness and try to join this model with the philosophical theory of selfhood. Especially emotional processing, non-language-based-memory and object-organism-differentiation seem crucial add-ons to the original philosophical theory. Secondly I will try to show that the method of applying a philosophical analysis of empirical data - as done in the example of selfhood and core-consciousness - can provide a broadening of existing philosophical theories of the mind in general and thus further the inter- and trans disciplinary dialogue.

Emotion Regulation by Verbal Structural Parallelisms in Younger and Older Adults – An ERP Study

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Keywords: ERP, structural parallelisms, emotion regulation, crossmodal priming, aging

We investigated the effect of structurally parallel, complex verbal stimuli on subsequent processing of facial emotion. Structural parallelisms are a main characteristic of texts like poems or prayers and typically involve repetitions of semantic, syntactic or phonological features. Recent research in social sciences has shown that structurally parallel non-verbal behaviour facilitates the synchronisation of emotion. However, experimental evidence on emotion regulation by structural parallelisms is scarce.

In the present study we examined the impact of verbal structural parallelisms on subsequent processing of emotional facial expressions in a cross-modal priming task. Event-related brain potentials (ERPs) were recorded while young participants (n=25) classified positive, negative or neutral facial expressions as emotional or non-emotional. The faces were preceded by verbal stimuli extracted from prayers, which were either parallel or non-parallel in structure. Analysis of ERP data revealed increased amplitudes of early posterior negativity (EPN) and decreased late positive potential (LPP) only on positive faces preceded by structural parallel primes. Our findings suggest that structural parallelisms facilitate early and late processing of positive emotional information in younger adults. Preliminary ERP-data of older adults (n=25) indicate that this effect is broader distributed in older age.

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Zahlen sind schnell bei der Hand

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Stichworte: Psychologie; Zahlenverarbeitung, Repräsentationseffekt, semantische Repräsentation, embodied cognition

Derzeitige Modelle zur mentalen Repräsentation von Quantität lassen sich in zwei grundsätzlich verschiedene Gruppen klassifizieren: Während die eine Gruppe von Ansätzen von einer einheitlichen, supramodalen Repräsentation von Quantität ausgeht, gibt es nach der anderen Auffassung mehrere verschiedene, multimodale Repräsentationen (Cohen Kadosh und Walsh, 2009). Die Vorstellung von einer supramodalen Quantitätsrepräsentation kann wiederum im Detail sehr unterschiedlich ausfallen. Aber unabhängig davon, ob man von einer abstrakten Repräsentation im Zehnersystem (McCloskey und Macaruso, 1995) oder von einer analogen Repräsentation auf einer Art mentalen Zahlenstrahl (Dehaene und Cohen, 1995) ausgeht, sollte es in keinem der beiden Fälle eine „Sprungstelle“ um die Zahl 5 herum geben. Die Hypothese von multimodalen Repräsentationen – obwohl derzeit noch stark unterspezifiziert – lässt die Möglichkeit zu, dass eine dieser mentalen Repräsentationen die Struktur unseres Fingerzählsystems geerbt hat. Da diese Struktur nicht nur eine Basis 10, sondern auch eine Unterscheidung der beiden Hände mit jeweils fünf Fingern beinhaltet, wären unter Annahme einer solchen Repräsentation besondere Effekte um die Zahl 5 herum zu erwarten.

Wir berichten Evidenz für Fünfereffekte aus drei verschiedenen Bereichen: Dem Erwerb von einfachen Rechenaufgaben im Grundschulalter, dem Verarbeiten von Quantitätsinformationen beim Vergleich symbolisch präsentierter Zahlen und bei einfachen Additionsaufgaben durch Erwachsene. Die Art dieser Fünfereffekte lässt darauf schließen, dass sie auf die Generierung einer handbasierten mentalen Quantitätsrepräsentation zurückzuführen sind. Damit werden multimodale Ansätze der Quantitätsrepräsentation unterstützt.

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The Effect of Devaluation in Causal Learning

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Keywords: causal models, reasoning under uncertainty, induction, conditional rules

According to J. S. Mill (1869) causal knowledge does not arise from the ‘constant conjunction’ of two events as stated by David Hume (1748), Instead, Mill claims that people analyze the covariation between two variables to conclude a causal relation. This conception is consistent with recent psychological approaches to causal learning and reasoning, such as Probabilistic Contrast Model (Cheng and Novick, 1990), Causal Model Theory (Waldmann and Holyoak, 1992) or Bayesian approaches (e.g. Griffith and Tenenbaum, 2005),

As pointed out by Mill (1869), an event or a conjunction of events is only regarded as a cause of an effect if it proves as both, sufficient and necessary for the effect of interest. Whenever either of these two aspects fails to apply, no causal relation will be perceived. Moreover, if one of both aspects is not satisfied, the state or strength of the complementary aspect should be devaluated. As a result, causal inferences related to that complementary aspect should be made under higher uncertainty even if no information was given to reduce the validity of that aspect. Whereas no recent approach of causal learning makes such a claim results obtained by a causal learning experiment support this hypothesis. A computational theory is provided, explaining the effect by means of causal representations and memory activation.

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Regulating one's Fear of Death - An fMRI Study Investigating the Neural Responses to Reminders of one's Mortality

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Keywords: cognitive neuroscience, psychology; affect regulation, mortality salience

A considerable body of evidence indicates that mortality threat, i.e. thinking of one's own future death, produces a number of unique psychological effects not being produced by other types of threat. Using functional magnetic resonance imaging, we investigated in 17 male participants whether this specificity is mirrored on the level of brain responses to mortality threat. To induce mortality threat, participants answered questions arranged in trial blocks that referred to fear of death and dying. In a control condition, participants answered questions related to their fear of dental pain and dentists. Neural responses to mortality threat contrasted with dental pain threat were found in right amygdala, left ventral anterior cingulate cortex and in bilateral caudate nucleus. Whereas absolute activations of these clusters were stronger for individuals with low affect regulation abilities, their intercorrelations were stronger for individuals with high affect regulation abilities. The findings are discussed with respect to the role of these areas in affect regulation.

Predictability is Driving Eye Movements During the Reading of Proverbs

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Keywords: eye movements, reading, predictability, proverbs, parafovea

Proverbs are generally read faster in contexts enhancing their figurative meaning than in control sentences (Katz and Ferretti, 2001), This facilitated reading is attributed to a dominant interpretation of the figurative meaning. We tested whether this global effect is a consequence of local word predictability, assuming reading proverbs to resemble reading high predictable sentences. Besides 61 proverbs, 75 sentences were constructed to be of low predictability and 48 of high predictability. Predictability values for each word in the set of 184 sentences were assessed in an incremental cloze-task predictabilities from 18 participants. We collected eye

movement data of 23 native Spanish speakers with all sentences read in random order. We find canonical effects of word frequency and predictability on the current fixation duration. In accordance with Kliegl et al. (2006) we find an inverse effect of word predictability of upcoming words on the current fixation duration, that is longer fixations on the fixated word N before high predictable words N+1. Word predictability of current words and memory retrieval of upcoming words plays a vital role in reading proverbs and processing their figurative meaning.

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Developments at the Language-Cognition Interface: The Left Periphery in Kiezdeutsch, a German Multiethnolect

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Keywords: linguistics; syntax-discourse interface, syntactic variation, left periphery, multiethnolect, German

We will present data from “Kiezdeutsch”, a new variety of German that emerges among adolescents in urban areas with a high migrant population, that bears on the interface between language and cognition, more specifically, between syntax and extragrammatical domains. We discuss new word order options in the left sentence periphery that are not or not yet available in Standard German and that indicate a particular interaction of syntax and pragmatics in Kiezdeutsch. While declaratives in German usually follow a verb-second order, where exactly one constituent precedes the finite verb, in Kiezdeutsch we also observed declaratives with more than one constituent in the left periphery.

Based on a corpus of spontaneous speech recordings in Kiezdeutsch, we discuss the characteristic features of this new construction and contrast it with other deviations from verb-second in standard German and in other Germanic languages. We show that the novel word order options in Kiezdeutsch can be motivated by information-structural preferences, in particular, by a preference for placing both framesetters and topics (or, in some cases, focus expressions) in the left periphery, thus using the position of the finite verb to demarcate information-structural domains in a more flexible way than would be possible in Standard German. An additional motivation for this new word order might come from the conceptual/pragmatic level, namely a general tendency to place the expression for an agent, which more often than not is the subject, in a position early on in the sentence. Our data suggests that this preference can be realised in Kiezdeutsch even when there already is a framesetter in the left periphery.

We argue that such preferences can be realised more directly in a multilingual setting, one that supports a linguistic system with less rigid grammatical constraints and allows preferences from extragrammatical domains such as information structure to be realised more directly.

The Cognitively Adequate Construction of Tactile Maps: First Results

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Keywords: spatial learning, tactile map, cognitive adequacy, map construction.

Spatial Knowledge Acquisition with Tactile Maps

A tactile map could be one means to convey spatial knowledge. A cognitively adequate map conveys a mental representation that enables the map reader to successfully solve spatial reasoning tasks with the acquired mental representation. Single parameters and how they contribute to convey or foster survey knowledge will be investigated in terms of how they effect qualitative spatial knowledge acquisition and spatial reasoning.

The concept of cognitive adequacy (Strube, 1992) is introduced and related to the concept of cognitive complexity. Then, a model of cognitive complexity of the usage of tactile maps is presented based on earlier research. It explains which parameters might influence the complexity of map usage – geometric-topological parameters, situational parameters and individual parameters. From the model a research agenda is motivated.

An Experiment with Tactile You-Are-Here Maps

A first experiment with tactile You-Are-Here Maps investigated the performance and user preferences with three different realizations of tactile guide types to the YAH symbol – grid, frame marks and guiding line. From cognitive principles some predictions could be made, e.g. that the grid was rated worse than the other guide types, but others effects were not as pronounced as expected and even counterintuitive, e.g. that the grid was statistically not worse than the others guide types. In all conditions over 80% of the reproductions showed clear survey knowledge character. The interpretation of these results are used to establish some guidelines for tactile map construction, e.g. grids must be omitted at any cost and any guide type used in tactile maps should be selected on the principle of least similarity.

Future Work

Follow-up experiments will show if late-blind and blindfolded, sighted people perform differently in the experiment, if they use different strategies and if the performance of both groups is qualitatively similar – independent of visual impairment, as suggested by some results.

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A Biologically Traceable Dual-Time-Scale Mechanism for Optimal Situation-Dependent Decision Making

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Keywords: temporal statistics, reinforcement learning, reversal learning, adaptive behavior, computational methods

Background

Humans have a remarkable ability to appropriately assign different forms of behavior to a given situation. Yet what mechanisms does brain use to create neural representations of mental states that contain all information necessary for an optimal situation-dependent decision making? Rigotti et al. proposed one that depends on temporal statistics of a given environment (Rigotti et al., 2010),

We studied this kind of adaptive behavior using a reversal paradigm.

Materials and Methods

Human observers viewed a sequence of fractal, visual objects (one per trial) and learned to associate with each object the one motor response (of four) that was rewarded. However, at some 'unexpected' point, some of the learned associations were changed, urging observers to re-learn the new object-response pairings.

Importantly, the sequence spanned a two-dimensional temporal space. One refers to predecessor objects and the other represents objects' cyclic orders.

Results and Discussion

Before reversal, objects with almost consistent cyclic orders were learned at a higher rate. However, learning after reversal was significantly faster *only* for objects that were predicted by their immediate predecessors.

A reinforcement model, which correctly predicted behavioral data in the same learning task, yet *without reversal* (Hamid et al., 2010) failed to account for the results in the reversal paradigm. This lends support to claims of possible limitations the theory of reinforcement learning has been recently thought to be incorporating (Doya, 2007; Rigotti et al., 2010),

Conclusions

Our findings suggest that brain defines temporal statistics on a dual time-scale: a short-term one that exploits the information conveyed by predecessor events and a long-term time-scale that employs events' cyclic orders. This proves beneficial in the face of uncertainty evoked by the imminent reversal.

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Implicit Classification Reveals Priority of Processing Physical Properties in Novices but Processing of Higher Cognitive Properties in Experts

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Keywords: psychology; objects, art and vision, visual classification, similarity

The visual classification of objects is based on properties like physical qualities (e.g. curvature complexity, color, size) or higher-level qualities (e.g. artistic style/artist of artworks, or brand/designer of consumer products, respectively). In the domain of art, it was shown that experts base their visual classifications more on style than on content (motif). Typically such results stem from explicit classification studies which might be problematic as we gain no insight of cognitive processes classifying visual stimuli. We employed an implicit classification task with asking for similarity: We let open on what dimensions participants (n=35) base their classifications. As stimuli we used car exteriors ranging fifty years of western car production which varied on two dimensions corresponding to a dimension for physical qualities (curvature) and higher-level qualities (car brand). Participants had to assess indirectly the similarity between all stimuli by positioning them on a checker-board with coordinates. Afterwards participants were tested on their knowledge about design and interest. While novices based their visual classifications primarily on curvature, a clear physical property, experts almost exclusively used both dimensions with particular stress on brands when curvature did not differ too much. This indicates different strategies and processes of visual classification in novices and experts.

Diurnal Variation of Language Processing

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Keywords: anaphoric resolution, language processing, German pronouns, diurnal variations, shift-work

Anaphoric Resolution and its processing at different times of day

Human cognitive performance is greatly affected by time of day. Many researchers demonstrated this for a variety of performance measures in controlled chronobiological studies and in field studies (for a review, see Carrier and Monk, 2000),

Language processing, as a part of cognitive performance, is therefore assumed to vary over the day as well. In fact, there are evidences from several studies, which show qualitative differences in processing and producing language at different times of day (see i.e. Folkard, 1982; Oakhill et al., 1986; 1988; Dietrich, 2006).

We examined in our field study the anaphoric resolution; it is well known, that syntactic, semantic and pragmatic factors are involved in processing this phenomenon. Therefore it seems a practicable tool for investigating language processing and its variations across the day.

The German language makes use of two sets of pronominal elements, the personal pronoun (*er, sie, es*) and demonstrative pronoun (*der, die, das*), Both of them can naturally used to refer to animate as well as inanimate antecedents. But they appear to have different preferences with respect to which antecedent is preferred. According to Bosch' *Complementarity Hypothesis*, personal pronouns have a slight preference for referents that are discourse topics, while demonstrative pronouns avoid them (Bosch et al., 2007), In a pilot study I was able to replicate the findings of Peter Bosch et al.

The same material was also used in our field study. We tested subjects working in rotating shifts at a hospital in Berlin. In each shift (early, late and night) three test sessions took place in a quiet room at their ward.

The results show significant variations in reaction time and accuracy between the early shift and the late and night shifts. But much more interesting are the variations in the differences between the two conditions (demonstrative pronouns vs. personal pronouns as anaphors), These differences were significant in the evening, but not in the morning. Overall the results were worst in the early shift. We interpret these results as qualitative differences in language processing at different times of day. In fact, our results confirm the findings of Folkard and Oakhill. They argue, that "subjects may spontaneously place more reliance on maintenance processing in the morning, but more on elaborative processing in the evening" (see Folkard, 1979).

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Concept for a Microsystem Based Implementation of the Thermal Vision of the Pit Viper

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Keywords: artificial intelligence, cognitive systems; microsystems, adaptive systems, neural algorithms

The thermal vision apparatus of the pit viper is an excellent example of how nature implements sophisticated functions with a minimal usage of resource by an elaborate interaction of biological sensor elements. Today's technical systems fail utterly by achieving the same level of efficiency. Expertise in micro system technology combined with recently gained knowledge of the cognitive implementation of information extraction in the infrared vision apparatus may now pave the way towards a novel technical system that achieves a similar efficiency with respect to size, energy usage, speed and precision.

In order to test the cognitive algorithms, a microsystem based platform is built to mimic adequate external conditions and provide stimuli to the sensing matrix, which subsequently is put to the test with variations of the algorithmic parameters. This ultimately leads to a subsequent miniaturization of the bionic sensor system and its output to a motor control circuit.

This poster presents the environmental test platform, the applied cognitive algorithms and results of the parametric variation.

Background Knowledge: An Important Factor in Human Navigation

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Keywords: spatial cognition, knowledge, semantic categories, virtual reality.

Spatial cognition research has successfully examined a multiplicity of factors that guide navigation. From the very first notions of a cognitive map to the influence of the environment on the account of navigational abilities, various aspects have been examined, both in isolation and in their interplay. One parameter that has been conspicuously absent from considerations, though, is pertinent background knowledge.

As shown by many studies, humans make sense of their everyday surroundings and actions by categorizing (Rosch and Lloyd, 1978). This also implies that search processes (memory or navigation based alike) make use of proximity relations. We therefore argue that just as in

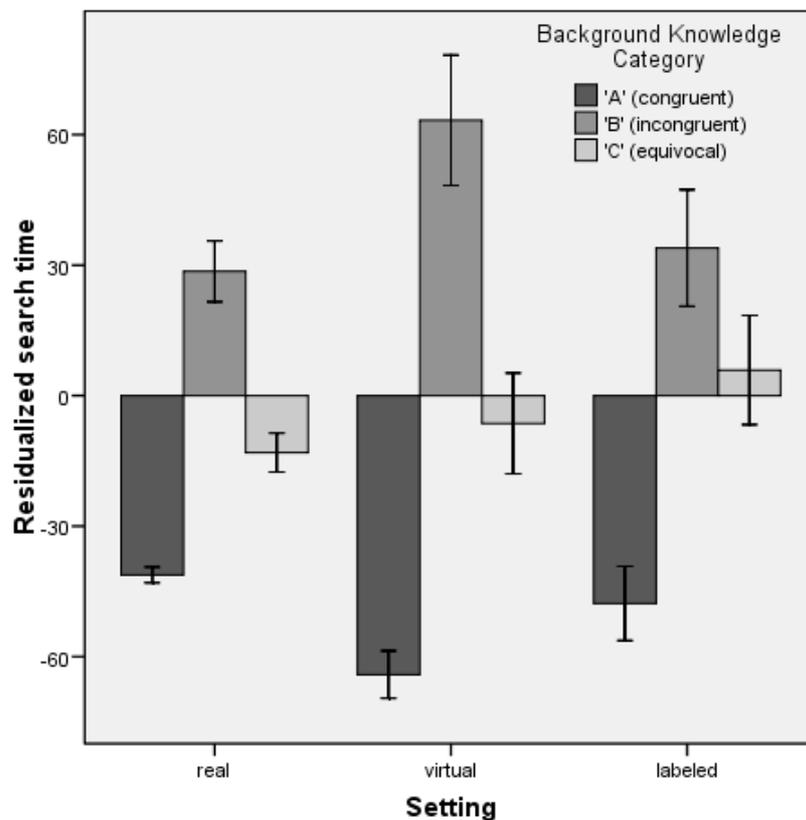


Figure 1. Summary of three experiments with respect to the influence of background knowledge on navigation performance.

other cognitive performances, navigation is also guided by generalized background knowledge.

Three supermarket studies

To demonstrate the power of background knowledge in navigation, a series of experiments were conducted, employing the semantic richness of a medium-sized supermarket. Based on a preliminary study, three background knowledge *congruency categories* comprising five supermarket items each were identified. As the results show (cf. Kalff and Strube, 2009) background knowledge congruency is a significant predictor of search performance (partial- $\eta^2 = .641$). Furthermore, a replication study in virtual reality corroborates the initial findings (partial- $\eta^2 = .588$). In a last variation the virtual supermarket was stripped of all non-semantic information by replacing the product photographs on the virtual shelves with written labels. Again, this resulted in a main effect of background knowledge congruency (partial- $\eta^2 = .295$). Figure 1 shows a summary of the three experiments with respect to the influence of background knowledge on navigation performance.

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Memory's Impact on Overt Attention

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Keywords: memory, overt attention, eye-tracking, introspection

Purpose

Exploratory viewing behaviour is most often investigated with stimuli that are presented once only. However repeated exposure to stimuli seems to be more ecologically valid. The present study investigates the impact of previous exposure on explorative behaviour of human subjects viewing complex scenes.

Method

Eye movements were measured during repeated presentation of natural and man-made visual scenes. They were analyzed with respect to fixation duration, fixation frequency, saccade length, distribution of fixation and finally regarding the correlation of 22 image features and fixation likelihood. Additionally, subjective impressions by participants were analyzed via a three-step qualitative data analysis procedure.

Results

Introspection indicates a change of strategy exploring stimuli during repeated exposure: During first presentation(s) participants scanned images extensively and later scrutinized at certain image regions. Accordingly fixation duration increased and frequency and saccade length decreased during repeated presentation. Inter-subject reliability of fixation distribution

continuously decreased with repeated presentation and achieved a preeminent minimum at fourth presentation. Correlations between image features and fixation likelihood were not affected by repeated presentations.

Conclusion

In summary, the introspective switch from stimulus driven exploratory behaviour to an internal guidance of eye movements is paralleled by systematic changes in saccadic parameters. Surprisingly, subjects did not uncouple their scanning pathways from basic image features. Hence, although memory's impact on eye movement behaviour is strong, this does not diminish the influence of the external stimulus.

The Interaction Between Individual Context and Eye Movement Behaviour

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Keywords: psychology; eye-tracking, action orientation, subjective impressions

Purpose

Investigations on overt Attention generally focus on individually independent and more universal mechanisms. For the present eye-tracking study we follow a complementary approach by examining the interaction between individual context [i.e. personality trait "performance related action/state orientation" (AOP), subjective rating of images] and free viewing behaviour.

Method

First subjects completed the German version of the action control scale (ACS-90; German version: HAKEMP-90) and were categorized by means of their AOP-value as action or state oriented. This scale contains items assessing the capability to stay within pleasant and self-initiated activities without shifting prematurely to alternative activities. Then several types of complex visual stimuli were presented repeatedly in a pseudo-randomized order and eye movement was recorded. Finally subjects rated the interestingness of each image.

Results

Statistical analysis of eye-tracking data revealed a large and significant interaction between individual context and vision behaviour: Subjects who rated images as more interesting on average showed higher saccade frequency, shorter fixation duration and a larger distribution of fixations. This effect was considerably moderated by AOP whereas this personality trait had no influence on subjective ratings. With respect to saccade length neither subjective ratings nor AOP had any influence.

Conclusion

We concluded that behavioural tendencies linked to personality as well as individual preferences significantly affect the level of eye movement behaviour. Hence it is important and fruitful to consider inter-individual differences on the level of personality traits and subjective impressions within investigations of attention processes.

Hybrid Representational Formalism for Verbally Assisted Virtual-Environment Tactile Maps

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Keywords: verbal assistance, tactile maps, virtual-environment haptics, hybrid representation

Visually impaired people can access spatial information using tactile maps. Compared to visual maps, these maps have lower resolution and need to be inspected sequentially, complicating the extraction of spatial relations especially among distant map entities. Verbal assistance can help to overcome these difficulties by substituting textual labels with verbal descriptions and offering propositional knowledge about spatial relations.

We present the architecture for a verbally assisting virtual-environment tactile map (VAVETaM) utilizing a haptic force-feedback device. In comparison to existing verbal assistance systems for tactile maps, VAVETaM offers situated verbal assistance that depends on both a semantic understanding of the users' exploratory movements in the virtual-environment tactile map and assumptions about their knowledge of the map gained from the exploration so far. Thus, the provided verbal assistance can specifically address the assumptions about current informational needs of the user. This includes, for example, the location of landmarks that are yet unexplored: *"You missed the church, in the north-east corner of the region you are exploring."*

Like visual maps, tactile maps are based on spatial-geometric representations that need to be reasoned about in order to generate verbal assistance. A part of this reasoning is propositional whereas when taking the user's exploration position into account, spatial reasoning processes are needed. We present the structural model of the proposed architecture including a hybrid representational formalism for virtual-environment tactile-map exploration that allows both qualitative and visual reasoning necessary for the interaction of haptic perception and verbal communication.

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Mood Alters Time Preference for Delayed Rewards

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Keywords: psychology; decision-making, intertemporal choices, emotion, mood

Emotional states influence people's decisions. For example, negative affective states have been found to reduce the ability to resist temptation and to delay gratification. Recent data also suggest that negative emotional states bias people towards short-term thinking, favoring immediate consequences (e. g. Gray, 1999),

These findings suggest that mood does also affect the delay-discounting effect in intertemporal choices. Delay discounting refers to the reduction in the present value of a future reward as the delay to that reward increases. Therefore, an experiment was conducted in which 60 participants were randomly and in equal number assigned to two experimental conditions (a positive-mood condition and a negative-mood condition). All participants were presented with a set of either pleasant or unpleasant pictures, successively shown on a computer monitor, which served for mood manipulation. The pictures were drawn from the International Affective Picture System (Lang, Bradley and Cuthbert, 2005) and while varying the valence of the pictures their arousal was kept constant. After the presentation of the pictures, a delay-discounting task followed which contained 27 choices, each with two options ranging between smaller but immediate or larger but distant monetary rewards.

As expected, the participants opted more frequently for larger but delayed rewards after being exposed to pleasant pictures and more frequently for smaller but immediate rewards after being exposed to unpleasant pictures. This finding was interpreted within the framework of the Affect Infusion Model (Forgas, 1995) which asserts that positive moods let people perceive the outcome of risky (here: delayed and hence less probable) choices as more favorable, whereas people in negative moods are more likely to perceive the world as a threatening place which in turn decreases their willingness to take risks.

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Information Search Under Asymmetric Reward Conditions

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Keywords: information search models, Bayesian decision theory, probability gain, optimal experimental design, categorization, experience-based learning

Human Information Search

In situations where humans acquire information for classification, information search preferentially maximizes accuracy (Nelson, McKenzie, Cottrell and Sejnowski, 2010). Can people adapt their information search behavior to asymmetric situations where different kinds of correct decisions are rewarded differently? We addressed this via two experiments in which the environmental probabilities maximally differentiated reward and accuracy maximization.

Participants learned a probabilistic categorization task, in which two dichotomous features probabilistically predicted the category (A or B) of artificial biological stimuli. They learned through experience, categorizing stimuli with feedback. A subsequent information-acquisition phase required participants to view only a single feature before making a categorization decision. In Experiment 1, no rewards were provided in the learning phase and an asymmetric reward structure – with meaningful real money payoffs – was given in the test phase. Participants could view only one of the features in each test phase trial, before categorizing the stimulus. Environmental probabilities were designed so that one feature led to higher expected monetary reward, but the other feature was superior for accuracy maximization (i.e., would allow more correct classifications). Participants preferred to view the accuracy maximizing feature. In Experiment 2, participants were trained on an asymmetric reward structure in the categorization phase, where different points were earned for each kind of correct classification. Yet the information-search phase used a symmetric reward structure, where each correct classification paid the same amount of money. Participants preferred to look-up the feature that had been most useful in the previous learning phase, which was suboptimal under the new reward structure.

Our results indicate (i) that maximizing accuracy may be a primary subjective reward function, both for learning and for information search and (ii) that psychological models of information search may need to take into account individuals' learning history.

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The Role of Analogical Functional Attributes in Evaluating the Plausibility of Analogical Inferences

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Keywords: analogy, functional attributes, inference evaluation

The subprocesses of retrieval, mapping and inference generation have received fair attention within psychological and computational accounts of analogical thinking. However, the mechanism by which we evaluate the plausibility of the generated inferences within the target domain has been generally regarded as independent from the prior analogical comparison. We carried out a study to demonstrate: 1) that the evaluation of inferences is sometimes based on an extended analogical mapping and 2) that in that evaluation object properties that are not salient out of the analogy (analogical functional attributes - AFAs) play a crucial role. Twenty participants read six analogies. The base analog stated that an object had been successfully used to fulfill certain function. Then they were required to indicate (and justify) to what extent they considered that a second object would also fulfill a similar function in an analogous situation. Whereas in half of the analogies the target object shared the relevant AFA with the base object, in the other half it did not. The plausibility scores given to target objects sharing a relevant AFA with the base object were higher than those assigned to objects lacking such attribute. This difference cannot be attributed to a higher intrinsic plausibility of the former within the target domain, since it was not replicated by a group of participants who evaluated the usefulness of the target objects for the desired function, but without having previously received their corresponding base analogs. Whereas most participants in the analogy condition mentioned the AFAs in their justifications, few participants in the control group referred to them. Results show that the evaluation of analogical inferences sometimes implies reanalyzing the mapped elements and they suggest that certain properties that are not evident outside an analogical comparison (i.e., AFAs) play a crucial role in this evaluation.

Die kognitive Ergonomie von Microsoft WORD und LaTeX

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Stichworte: Kognitive Ergonomie, Software-Ergonomie, Microsoft WORD, LaTeX.

Seit den 1980er Jahren etablierte Systeme zur elektronischen Verarbeitung von Texten basieren entweder auf dem „*what you see is what you get*“-Prinzip (WYSIWYG) oder auf dem „*what you get is what you mean*“-Prinzip (WYGIWYM). Wir verglichen Microsoft WORD, ein auf dem WYSIWYG-Prinzip beruhendes Textverarbeitungsprogramm mit LaTeX, einem auf dem WYGIWYM-Prinzip beruhendes Satzprogramm anhand mehrerer Variablen bzgl. Benutzbarkeit und Benutzerfreundlichkeit in Abhängigkeit von der Expertise.

40 Probanden wurden an ihren eigenen Arbeitsplätzen untersucht. Sie wurden in vier Gruppen (N=10) aufgeteilt: WORD-Novizen, WORD-Experten, LaTeX-Novizen und LaTeX-Experten. Die Aufgabe jedes Teilnehmers bestand darin in jeweils 30 Minuten drei Texte originalgetreu zu reproduzieren: einen „normalen“ wissenschaftlichen Fließtext, einen Text, der auch eine komplexe Tabelle enthielt und einen Text mit umfangreichen mathematischen Formeln. Überprüft wurde wie viel Text von den Probanden in der vorgegebenen Zeit reproduziert wurde (Anzahl von Zeichen und Wörter) und wie viele Fehler gemacht wurden (Anzahl von Formatierungs-, sowie orthographischen und grammatischen Fehlern),

Experten zeigten generell bessere Leistungen als Novizen und WORD-Nutzer bessere als LaTeX-Nutzer. In Fließ- und Tabellentexten reproduzierten WORD-Anwender signifikant mehr Zeichen und Wörter und machten weniger Fehler in der Formatierung im Vergleich zu LaTeX-Anwendern. Die Formatierungsleistung der WORD-Novizen übertraf sogar die der LaTeX-Experten. Die Anzahl der orthographischen und grammatischen Fehler bei WORD- und LaTeX-Nutzer war ähnlich. Beim Formeltext reproduzierten LaTeX-Anwender mehr Zeichen und Wörter und machten weniger Formatierungsfehler. Trotz dieser eindeutigen Ergebnisse, gaben LaTeX-Nutzer in einem standardisierten Fragebogen zur Benutzerfreundlichkeit an, sie seien mit LaTeX sehr zufrieden und das Programm sei leicht zu benutzen. Mögliche Gründe für diese Einschätzungen werden diskutiert.

Mittelalterstudien als eine neue Perspektive auf die Assoziation und das Mental-Mapping

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Stichworte: Mittelalterstudien, Ikonographie, Assoziation, mental-mapping, kognitive Semantik

Die Kultur des mittelalterlichen Europas war die Schatzkammer der Assoziation⁶. In der mittelalterlichen Welt sind die zahlreichen kulturellen Symbole häufig nicht diskursiv, sondern assoziativ verbunden (Heuzinga, 1924): z.B. wurde die Mutter Maria als sogenannter Katalysator mit verschiedensten Symbolen assoziiert, die auf vielfältige Weise bildlich wie schriftlich dargestellt wurden. Die bisherige Forschung zum mittelalterlichen Europa thematisiert solche Phänomene meist theologisch und übersieht dabei, inwiefern solche verschiedenen Symbole überhaupt mit der Mutter Maria in Beziehung gesetzt werden konnten.

Unser Poster schildert ein neues Wissensmodell für mittelalterliche Europa-Studien, das ausgehend von der kognitiven Semantik eine computergestützte Visualisierung der Assoziationsbeziehungen zwischen den Bildelementen ermöglicht. Auf Basis einer Klassifikation der symbolischen Elemente werden diese selbst sowie deren Beziehungen einer prototypensemantischen Analyse (Lakoff, 1987) unterzogen. Anhand eines ikonographischen Beispiels, der „Maria im Rosenhag“ (Vetter, 1956), zeigen wir, welche Arten assoziativer Verbindungen zu einer Bedeutungsgenerierung führen. Über den mittelalterlichen Kontext hinaus geht es uns darum, kognitive Strukturprinzipien der Assoziation herauszuarbeiten. Anhand der Prototypen sowie der Arten der Familienähnlichkeit werden die strukturellen Momente bestimmt, die den kognitiven Gehalt der assoziativen Bildkomposition ermöglichen. Die mittelalterliche Assoziation zeigt sich als visuelle Darstellung grundlegender Schemata der Assoziation, die als Grundlage für eine Algorithmisierung assoziativer Schemata ausgewertet werden kann. Ferner, da die Ikonographie auch eine idealisierte kognitive Karte des mittelalterlichen Geistes darstellt, die sich nicht auf empirische Objekte in der Welt bezieht, bildet sie einen weiteren Forschungsbereich für die *mental-mapping Studies*⁷.

⁶ Die Assoziation in unserem Kontext bezeichnet solche kognitiven Phänomene, in denen mehrere Elemente nicht nur zufällig, sondern sinnlogisch verbunden werden (Heikonen, 2009). Der Prozess der Assoziation wirkt zwar oft zunächst unlogisch, aber nicht weil dieser ohne Gründe generiert wird, sondern weil dessen Konstruktion noch nicht methodisch eingeholt wurde. Unser Poster zeigt eine Möglichkeit, wie die sinnlogische Seite der Assoziation dargestellt werden kann.

⁷ Das Mental-mapping stellt in der Regel eine kognitive Karte, die als Konsequenz aus dem Selektionsprozess der sinnlichen Wahrnehmung entstand, dar (Downs and Stea, 1982). Im Gegensatz dazu beziehen wir uns auf die kognitive Repräsentation des menschlichen Geistes.

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Process Analyses of Grounding in Chat-Based CSCL: An Approach for Adaptive Scripting?

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Keywords: Grounding, Adaptive Scripting, CSCL, Chat Discourses, Process Analysis

Adaptive or intelligent scripting is a promising new approach to computer-supported collaborative learning (CSCL). Such collaboration scripts need mechanisms to adapt to the learners' progress and to assess the learners' evolving interactions. However, researchers are still facing many challenges how to model this process effectively.

In our current experimental study we applied a probabilistic approach to model cognitive and communicative processes in chat-based CSCL based on the grounding theory in linguistics according to Clark (1996; Clark and Brennan, 1991). Especially chat-based CSCL often suffers from deficiencies such as lack of coherence and coordination. It is suggested that the provision of two functionalities by the learning environment, referencing and typing, which learners may optionally use to ground their contributions during a chat-based discourse, can improve collaborative learning. In particular, we examined if goal focus and type of task affect learning outcomes as well as the grounding process and the use of these supportive functionalities. Besides a comparison of the learning outcomes, the grounding processes and the discourse structures were modeled with Hidden Markov Models. Additionally, we propose a process model, which models the cognitive processes leading to grounding activities.

Results showed that learning outcomes were higher for knowledge-acquisition tasks than for problem-solving tasks. The probabilistic process analyses suggested that the use of supporting functionalities increased when goal focus was on the group rather than on the individual, but the task of solving a problem decreases grounding activities in contrast to the task of knowledge acquisition.

We will discuss methodological issues of modeling grounding processes for adaptive scripting as well as we will outline implications for further research and application.

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Remediation of Reading Deficits with Distinct Causes: Training Effects and Underlying Neural Mechanisms.

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Keywords: developmental dyslexia, subtypes, deficit-specific training, primary school, fMRI study

Different theories consider reading problems in developmental dyslexia as resulting from a deficit in phonological awareness, attention, auditory processing, magnocellular processing, or automatization.

Based on these theories, we recently demonstrated different subtypes of developmental dyslexia with distinct cognitive deficit patterns. Compared to reading-unimpaired children, subtype #1 showed lower performance in phonological awareness, but at the same time surprisingly good auditory discrimination. Subtype #2 showed an isolated attention deficit. Subtype #3 was characterised by worse performance in the phonological, auditory and magnocellular tasks. Depending on reading ability, these tasks also showed distinct brain activation patterns in left vs. right BA 44 and 45 (Broca's region and right homologue),

Based on these earlier findings, the present study investigates which training method is best suited for remediation of dyslexia that is accompanied by either a phonological or an attention deficit. First, pure deficit-specific phonological or attention training are compared to deficit-specific reading training and to deficit-unspecific reading training. Data are still being collected and analysed (presently N =30), Preliminary analysis reveals effects for all training methods.

Second, we aimed at identifying the neural mechanisms underlying the training effects. Here, preliminary data reveal activation increase in bilateral frontal cortex after training, thus further suggesting the relevance of Broca's region and its right homologue for reading-related cognitive processes. Differences between training groups are currently being analysed and will also be presented.

Money Corrupts Empathy: Effects of Money on Empathic Responses to Others' Pain

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Keywords: philosophy, psychology; empathy, simulation theory, pain

The capacity to understand and share the feelings of others, referred to as empathy, is crucial for successful social interactions. Simulation theories (ST) claim that understanding other minds is achieved by using one's own mechanisms of experience as an internal model to simulate the other's state of mind (Goldman, 2006). According to ST, this coupling mechanism has been suggested to be an automatic bottom-up process. However, empathy studies, mainly conducted in the domain of pain, suggest that empathic responses are influenced by various modulatory factors (de Vignemont and Singer, 2006). Reminders of money for example alter people's behavior toward others and lead to reduced helpfulness (e.g. Vohs et al., 2006),

In a behavioral study we examined the psychological consequences of subliminal priming with money on empathic responses to facial expressions of pain and negative emotions. Participants (N = 40) were assigned to a 2 (money vs. nonmoney cue) x 3 (emotional expression: fear vs. sadness vs. pain) mixed factorial design with money priming as a between subjects factor. For a series of emotional expression videos participants identified its content, its intensity and how strongly they were touched by it.

While the money prime did not affect identification accuracy or intensity ratings, participants subliminally primed with money were significantly less touched by the emotional expressions than controls.

These results suggest that empathy is not a purely sensory-driven process in which affective states are induced in the observer solely by means of involuntary simulation, but might be influenced by a variety of parameters such as the motivational state of the empathizer. Thus, empathy cannot be described as an automatic bottom-up process but involves several levels of processing.

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Tracking and Visualizing Visual Attention in Real 3D Space

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Keywords: visual attention, eye tracking, 3D tracking, spatiality, visualization.

Motivation

Humans perceive, reason and act within a 3D environment. In empirical methods, however, researchers often restrict themselves to 2D, either in using 2D content or relying on 2D recordings for analysis, such as videos or 2D eye movements.

Regarding, e.g., multimodal deixis, we address the open question of the morphology of the referential space (Butterworth and Itakura, 2000), For modeling the referential space of gaze pointing, precise knowledge about the target of our participants' visual attention is crucial. To this ends, we developed methods to assess the location of the point of regard, which are outlined below.

3D Tracking and Visualization

Recent technological advances allow researchers to record body and eye movements of participants at an unmatched precision. We combined body tracking with binocular eye tracking and developed machine learning methods to estimate in real-time the location of the

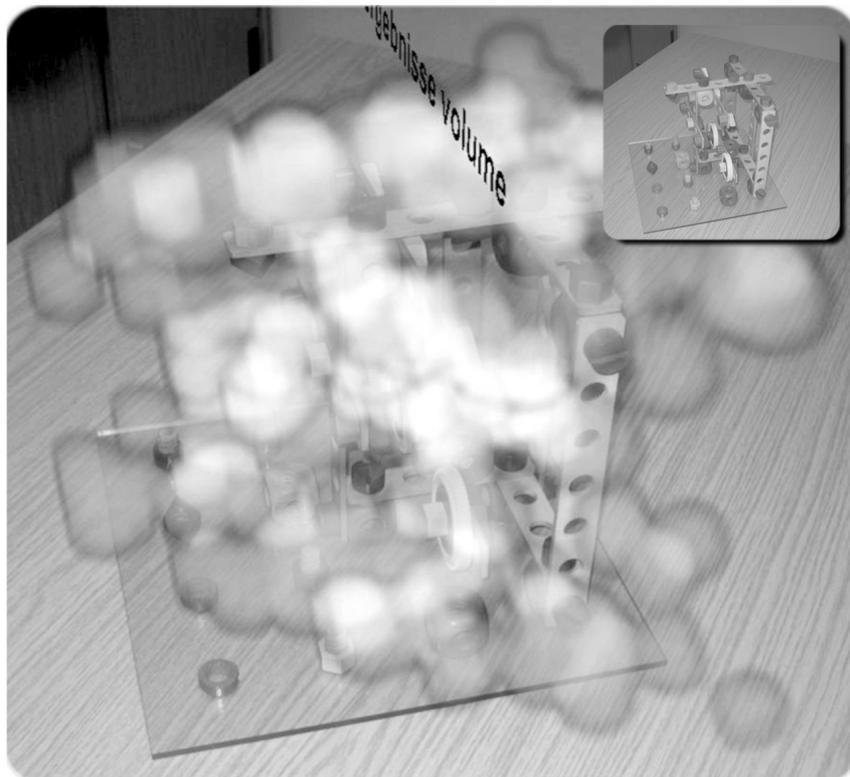


Figure 1: 3D Attention Volume depicting the visual attention on an aggregate of real objects. The 3D locations of the fixations were estimated by measuring convergence.

point of regard in space from positions, orientations and convergence of the eyes (Pfeiffer, Latoschik and Wachsmuth, 2009), These methods can be used in virtual as well as in real worlds and do not require computer-models of the targets. Analysis of the data requires little manual effort. To support visual analysis, we developed *3D Attention Volumes* (Fig. 1), transferring the idea of 2D heatmaps to 3D space, which allow for an interactive exploration of the distribution of attention from any perspective. We expect that these methods can support research in other areas as well.

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Object Deixis: Interaction Between Verbal Expressions and Manual Pointing Gestures

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Keywords: deixis, manual pointing, interaction between speech and gesture, 3D gesture space

Motivation

Object deixis is at the core of language and an ideal example of multimodality. Speech, gaze and manual gestures are used by interlocutors to refer to objects in their 3D environment. The interplay of verbal expressions and gestures during deixis is an active research topic in linguistics as well as in human-computer interaction.

Previously, we conducted a study on manual pointing during dialogue games using state-of-the-art tracking technologies to record gestures with high spatial precision (Kranstedt, Lücking, Pfeiffer, Rieser and Wachsmuth, 2006), To reveal strategies in manual pointing gestures, we present an analysis of this data with a new visualization technique.

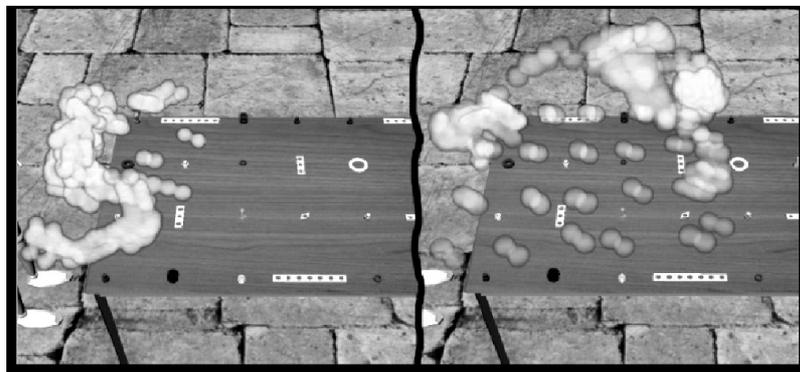


Fig. 1: The *Gesture Space Volumes* of the end positions of manual pointing gestures (spheres, left: co-verbal, right: without speech) reveal different strategies for manual pointing depending on the availability of speech.

Method

During the study with 50 participants, about 1000 manual pointing gestures to objects located on a real table (Fig. 1 shows a virtual model) were recorded in two settings. In one setting the participants were allowed to speak, in the other setting they had to remain silent.

Results

Previously, we identified an increase in words when referring to distant objects, but were not able to identify strategies used in pointing *without* speech. Therefore we recently developed the new *Gesture Space Volume (GSV)* visualization. GSVs visualize spatial and temporal properties of multiple gesture acts, similar as heatmaps do for gaze, but in 3D. We found that over 60% of the participants used a successful *leaning-forward* strategy when pointing without speech (Fig. 1),

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Is Verbal Short-Term Memory Linguistically Structured?

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Keywords: short-term memory, linguistic structure, cross-linguistic

This study set out to explore cognitive processes involved in verbal repetition by investigating the effects of linguistic factors on memory span. In most studies investigating verbal memory, items are presented in a list and the focus is on properties of these items such as imageability, lexical status or word-likeness; investigation beyond the word level is rare. The present study compares performance on sequences of items which are manipulated regarding syntactic, semantic and prosodic properties at a sentence level, while holding constant the nonexperimental characteristics of constituent words (frequency, familiarity, imageability and phonological complexity), Performance on immediate repetition of sequences of items in 7 conditions, with well-formed sentences at one end of the spectrum and lists of nonwords at the other, is compared in two typologically different languages (see the examples from English below):

Well-formed sentence:	<i>He sent us a letter.</i>
Well-formed sentence with list prosody:	<i>he, sent, us, a, letter</i>
Semantically implausible sentence:	<i>He sang us a kettle.</i>
List of words with sentence prosody:	<i>A sent he letter us.</i>
List of words:	<i>a, sent, he, letter, us</i>
Pseudosentence with words replaced by nonwords:	<i>ve fint esh u lopper</i>
List of nonwords:	<i>ve fint esh u lopper</i>

The same set of conditions was presented to 50 young children and 20 adults in English and 50 young children and 20 adults in Czech, with stimulus materials matched as far as the languages allow, but reflecting differences in language typology which are of theoretical interest. Participants repeated successively longer sequences in order to determine their maximum span for each condition. Results for both languages and two different age groups will be presented and the theoretical implications of findings for current memory models and the role of linguistic factors in recall will be discussed.

Prosody and Verbal Short-Term Memory

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Keywords: verbal short-term memory, prosody

This study deals with the relationship between language and short-term memory, more specifically with how prosodic structuring affects short-term memory recall. Data from a syllable span test will be presented and discussed in the light of item-based versus time-based theories of verbal short-term memory. Assuming that the alternation of stressed and unstressed syllables supports the construction of relations between abstract prosodic units in perception and that abstract prosodic structure functions to relate bits of speech information to one another, we hypothesized that the phonetic expression of prosodic structure is beneficial for verbal STM in perception. Furthermore, we investigated whether trisyllabic grouping resulted in a stronger effect than bisyllabic grouping, because more information could be packed into each unit. A second experiment was conducted involving the same 27 English speaking participants and procedure in order to investigate a potential effect of rate of presentation that would be predicted by time-based models of short-term memory/ working memory.

We found that prosodic structure does have a positive effect on recall, with recall performance for dactylic patterning being superior to trochaic patterning. Also, the effect for dactylic patterning over the monotonous condition does not seem to reflect a benefit from a quicker rate of presentation.

The authors subscribe to a definition of short-term memory capacity as the amount of information that can be hold in activation simultaneously. It will be argued that verbal short-term memory (STM) capacity is dependent on the linguistic structures involved: Embedding generally supports STM, while multiple-branching structures, in contrast to binary or ternary branching structures, increase 'memory load'.

The Social Antisocial – A Paradox?

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Keywords: antisocial, aggression, philosophy of mind, social psychology, ostracism, interpersonality

In spite of what is suggested by intuition and language, antisocial behavior is thoroughly social. An act that is directed against another person cannot per se be defined as “non-social.” I will argue for that claim in two steps:

- 1) Antisocial behavior needs to be considered as functional for interpersonal, i.e. social relations. Social structures necessary for the stability and survival of kin (human or non-human) seem to depend on reinforcement by punishment, aggression and hierarchies – in other words, mechanisms which count as antisocial and thus have a negative connotation.
- 2) Moreover, antisocial behavior even maximizes the social influence and power of the person who acts antisocially. My claim is that essential needs that are threatened by any episode of ostracism (Williams, 2001) are strengthened as soon as a person performs antisocial actions.

In this respect, antisocial behavior cannot be normatively designated as either “good” or “bad,” but simply as functional for sociability.

In addition to that, social interactions are needed in order to perform any action that should harm someone. Conceptually, antisocial behavior demands social context.

I will argue for the thesis that the essence of the antisocial is necessarily social by using social-psychological, neurobiological, evolutionary biological and philosophical evidence.

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Wechselkosten und modalitätsspezifische Verarbeitung bei der Navigation: Welche Landmarken werden in welcher Modalität optimal verarbeitet?

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Stichworte: Psychologie; Raumkognition, Landmarken

Visuelle Landmarken sind für die Navigation von essentieller Bedeutung. Allerdings ist bislang noch nicht ausreichend geklärt, ob und in wie fern auch andere Modalitäten bei der Verarbeitung von Landmarkeninformation beteiligt sind oder ob gar eine andere Modalität als das Sehen besser für diese Art der Informationsverarbeitung geeignet ist. Hierbei steht die Erforschung von Wechselkosten (switching-costs) zwischen den einzelnen Modalitäten im Vordergrund. Hierzu haben wir eine Serie von drei Experimenten durchgeführt. Im ersten Experiment wurden visuelle (Tierbilder) und akustische Landmarken (Tiergeräusche) unterschieden, während sich das zweite Experiment mit visuellen versus textlichen Landmarken (Tierwörter) befasste (je N=20), Experiment 3 untersuchte den Einfluss von berühmten und unbekanntem Gebäuden in Verbindung mit Wechselkosten (N=10). Jedes Experiment bestand aus einer Lernphase mit 12 Objekten (je 6 pro Modalität), sowie einer Rekognitionsphase, in welcher die Objekte von Distraktoren unterschieden werden mussten. In einer Navigationsphase musste an jeder Kreuzung eine Richtungsentscheidung getroffen werden. In beiden Phasen konnte die Präsentationsmodalität (visuell, akustisch, sprachlich) kongruent mit der Lernphase oder inkongruent mit der Lernphase sein, so dass Wechselkosten untersucht werden konnten. Im ersten Experiment zeigten sich bei der Rekognition die akustisch zu lernenden Landmarken bei der Performanz überlegen, während es keine Unterschiede zwischen den einzelnen Modalitätsbedingungen in Experiment 2 gab. Im dritten Experiment waren die textlich zu lernenden Landmarken überlegen. Keines der drei Experimente erbrachte signifikante Unterschiede bei der Navigation. Wenn Unterschiede auftraten, dann zu Gunsten der akustischen oder sprachlichen Landmarken. Es ergaben sich einheitlich keine Unterschiede zwischen kongruenten und inkongruenten Präsentationsformen, so dass keine Evidenzen für Wechselkosten gefunden werden konnten.

Age of Acquisition and Typicality Effects in an Online Categorization Task

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Keywords: age of acquisition, typicality, semantic processing, online category verification task

The typicality of an exemplar of a semantic category reflects the degree to which a concept (e.g., *penguin*, *robin*) is representative of a given category (e.g., *birds*, Rosch, 1975). While typicality is a variable well known to affect semantic processing (e.g., Rosch, 1975; Morrison and Gibbons, 2006), the influence of age of acquisition on semantic processing is less well understood. An effect of age of acquisition on processing speed has been found in some studies (e.g., Catling and Johnston 2006; Morrison and Gibbons, 2006) but not in others (e.g., Morrison et al., 1992), especially when the items used were controlled for typicality (Holmes and Ellis, 2006). Aim of the present study was to explore the influence of typicality and age of acquisition and their possible interaction in an online categorization task. 20 participants took part in the study. Four sets of 40 words (early/late acquired, high/low typicality) were matched for word frequency and word length in syllables and letters. Each set contained an equal number of exemplars from eight semantic categories, half of them belonging to living or nonliving categories. Age of acquisition and typicality values were rated in two pilot studies by each 20 participants (Schröder et al., in preparation). During the online categorization task, participants had to indicate whether a visually presented word belonged to the living (natural) or nonliving (artificial) domain. Results revealed main effects of typicality and age of acquisition (all $p < .01$) as well as a significant interaction ($p < .05$). Pairwise comparisons showed that items with high typicality were categorized faster than items with low typicality for both early and late acquired words (all $p < .01$). In contrast, early acquired words were categorized faster than late acquired words for items with low typicality ($p < .01$) but not for items with high typicality ($p > .1$). The results confirm recent findings that not only typicality but also age of acquisition influence processing in semantic categorization tasks.

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Gender Differences in Grip-Strength Depending on Arousal and Valence of Emotions

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Keywords: emotions, appraisal theory, gender, arousal

Emotions leading to maladjusted driving behavior are main contributors to traffic accidents. Therefore, emotions and the cognitive interpretations of traffic situations are important objects of applied psychological human factors research. However while there has been much progress in the research of the relation between especially negative emotions, maladjusted driving and accident risk; little attention has been paid to the detection of drivers' emotions in automobiles.

This current experimental study followed an applied approach to detect drivers' emotional arousal in automobiles, using non-invasive physiological measures. The main focus was put on the measurement of grip-strength while holding the steering wheel. Subjects were asked to drive a predefined route in a driving simulator with and without induced emotions. We induced emotional arousal in subjects on the basis of the cognitive appraisal theory, whereas we focused on two high arousal emotions prevalent in traffic situations either negative (anger) or positive (happiness). The results of our current experimental study confirmed and extended preliminary findings of LaMont (2000): Subjects showed increased grip-strength while driving a car when high arousal emotions like anger or happiness were induced. Furthermore, grip-strength differed between female and male drivers. Male participants had an overall higher grip-strength in the non-emotional routes than female participants. These results are consistent with findings of Eksioglu and Kizilaslan (2008). In addition, female grip-strength reactions to positive emotions were stronger than male participants' reactions, while males reacted stronger when negative emotions were induced. This shows that grip-strength can contribute to a more valid detection of automobile drivers' (male vs. female) emotions, depending on arousal and valence. Implications of these results for further research and praxis will be outlined.

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Die Flexibilität des menschlichen Geistes und die Rolle von Selbstreflexion

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Stichworte: Künstliche Intelligenz / Kognitive Systeme, Psychologie; Flexibilität, Selbstreflexion, Problemlösen, Denkprozesse

In der kognitiven Psychologie wird Problemlösen oft als Prozess beschrieben bei dem als passend identifizierte Regeln aus dem Gedächtnis abgerufen werden (siehe beispielsweise das Produktionssystem ACT-R von Anderson). Wenn man sich beim Lösen von Problemen selbst beobachtet, fällt bereits auf, dass der Mensch jedoch flexibler vorgeht und sich mit Hilfe von Selbstreflexion selbst zum Gegenstand der Betrachtung machen kann, um seine Strategien anzupassen. Mit dem Ziel möglichst genau zu beschreiben, wie der Mensch seine Denkprozesse unter Verwendung von Selbstreflexion verändert, wurde ein Experiment im Bereich Problemlösen durchgeführt. In einer Einzelfallstudie wurden zwei Probanden intensiv betrachtet, denen man Probleme aus drei verschiedenen Bereichen gab (Intelligenztestaufgaben, Travelling-Salesman-Problem, Schach). Um einen möglichst genauen Einblick in die Denkprozesse der Probanden zu gewinnen, nutzte ich die Methode des lauten Denkens bei der Durchführung des Experiments. Die Gedankenprotokolle wurden schließlich insbesondere nach Auslösern von Selbstreflexion und daran anschließenden Prozessen untersucht. Es ließen sich mehrere Kategorien von Auslösern finden, die Suchprozesse auslösen, welche durch Selbstbefragung und innere Diskussion unterstützt wurden. Außerdem zeigte sich, dass Denkprozesse durch Selbstinstruktionen gesteuert und verändert werden können. Hier wurde auch die Bedeutung von Sprache für das Denken deutlich, da wohl Selbstreflexion ohne eine innere Diskussion kaum vorstellbar ist. Insgesamt wurde sichtbar, dass Selbstreflexionsprozesse während des ganzen Experiments auftraten und von den Probanden genutzt wurden, um die vorgegebenen Probleme flexibel und effektiv zu lösen. Dies ist ein Hinweis darauf, dass die in der kognitiven Psychologie verbreiteten Ansätze der Komplexität des menschlichen Geistes noch nicht gerecht werden und in Zukunft eine genauere Betrachtung nötig sein wird.

Moderate Cognitive Impairment and Risk Factors in Progression of Vascular Dementia

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Keywords: vascular dementia, vascular cognitive impairment, risk factors

Introduction

Vascular cognitive impairment and vascular dementia are important causes of cognitive decline in the elderly. We reviewed vascular factors that might be responsible to cognitive decline in vascular dementia and vascular cognitive impairment.

Methods

144 patients with vascular dementia aged from 50-79 (46 man and 82 female, mean age $64,9 \pm 4,6$ years) have been studied. Diagnosis as "Vascular Dementia" was determined in accordance with ICD-10 and NINDS—AIREN criteria. 145 patients with chronic cerebrovascular pathology and moderate cognitive impairment aged from 50-79 (91 female and 54 men, mean age $63,8 \pm 3,1$ years) were a control group. Clinical-neurological and MRI-investigation were performed for all patients.

Results

Comparative study of vascular risk factors in patients with vascular dementia and chronic cerebrovascular pathology and moderate cognitive impairment was performed. Arterial hypertension was significant risk factor for patients aged from 50-79. A coronary heart disease and hyperlipidemia were significant risk factors for patients aged from 50-59; coronary heart disease, diabetes mellitus were significant risk factors for aged from 60-69, hyperlipidemia was significant risk factor for aged from 70-79. In accordance with MRI-results a cerebral white-matter lesions in thalamic, basal ganglion and bilateral subcortical leukoaraiosis were significant risk factor for dementia. The control examination was performed for group patients with moderate cognitive impairment after 3-years. So, during 3-years in 32 patients (22,1%) with moderate cognitive impairment the MMSE summary point was less than 24 point, consequently, the mild dementia was diagnosed for these patients and arterial hypertension, coronary heart disease, hyperlipidemia and diabetes mellitus were significant risk factors for these patients with dementia.

Conclusion

All determined vascular risk factors are potentially eliminated and resolved and performed of timely therapeutic actions for patients with vascular cognitive impairment will allow to avoid of vascular dementia progression.

Does the Structure of Thought Mirror the Structure of Vision?

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Keywords: generality constraint, systematicity, perceptual demonstrative, binding problem, object representation, attention

Visual perception and thought are tightly related: Vision provides information that is fundamental to entertain perceptually based thought, like, for example, perceptual demonstratives. However, according to an influential view in philosophy (Evans, 1982), the information-link between sensory information and thought is not sufficient, although necessary, to sustain demonstrative identification. This is because of the requirement imposed by the Generality Constraint (GC): The identification of an object is related to the systematic ability to produce an indefinite number of thoughts about it. The systematic structure of thought is explained by referring to the subject's conceptual abilities and, thus, justified within the conceptual level.

Sensory systems, like the visual system, apparently fail to satisfy the GC and, therefore, lack a systematic structure of primitive constituents. By considering how the visual system represents objects (Treisman, 1996), I will argue that (i) the visual system displays systematicity; and (ii), given the perceptual basis of certain types of thought (i.e., demonstrative thoughts), that the structure of thought mirrors the structure of vision. Those arguments might ultimately lead to the justification of the GC within the pre-conceptual level of sensory processes.

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Trait Emotional Intelligence Facilitates Responses in a Social Gambling Task

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Keywords: social cognition, trait emotional intelligence, decision making, dual system theories, gambling card game

The ability to make rational decisions is uniquely human. However, even though equipped with this ability, human decisions do not always follow the rules of logic. In order to account for deviations from normative decision making, various dual-process theories of reasoning and decision making have been proposed by several scholars. Such dual-process theories have been used as a framework, to empirically examine human decision making in a financial context in the present study. Hereby, special attention is paid to trait emotional intelligence (Petrides and Furnham, 2000) as a socially inherent, interpersonal variable, linked to social cognition. It is hypothesised that this factor accounts for variances in decision making performance.

To investigate this relationship, one hundred participants (N = 100) volunteered to take part in the present experimental research. The study comprised a trait emotional intelligence questionnaire and a computerised gambling card game, simulating financial decision making in a social context. The card game requires participants to decide whether they think that a randomly allocated card of a card deck has a higher or lower value than another card that is randomly allocated from the same deck to the computer. Immediately prior to the display of the participant's card and their decision, a social emotional cue in form of either a happy, neutral or fearful face is shown to the participants.

Results showed that participants scoring high on various scales of trait emotional intelligence such as sociability, social awareness as well as having a better capability to build and maintain fulfilling social relationships, made significantly better decisions in certain card game conditions compared to their lower scoring counterparts. Results are discussed in light of dual-process theories and social cognition. Directions for future research as well as practical implications and recommendations for organisations are proposed.

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Der Weg und seine Struktur: Kognitive Prozesse und optimale Positionierung von Landmarken an einer Wegkreuzung

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Stichworte: Landmarken, strukturelle Salienz, Raumkognition

Wenn man sich mit der strukturellen Anordnung von Landmarken auseinandersetzt, stößt man auf das theoretische Salienz-Modell von Klippel und Winter (2005). Dieses geht bei der Struktur davon aus, dass Landmarken, die in Abbiegerichtung und vor einer Wegkreuzung positioniert sind, präferiert werden. Um diese Aussage und die damit zusammenhängenden Salienzberechnungen des Modells empirisch zu überprüfen, wurde eine Onlinebefragung (N>45) durchgeführt. In diesem Fragebogen waren zwei verbale Wegbeschreibungen mit je sechs Entscheidungs-punkten zu lernen. Die Wegangaben waren dabei linguistisch neutral in Bezug auf ihre Position entlang der Route, z.B. „Biegen Sie am Spielplatz rechts ab“. Die sechs Entscheidungspunkte bestanden aus jeweils zwei Abbiegungen nach rechts, zwei nach links und zwei Kreuzungen, an denen man geradeaus gehen sollte. Nachdem die Teilnehmer die Wegbeschreibung gelernt hatten, wurde ihnen aus der Vogelperspektive ein Stadtplan gezeigt, in welchem alle Kreuzungen rechte Winkel bildeten. Die bereits gegangene Route und der letzte Abbiegevorgang waren jeweils eingezeichnet und die Befragten sollten nun angeben, an welcher Position der Kreuzung (oben links/rechts, unten links/rechts) sich die Landmarke ihrer Meinung nach befunden haben könnte/sollte. Die beiden gelernten und abgefragten Stadtpläne unterschieden sich insoweit, dass der eine nordzentriert war, d.h. das Ziel immer oben und der Start unten und der andere egozentrisch, d.h. er wurde für jeden Abbiegevorgang so gedreht, dass der Weg vor der Kreuzung nach oben wies. Die Ergebnisse zeigen, dass sich das Modell von Klippel und Winter (2005) insofern bestätigt, als dass Landmarken vor einer Kreuzung auf der Abbiegeseite deutlich präferiert wurden. Allerdings zeigt diese Forschungsarbeit darüber hinaus auf, dass Modelle zur Salienzberechnung einer empirischen Überprüfung bedürfen, da sie sonst nicht die tatsächlich zugrunde liegenden kognitiven Prozesse bei der Navigation berücksichtigen.

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Rethinking Syntactocentrism: An Architectural View on Minimalist Approaches to German Left Peripheral Focus

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Keywords: language, architecture of grammar, focus, minimalism, syntax

Background

In the 1950's, 'mainstream generative grammar' (MGG) placed itself within a nascent cognitive science community. For over ten years now, Jackendoff (1997 *et seq.*) has criticized MGG for becoming estranged from that community due to claiming that syntax is the only source of generativity in language, thus regarding phonology and semantics as purely interpretive. One phenomenon that, according to Jackendoff, seems to contradict such 'syntactocentrism' is prosodically marked focus, suggesting a direct phonology-semantics interface without 'mediation' of syntax.

Proposal

The main goal of the poster is to add further evidence to show that Jackendoff's notion of syntactocentrism is antiquated. In particular, comparing old-fashioned analyses with recent minimalist accounts of German left peripheral focus (Fanselow and Lenertová, 2008) reveals that current MGG allows for direct phonology-semantics interaction and thus for excluding certain semantic properties from syntax. Such attempts to constrain syntax to combinatorial aspects due to recursive operations help to make claims of MGG more explicit, thus allowing for straightforward testing and falsification of linguistic hypotheses within the general program of experimental cognitive neuroscience, as recent studies have shown (Friederici et al., 2006). Accordingly, the original conception of MGG rooted in cognitive science is strengthened and recent claims that MGG needs radical surgery to participate in cognitive neuroscience seem quite unmotivated.

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Modellierung von Reihenfolgeeffekten beim moralischen Urteilen

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Stichworte: Reihenfolgeeffekte; Moralisches Urteilen; Trolley Dilemmata; Modellierung.

Schwerwiegende moralische Fragen werden nicht nur im philosophischen Lehnstuhl behandelt, sondern rücken auch häufig im Alltag in den Mittelpunkt des Interesses, wenn es beispielsweise um die Legalität von aktiver Sterbehilfe oder den Umgang mit potentiellen Terroranschlägen geht. Viele Studien beschäftigen sich mit der Frage, unter welchen Umständen es moralisch erlaubt ist, ein Menschenleben zu opfern, um das Leben von mehreren Personen zu retten. In einigen dieser Studien traten starke Reihenfolgeeffekte auf, das heißt: Ob eine Handlung als moralisch richtig beurteilt wurde, hängt davon ab, welche Handlungen vorher beurteilt werden (Petrinovich und O'Neill, 1996; Lanteri, Chelini und Rizzello, 2008). Dass diese Reihenfolgeeffekte eine gewisse Systematik aufweisen, konnte erst kürzlich in einer Studie von Wiegmann, Okan, Nagel und Mangold (2010) gezeigt werden. Demnach werden nur diejenigen Handlungsbeurteilungen von der Reihenfolge der Präsentation beeinflusst, die normalerweise, also ohne dass ihnen andere Handlungsbeurteilungen vorausgehen, positiv (im Sinne von moralisch richtig) ausfallen – und das auch nur, wenn ihnen eine negative Handlungsbeurteilung direkt vorausgeht. Hingegen werden Handlungsbeurteilungen, die normalerweise negativ ausfallen, nicht von der Reihenfolge der Präsentation beeinflusst.

Es ist allerdings noch nicht klar, welche psychischen Prozesse für diese Systematik verantwortlich sind. Ein Erklärungsansatz postuliert, dass negative Handlungsbeurteilungen – im Vergleich zu positiven – einen stärkeren Rechtfertigungsmechanismus aktivieren, wodurch ein einmal angewandtes Prinzip auch bei weiteren Beurteilungen Anwendung findet. Diese Theorie wird in der vorliegenden Arbeit auf Basis der Item-Response-Theorie modelliert und gegen andere Erklärungsansätze getestet. Die Ergebnisse werden in der vorliegenden Studie präsentiert und ihre Implikationen diskutiert.

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Every Embodiment Needs Some Body!

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Keywords: artificial intelligence / cognitive systems, philosophy; embodiment, artificial intelligence

The concept of embodiment has gained increasing amount of attention in most areas of cognitive science. This trend focuses mainly on living organisms in the physical world and describes all forms of meaningful interactions between these two entities as cognitive processes. The meaning of these interactions is the result of the organism's transformation of the world into an environment, i.e. certain inputs are recognized as relevant and the effects of these on the state of the organism is evaluated as positive or negative for the organism relative to a certain goal. The embodiment movement has lead to the emergence of a new line of artificial intelligence research concentrating mainly on the development of systems, which acquire cognitive capacities through their interactions with the physical world.

We challenge the view that the environment of an agent necessarily has to be the physical world (or a certain part of it, or some simulation of it), to speak of cognitive processes. Other conceptions of world and body are possible (e.g. a web crawler communicating with servers in the internet, a program using functions from a certain library), through which completely new forms of interaction present themselves and thereby different forms of cognition come about. What makes these interactions meaningful and thereby cognitive, is the assessment of the relevance of the interactions for the system's performance of its function or goal. Many further core notions of enactivism can be adapted to this widened concept of embodiment.

We claim that such a broader notion of embodiment can be of use in at least two ways: firstly, on a theoretical side, it opens the possibility of applying the theoretical framework of enactivism to a larger range of systems. Furthermore, on a practical side, it can lead to a new paradigm in software development considering programs as cognitive agents with the capacity of self-monitoring and regulating their behaviour in a specific environment.

ERP Analysis of Audiovisual Integration During Language Comprehension

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Keywords: linguistics, cognitive neuroscience, neurobiology; audiovisual integration, ERP analysis, asynchrony, speech perception, lip reading

When we talk to each other, we do not perceive speech as purely acoustic event. The lip movements of the dialogue partner plays also a supporting role for increasing robustness of language comprehension, especially in the context of increased background noise. In a natural dialogue situation speech is perceived as integrated audiovisual event in which the auditory speech signal lags the visual signal approx. 3 ms per meter between talker and perceiver, though it is not temporally aligned.

To analyze the time window in which the temporal synchronization of auditory and visual signal succeeds, 25 subjects perceived audiovisual sequences up to 4 seconds length of a talker, whose auditory speech signals lag 0 ms, 80 ms, 120 ms and 280 ms and precede 40 ms, 80 ms, 200 ms and 360 ms his lip movement. The impact of this temporal desynchronization was recorded by an electroencephalograph (EEG) to locate those levels of asynchrony that lead to an incongruent perception. As indicator of the effect of audiovisual asynchrony on language comprehension, the ERP-complex N1/P2 was analyzed (Pilling, 2009),

Audiovisual asynchrony in language signals are consciously perceived only, when both signals are shifted from each other in a range of hundreds of milliseconds (Dixon and Spitz, 1980), The neural integration mechanisms allow the auditory and visual speech signals to be integrated, however this process can be shifted across a broad time window. At present there is no clear answer which mechanisms are underlying this temporal flexibility (Spence and Squire, 2003),

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Associated Event / Begleitveranstaltung

Mind and Brain Dynamics

Satellite conference of the DFG Research Group FOR 868: "Mind and Brain Dynamics"
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Begleitkonferenz der DFG Forschergruppe FOR 868: „Mind and Brain Dynamics“ (Reinhold
Kliegl, Ralf Engbert, Universität Potsdam)

Skipping of "the" is not Fully Automatic

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Keywords: eye movements, reading, skipping, preview

One of the words that readers of English skip most often is the article "the". Most accounts of reading assume that in order for a reader to skip a word, it must have received some lexical processing. The article "the" is skipped so regularly, however, that the oculomotor system might have learned to skip articles automatically. We tested whether skipping of "the" is automatic using the gaze-contingent boundary paradigm (Rayner, 1975) to provide readers with false parafoveal previews of the article "the". All experimental sentences contained a short target verb, the preview of which could be identical ("lie"), dissimilar ("tda") or a false article preview ("the"). Our results suggest that while readers tended to skip the false "the" previews frequently, they seem to sometimes be able to detect the syntactic anomaly in the preview parafoveally, as they also showed increased skipping of the pretarget word in the "the" preview condition.

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ERP Parafoveal Effects During Sentence Reading Using Rapid Serial Visual Presentation with Flankers

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Event Related Potentials (ERP) studies using the rapid serial visual presentation (RSVP) method has provided considerable insights on word processing in sentential contexts. This paradigm however cannot be used to investigate the role of parafoveal perception during reading. In a series of experiments, the standard RSVP procedure was modified to study parafoveal perception during sentence reading in absence of eye movements. Sentences were presented word-by-word on a computer screen at fixation, flanked two degrees bilaterally by letter strings. In the first two experiments, all but the third words in the sentences were flanked by two pseudowords. The third word of each sentence was flanked either by two pseudowords, or by a pseudoword/word combination. In the latter case, the word randomly appeared either as the left flanker or right flanker, and was either semantically congruent or incongruent with the sentence context. Parafoveal effects were examined in two languages, English and Hebrew, with different orthographic systems and reading directions.

Relative to congruent flankers, incongruent word flankers elicited larger P2 amplitudes. Critically, in English the parafoveal effect was observed only when the flanker words were positioned to the right of the fixated word, while the opposite pattern of flanker asymmetry was observed in Hebrew reading. In subsequent experiments, this design was modified by using only words as flankers, arranging the triadic display to more closely simulate natural reading. Results showed that N400 amplitudes to the critical triads were larger when the right flanker was contextually incongruent, indicating that parafoveal information was extracted and quickly used in online sentence comprehension. Therefore, we propose that serial rapid visual presentation can be easily accommodated to the study of parafoveal perception during sentence reading, providing a complementary method to other approaches.

Mathematical Models of Microsaccadic Shapes and Sequences

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Microsaccades are rapid small-amplitude movements which occur involuntarily during visual fixation. The talk will focus on the dynamics of sequences of microsaccades. A recently developed wavelet-based detection algorithm (Bettenbühl et al., submitted) will be used to identify parameters of microsaccadic shapes. Next, we analyze the correlation structure of successive saccades. We test the (simplifying) assumption of a very short memory of the process of microsaccade generation and try to approximate the dynamics by a Markov chain in sequence space. Since our analysis permits a quantized description of the shapes, we are able to present a rigorous statistical treatment of earlier results (e.g., Abadi et al., 2000; Abadi and Gowen, 2004).

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Co-registration of EEG and Eye Movements: Evidence for Partial Independence of Oculomotor Control and Word Recognition in Reading

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Fixation durations in reading increase not only with word difficulty of a currently fixated word n , but also with that of a previous word $n-1$. Such spill-over or “lag” effects are explained differently by models of oculomotor control: Serial models assume a strong relation between fixation durations and lexical processing time of an attended word, without crosstalk between consecutive words; lag-effects are regarded as a consequence of reduced parafoveal preprocessing of word n during the fixation of a difficult word $n-1$. In contrast, parallel approaches propose a rather loose coupling between oculomotor control and word recognition; accordingly, the eyes may leave a word before it is fully accessed, such that incomplete processing of (a difficult) word $n-1$ spills over and interferes with the recognition of word n .

To test these assumptions, we manipulated frequency on successive words $n-1$ and n in arrays of unrelated nouns. In two experiments, we co-registered fixation-related potentials (FRPs) and eye movements during left-to-right reading. Every stimulus in the arrays was initially masked, and was unmasked upon fixation either immediately (Exp1), or after a brief delay (Exp2).

Robust influences of word frequency $n-1$ on fixation durations and FRPs to word n pointed to ongoing word processing beyond the duration of a fixation. Furthermore, FRPs revealed interactions between word $n-1$ and n in an interval starting before 200 ms, indicating that incomplete processing of the past stimulus affects early lexical processing of the currently fixated word.

The findings demonstrate that lag effects can be attributed at least partly to ongoing processing beyond the inspection time of a fixated word. Such spill-over interferes with recognition of the next word and co-determines subsequent reading behavior. The data support the view of a loose coupling between oculomotor control and word recognition, as the eyes can move on before words are fully processed.

Brain-electric Correlates of the Preview Benefit in Left-to-right Reading

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While reading a text, readers obtain information about the upcoming words that facilitates their subsequent recognition. This global preview benefit is reflected in shorter fixation durations on words that had been visible in the parafovea on the preceding fixations compared to words covered by a mask. However, there is a long controversy whether parafoveal preprocessing is restricted to orthographic and phonologic low-level properties or whether it extends to the level of meaning. Eye tracking studies have provided mixed results on this issue, but the majority has failed to find evidence for parafoveal semantic access.

The first goal of the present study was to use simultaneous EEG recordings to investigate the time course and electrophysiological correlates of the global preview benefit established in many previous eye tracking studies. The second goal was to investigate the existence of semantic preprocessing effects in the concurrent EEG record.

Eye movements and FRPs were co-recorded while participants read lists of five unrelated German nouns from left to right. Each list contained a target word (e.g. “song”) that was shown with one of three previews: An identical preview (“song”), a semantically related preview (“tune”), or an unrelated preview (“room”). Effects of preview condition were investigated both as “preview benefits” and “parafovea-on-fovea effects”: In half of the trials, the preview word was shown in parafoveal vision, but changed to the target word upon direct fixation, using the Boundary Technique. In the other half, there was no display change. Instead, target and preview words were placed at adjacent positions in the list and FRPs were time-locked to the first word. We will report behavioral and electrophysiological effects as a function of preview condition and paradigm. Results will be discussed in the context of existing FRP data on the timeline of word recognition in natural reading.

An Integrated Model of Fixational Eye Movements and Microsaccades

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When we fixate a stationary target, our eyes generate miniature (or fixational) eye movements involuntarily. Fixational eye movements are classified as slow components (physiological

drift, tremor) and microsaccades, which represent rapid, small-amplitude movements. Over recent years, the investigation of the functional role of fixational eye movements for vision, in particular the function of microsaccades, has been an active research field. Here we propose an integrated mathematical model for the generation of slow fixational eye movements and microsaccades.

The model is based on the concept of self-avoiding random walks in a potential and reproduces important statistical properties of the eye's trajectory. Within this framework, we suggest that microsaccades are generated by critical states in an activation field which emerge from the self-avoiding walk. This mechanism generates the experimentally observed reduction of retinal image slip immediately before microsaccades. We conclude that self-avoiding random-walks capture fundamental properties of fixational eye movements.

Fixation-related Brain Potentials Question Eye-tracking Evidence on Parafoveal Preprocessing

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Estimates of the amount of parafoveal preprocessing is mainly based on eye tracking studies using the boundary paradigm. In the present study, we used the new fixation-related brain potentials (FRP) technique to explore the electrophysiological correlates of parafoveal preprocessing: Brain potentials and eye movements were simultaneously recorded during the natural reading of lists of words. Parafoveal preprocessing of target words was either enabled or disabled using the boundary paradigm: In the latter condition, target words were masked by an "xxx"-mask. Results revealed (a) That brain potentials reflected the typical acceleration in the recognition of the upcoming, parafoveal word: Target words were recognized around 67 ms faster when parafoveal preview was enabled compared to the recognition of isolated words. (b) Parafoveal masking delayed word recognition beyond that during the recognition of isolated words. This delay was most probably caused by visual interference due to parafoveal masking. Such an interference of parafoveal masking does have serious theoretical implications: The above reported findings as well as a follow-up study on Rayner, McConkie, & Ehrlich (1978) seminal publication suggest that parafoveal masking might result in an incorrect estimate of parafoveal preview benefits. As a consequence, the present data might challenge findings on parafoveal preprocessing in the literature as acquired by parafoveal masking.

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The spatial representation of words during reading

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In all written languages words are spatially arrayed so that their grammatical order can be determined. Through this order, each word occupies a unique location, and according to recent conceptions of spatial object indexing this distinguishing feature becomes part of a visual object's working memory representation. To determine whether the spatial location of a recognized word becomes part of its representation, participants were asked to read two-line sentences that contained a target word near the right- or left-side margin. The sentence was subsequently replaced with a single content word (SCW), shown at the screen center, that was part of the previously read sentence on half of the trials. SCW onset was accompanied by a brief 50 ms presentation of a short horizontal bar-cue on two thirds of the trials (no cue was present on the remaining trials). The bar-cue appeared either near the right or left margin so that it either matched or mismatched the original location of the target on positive trials (in which the SCW had appeared in the previously read sentence). The results revealed similar viewing durations for left- and right-side targets during sentence reading and a robust effect of target location during the subsequent memory task on positive trials. Decision times were shorter when the target had occupied a location near the left margin in the sentence, and this occurred irrespective of linguistic word order. Cues that matched the targets location on positive trials were, however, no more effective than cues that mismatched its location. These findings suggest that words are represented within a spatial framework in which the left margin is used as reference. Knowledge of a words spatial location does not increase the accessibility of its linguistic content, however, as should be the case according to some spatial indexing accounts.

Parafoveal predictability

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The length, frequency and predictability of words in text all affect the time spent inspecting them. Measured predictability exerts an effect independent of the other two properties. It also appears to be different in kind, involving, by definition, computations carried out over many words. As a result, current models of eye movement control in reading reveal an uncertainty about how best to characterise the underlying mechanism. In this paper I re-examine a recent proposal that the identification of words not yet fixated is (a) a function of how predictable they are, and (b) reflected in current foveal processing. This second proposition has proved controversial. I will present new data confirming the suggestion that inspection time on a given word n is longer (not shorter) when a neighbouring word $n+1$ is more predictable. This result, however, is qualified by a strong interaction with the class (function or content word) of the foveal stimulus. Consideration of this outcome may point to a better characterisation of the precise mechanism involved in the predictability effect.

Multivariate Analyses of Distributed Cognitive Processing in Reading Fixations

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Theory must guide multivariate analyses of eye movements during reading. This presentation will propose a data-analytic framework to this end. Reading fixations reflect a surprisingly large number of oculomotor, sublexical, lexical, and sentence-level effects as well as effects relating to differences between writing scripts and differences between readers. Inferences about contributions of these effects are typically tied to a single predictor variable. Unfortunately, this one-to-one mapping between measure and cognitive process may not be correct. Rather, a specific word-related variable (e.g., bigram frequency of initial letters) is likely to express not only one cognitive process (e.g., sublexical access of orthography) but also so-called high-level processes such as difficulty of integrating the word in the current sentence context. Last not least, the strength (and possibly even the direction) of these effects may change during a fixation. The presentation illustrates that a dissociation of these processes becomes possible by estimating the effects not only for properties of the fixated word, but also for the properties of the words next to the fixated one, and by comparing effects between different languages and different writing systems. The analyses focus on word predictability effects from prior sentence context and three types of frequency effects (lemma, type, and bigram), all of them for the fixated word as well as the two words to the left and the two words to the right of the fixated word (word quintet). Skipping status of the word to the left and the word to the right is also taken into consideration. Results are reported from Chinese, English, and German. Statistical inferences are based on (generalized) linear mixed models and repeated-measures quantile regression analysis. The multivariate and multilevel data-analytic framework is motivated by a theory of distributed processing in the perceptual span, dynamically modulated by local processing demands. This framework is drawn upon and compatible with experimental research about and computational modeling of eye-movement control during reading.

Fixational Eye Movements are Influenced by Small Postural Movements

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Large eye movements, i.e., saccades and smooth pursuit can be induced by large passive or active body movements, e.g., via vestibulo-ocular and opto-kinetic reflexes. For small fixational eye movements, however, no clear link to small postural movements, i.e., center of pressure movement, has been established. Nevertheless, the link is expected to play an important role in retinal image stabilization, one of the major roles suggested for fixational eye movements. Here we investigate the influence of postural sway during quiet standing, represented by the center-of-pressure movement, on fixational eye movements. In an experiment consisting of two sessions with different postures, one sitting and one quietly standing, we measured eye movements during prolonged fixations on a tiny fixation stimulus presented on a computer screen. In the standing condition the center-of-pressure movement was recorded simultaneously to eye movements, allowing to investigate temporal interactions. Measures describing fixational eye movements, i.e., microsaccade rate, microsaccade amplitude, standard deviation of eye position and Hurst exponents were compared across conditions. Revealing unchanged, i.e. microsaccade rate, horizontal standard deviation, and changed properties, i.e. microsaccade amplitude, vertical standard deviation and Hurst exponents. The investigation of temporal properties was performed by shifting the center-of-pressure and eye movement time series against each other and analyzing cross-correlations. This allowed the identification of temporal patterns of coupling. The observations suggest visually guided compensatory mechanisms in fixational eye movements for postural sway.

The Perceptual Span and Preview Benefit in Reading

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Research on the perceptual span during eye fixations in reading will be reviewed, and recent research in my lab will be presented. Recent experiments varying the effect of spaces between words (with minimal effect on the size of the perceptual span) will be discussed as will an experiment demonstrating that reading speed influences the size of the perceptual span. Research on preview benefit will also be reviewed, and other recent research from the lab will be presented in which we reverse the order of morphemes in a word in both Chinese and English. The differential pattern of results between the two writing systems illustrates some differences between the two.

Neural Encoding with Jittering Eyes

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Our eyes are never at rest. Even when attempting to maintain fixation on a stationary point in the scene, small fixational eye movements keep the stimulus on the retina always in motion. This talk will focus on the impact of fixation instability on the statistics of visual input signals and on the neural encoding of visual information. Building upon recent theoretical and experimental results, I will argue that an unstable fixation constitutes an efficient strategy for acquiring information from natural scenes. According to this theory, the fluctuations of luminance caused by the incessant motion of the eye equalize the power present at different spatial frequencies in the spatiotemporal stimulus on the retina. This phenomenon emphasizes fine spatial detail and might enable a temporal multiplexing of visual information from the retina to the cortex. This theory posits motor contributions to early visual representations and suggests that perception and behavior are more intimately tied than commonly thought.

Word Frequency and Contextual Predictability Effects in Reading: The Role of Parafoveal Information

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Two key variables that influence eye movement behavior during reading are a word's frequency of occurrence and its predictability from a prior context. Past eye movement research has generally demonstrated that the relationship between these two factors is additive in fixation time measures (but interactive with respect to word skipping). In two experiments, we examined the word frequency x predictability interaction in target word fixation times during reading. Targets were either high frequency (HF) or low frequency (LF) words. Additionally, such words were embedded in the second sentence of two-sentence passages whose predictability (as determined from prior Cloze probability norms) was low, medium, or high (LP, MP, or HP). In Experiment 1, participants read the passages under normal viewing conditions. In Experiment 2, a boundary paradigm was used. When participants' eyes were to the left of the target, a pronounceable nonword letter string sharing the overall shape of the target was initially presented. When participants' eyes crossed the boundary, the letter string was replaced by the target. These manipulations allowed us to examine how foveal processing of word frequency and predictability is modulated by the acquisition of prior parafoveal information. Results are discussed within a time-course framework.

Eye movement and EEG responses during serial and free viewing of emotional images

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Previous research has shown that, in the EEG, the 4 – 6 Hz responses emerge as a response to the processing of emotional visual stimuli. The purpose of the present study was to analyze the time course of emotional attention and processing of emotional image content during free viewing. In order to do so eye movement and EEG data were recorded simultaneously while 17 right-handed participants (9 female, mean age 22 years) viewed images (from the International Affective Picture System, IAPS) with varying emotional valence. Sets of four images were shown either serially or in parallel. An ‘emotional’ image set included one image with a high positive or high negative valence content among neutral images. A ‘neutral’ set comprised of four neutral images. After the presentation of a four-image set, the participants were asked to indicate which picture - if any - was emotional and to rate the selected image on the valence and arousal dimensions (on self assessment manikin scale, SAM).

The results from the serial presentation condition showed greater EEG responses in the 4 – 6 Hz frequencies for the negative valence images as compared to the neutral stimuli. In the parallel condition, the same sets of four images were presented simultaneously on the screen. The EEG responses were analyzed time-locked to the eye fixations on an emotional image. This experimental setting allowed for direct comparisons of the serial and free viewing (the parallel) conditions. The hypothesis was that 4 – 6 Hz EEG responses emerge when visual attention is directed on the emotional stimulus.

Display change detection during reading: d' and ROC analyses

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Keywords: eye movements, reading, preview, display changes, ROC

In the boundary change paradigm, when a reader’s eyes crosses an invisible boundary location a preview is replaced by a target word. Readers are generally unaware of such display changes due to saccadic suppression. However, some readers detect changes on a few trials and a small percentage of readers detect many changes. We conducted a study in which we combined eye movement data with signal detection confidence rating analysis to investigate aspects of display change detection. After reading each trial, readers had to indicate how confident they were that a display change occurred. On half the trials the display change occurred during the saccade (immediate condition); on the other half, it was slowed by

15 ms (delay condition). Target words were presented in alternating case. Identical, word, and non-word previews were used. For each preview type, the case of the preview letters matched the target on half the trials; on the other half, the case of all the preview letters was different from that of the target. We examine how the target preview relationship influenced the d' and fixation duration data. ROC curves constructed from the confidence ratings will be presented and discussed.

Character and word processing of reading Chinese in parafovea

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There is a growing body of eye movement studies showing that lexical properties of characters and words can be extracted in parafovea while the reading of Chinese. Comparing to alphabetic scripts, the structure and functional unit of Chinese script are less transparent in several perspectives. First, there is no space between words to indicate word boundary in Chinese sentence. Second, Chinese is characterized as a logographic script with deep orthography and the role of phonological coding is less clear than alphabetic scripts. Third, most Chinese characters are also morphemes carrying semantic information. Eye movement studies using the boundary paradigm have shown the preview effects of word segmentation, phonological coding, and semantic processing during reading Chinese. These effects could be explained by taking other perceptual or contextual factors together into account. In conclusion, reading Chinese is similar to alphabetic scripts, in which the word is the meaningful unit to be processed. However, as the constituents of words, characters also provide the useful information to access the word representation at different lexical levels. The underlying mechanisms of eye movement control in reading Chinese could be revealed by investigating the interaction of character and word processing

The Perceptual Span and Parafoveal Preview Effect of Skilled and less Skilled Readers - an Eye Movement Study

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Do skilled and less skilled readers differ in their timelines of information extraction during a fixation? The present presentation addresses this issue in Chinese reading with respect to both the quality and the quantity of information extraction. Quantitative differences are reflected in the size of the perceptual span; qualitative differences are revealed by different types of information (orthographic, phonological, etc.) as seen in parafoveal preview benefits. Previous studies tested if reading skill modulated the perceptual span and some research tested how reading skill influenced the information type acquired in parafoveal preview, but there has been no research which looked at both factors simultaneously. Forty fifth graders and 40 undergraduate students participated in two experiments. In experiment 1, the size of the perceptual span was determined with the moving-window paradigm. In experiment 2, the different types of information were examined with the boundary paradigm. Results showed that the perceptual span of skilled readers was larger than that of less skilled readers. Orthographic and homophonic information was extracted by skilled readers, while orthographic, but not homophonic information was extracted by less skilled readers from parafoveal preview. In summary, the present study indicated that information acquired in a fixation was different for skilled readers and less skilled readers in terms of quality and quantity. The low reading efficiency of less skilled readers could be due to them acquiring less information during a fixation than skilled readers. Less skill readers differ from skilled readers not only in the quantity of information, but also in the type of information gained from preview.

Associated Event / Begleitveranstaltung Kognitive Ethnologie

Satellite conference organised by Andrea Bender, Sieghard Beller, Freiburg University

Begleitkonferenz organisiert durch Andrea Bender, Sieghard Beller, Universität Freiburg

Die Rückkehr der Kognitiven Ethnologie in die Kognitionswissenschaften

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Zur «kognitiven Wende» in den Sozialwissenschaften hat die Kognitive Ethnologie einen entscheidenden Beitrag geleistet, und im interdisziplinären Gebäude der Kognitionswissenschaften war sie anfangs eine der tragenden Säulen. In den letzten Jahren jedoch scheint sie sich von den übrigen Kognitiven Wissenschaften zunehmend zu entfremden. Dabei wird die Bedeutung von Kultur für Kognition – und damit auch der Kognitiven Ethnologie für die Kognitiven Wissenschaften allgemein – außerhalb der Ethnologie immer dringlicher erlebt; die Expertise der Kognitiven Ethnologie ist gefragter als je zuvor. Dieser Workshop soll dazu beitragen, der für beide Seiten unvoreilhaftigen Entfremdung gegenzusteuern und die Kognitive Ethnologie wieder stärker mit den Kognitionswissenschaften zu vernetzen, indem er aus aktuellen Forschungsprojekten berichtet und kognitionsethnologisches Methodeninventar vorstellt.

Theory of Mind Across Cultures: Bosmun (Papua New Guinea) and Tonga (Polynesia)

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The attribution of mental states is a central cognitive ability on which human culture (and language) is based. Various studies which have analysed the *Theory of Mind* (ToM) in so-called Western cultures reveal that children develop a mentalistic understanding of self and other and the ability to predict behaviour at about the age of five. Cross-cultural approaches, however, provide deviating data and give rise to the question whether the acquisition of this cognitive competence is universal. Do children elsewhere start to differentiate between their own mental states and those of others at the same age? If not, why is that the case? This question was vital to an interdisciplinary project on ToM research, prompted by Heidelberg scholars from psychology and social anthropology. Apart from discussing issues of ToM theoretically, a number of psychologist-anthropologist-teams went out to Pacific countries in search of empirical data.

There are common research methods in psychology, which deal with false belief tasks such as the *deceptive container task/unexpected content task*, the *change of location task* and the *good/ bad puppet task*. For the study of ToM in Bosmun and Tongan children, it was both necessary and revealing to adapt these experiments (developed for the study of ToM in Western societies) to the distinct cultural contexts and local conditions. Furthermore, respective cultural knowledge about childhood, socialisation, morality and social structure was essential for a proper interpretation of the results. With our examples of two ToM studies conducted in Pacific societies we aim to show that the attribution of mental states is not only a matter of cognitive achievements (competence) but also a matter of socio-cultural rules (performance).

Die kulturelle Konstitution kausaler Kognition

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Kausalität ist eines der Kernkonzepte in unserem Bemühen zu verstehen, was um uns herum vorgeht, und die gefundenen Erklärungen prägen wiederum unsere Urteile, Emotionen und Intentionen. Das macht Kausalkognition zu einem Kernthema der Sozial- und Kognitionswissenschaften. Die bisherige Forschung war allerdings in verschiedene Paradigmen zersplittert, die jeweils einer bestimmten (Sub-) Disziplin angehörten und auf einzelne Domänen fokussierten, was zu einem eher fragmentierten Bild kausaler Kognition führte. Außerdem wurde Kultur als konstitutiver Faktor eher beiläufig beachtet. Dabei ist durchaus kulturelle Varianz zu erwarten: bei der Abgrenzung von Domänen, bei den Kausalkonzepten und ihrer Verarbeitung und sogar bei der Bereitschaft, überhaupt nach Kausalerklärungen zu suchen. Eine systematische Erforschung der kulturellen Konstitution kausaler Kognition ist deshalb überfällig – ebenso wie die Ausweitung des Fokus über die konzeptuelle Ebene hinaus. Um dies zu erreichen, muss kognitive Expertise mit kultureller Expertise verknüpft werden, und dies setzt zwingend die Re-Integration der Ethnologie in die Kognitionswissenschaften voraus, zu denen sie einst gehörte. In unserem Beitrag skizzieren wir zunächst bisherige Forschungsbefunde und stellen dann verschiedene Initiativen vor, deren Ziel es ist, eine integrierte Perspektive auf Kausalkognition über Kulturen, Domänen und Disziplinen hinweg zu entwickeln.

Naive Theorien über Licht und Wärme bei den yukatekischen Maya

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Während Vertreter der Kognitiven Anthropologie in den 50er und 60er Jahren noch das kollektive Wissenssystem einer Kultur zu erfassen versuchten und an diesem Anspruch scheiterten, ist in jüngster Zeit das im Alltag erworbene und angewandte Wissen einzelner Individuen verstärkt erforscht worden. Im Zusammenhang mit der Erforschung menschlichen Alltagswissen, das auch als naives Wissen bezeichnet wird, sind in den letzten Jahren vor allem der Erwerb, die Entwicklung und der Inhalt fundamentaler Wissensdomänen, wie der Biologie, Psychologie oder Physik, in das Zentrum des Forschungsinteresses gerückt.

Eine kritische Durchsicht derjenigen Forschungsarbeiten, die sich mit naiver Physik beschäftigt haben, zeigt allerdings, dass sich der Großteil der Studien vor allem auf die Beschreibung und Analyse naiver physikalischer Vorstellungen europäischer und US-amerikanischer Kinder und Erwachsener beschränkt hat. Gleichzeitig lässt sich auch ein thematisches Ungleichgewicht erkennen. So sind beispielsweise naive Vorstellungen über Kraft und Bewegung in weitaus umfangreichem Maße untersucht worden, als dies für naives Wissen über Licht und Wärme der Fall ist.

Die im Rahmen der Werkstattberichte vorgestellte Studie untersucht das Alltagswissen der indigenen Bevölkerung Yucatáns über Licht und Wärme. Ausgehend von theoretischen und methodischen Ansätzen der Kognitiven Anthropologie sollen die folgenden Fragen erörtert werden. Welche Rolle spielen Licht und Wärme in der Gesellschaft der yukatekischen Maya? Auf welche Rahmentheorien über Licht und Wärme greifen die yukatekischen Maya in ihren Alltagshandlungen zurück? Und aus welchen Wissensinhalten setzten sich diese Rahmentheorien zusammen? Die Präsentation basiert dabei auf vorläufigen Ergebnissen, die während eines Forschungsaufenthaltes in einer mayasprachigen Gemeinde im mexikanischen Bundesstaat Yucatán gewonnen wurden.

Mobiles *eye-tracking* im Museum: Ergebnisse einer Besucherstudie am Linden-Museum Stuttgart

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Die zentrale Forschungsfrage der Besucherstudie über die Ausstellung “Südsee-Oasen: Leben und Überleben im Westpazifik” im Linden-Museum Stuttgart lautete: Inwieweit stimmt die Evidenzzuschreibung der Besucher mit der Intention der Kuratorin überein? Dabei war mobiles Eye-Tracking die gewählte Methode, um in einer explorativen Studie die Blickbewegungen und in anschließenden Verbalisierungen (*cued retrospective verbalization*) das “*meaning making*” von akquirierten Teilnehmern zu untersuchen. Diese Studie diente als Ausgangsbasis für die systematische Beobachtungsstudie, bei der Verhaltensausschnitte echter Besucher an ausgewählten Stationen in der Ausstellung anhand der bisherigen Erkenntnisse überprüft wurde. In diesem Vortrag werden vorläufige Ergebnisse dieser Studien vorgestellt.

Methoden – warum?

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Methodenveranstaltungen werden in der Ausbildung selten geliebt; sie gelten als „trocken“ und haben (auf den ersten Blick) oft wenig mit den inhaltlichen Themen zu tun, die einen eigentlich interessieren. Methoden werden manchmal auch ganz abgelehnt mit dem Argument, dass die gewählte Methode das Ergebnis bereits nahelege und die Forschenden damit eine vorherbestimmte Perspektive einnehmen. Aber auch wenn Methodikveranstaltungen nicht zum Spannendsten gehören mögen und die Methodik einer Untersuchung natürlich immer kritisch hinterfragt werden soll, so ist es dennoch eine Illusion zu glauben, wissenschaftliche Fragen methodenfrei beantworten zu können. Und auch um die Ergebnisse wissenschaftlicher Arbeiten zu beurteilen, sind Methodikkenntnisse unerlässlich. Als Einführung zur kognitionsethnologischen Methoden-Fortbildung sollen einige grundlegende Aspekte des methodischen Arbeitens beleuchtet und Fehlannahmen aufgedeckt werden.

Pile-Sorts und ihre Auswertungsmethoden

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Hand in Hand mit anderen Feldforschungsmethoden bieten *Pile Sorting* Verfahren eine Möglichkeit, sich kulturell geteilten Konzepten und Konzeptstrukturen (wie z.B. Taxonomien) systematisch und unter Verwendung statistischer Analyseverfahren anzunähern. Grundlage dafür bilden Begriffe, Gegenstände oder Abbildungen aus der betreffenden Forschungsdomäne, die durch mehrere Informanten entsprechend ihrer Ähnlichkeit in einzelne Gruppen sortiert werden. Begriffe, Konzepte oder Objekte, die kulturell als besonders ähnlich repräsentiert werden, sind somit auch häufiger zusammen in einer Gruppierung zu finden. Diese Häufigkeiten, mit welcher die einzelnen Entitäten gemeinsam auftreten, bilden die Grundlage für statistische Analyseverfahren wie Multidimensionale Skalierung und Clusteranalysen. Ziel der Auswertungsmethoden ist es, zum einen latente Dimensionen zu identifizieren, auf welchen sich die einzelnen Begriffe oder Objekte anordnen lassen, und zum anderen Gruppen oder Kategorien zu bestimmen, die Aufschluss über die mentale Repräsentation in einer Wissensdomäne geben. Innerhalb des Workshops werden überblicksartig verschiedene *Pile-Sort*-Techniken und deren Auswertungsmethoden vorgestellt und anhand von Beispielen das schrittweise Vorgehen von der Vorbereitung der Untersuchung bis zur Datenanalyse besprochen. Außerdem wird auf die Vor- und Nachteile der einzelnen Techniken für die Datenerhebung und Auswertung eingegangen.

Die Genealogische Methode

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Woher kommen wir? Wer gilt als Verwandter und was macht Verwandtschaft aus? Beziehungen zu Verwandten stellen eine besondere 'Sorte' persönlicher Netzwerke dar. Wie werden Freunde zu Verwandten (z.B. Patentanten und -onkel)? Wie viel dürfen Schwiegereltern bei der Kinderziehung mitreden? Wer wird wie, wann und wie lange unterstützt, beschenkt, besucht oder angerufen? Mit wem verbringt die Familie Fest- und Feiertage? Allen Antworten gemeinsam ist die große Emotionalität in Fragen der Verwandtschaft. Das sind Fragen, die alltägliches Leben ausmachen. Fragen, an denen Ethnologen besonders interessiert sind. Die Ethnologie hat seit ihren Anfängen ein Instrumentarium zur Erhebung von Informationen über verwandtschaftliche Beziehungen und vom Wissen über Verwandte entwickelt. Diese so genannte "Genealogische Methode" steht im Mittelpunkt meines Beitrags. Sie ist Grundlage der Erhebung von Klassifikationen von Verwandten und Basis für die Aufnahme von Verwandtschaftsterminologien, die in den 1950er Jahren eine wichtige Rolle in der kognitiven Ethnologie spielten. Gesellschaftliche Veränderungen bieten neue Herausforderungen für die kognitiv orientierte Verwandtschaftsethnologie: "Deine Kinder und meine Kinder streiten sich mit unseren

Kindern” kann in “Patchwork-Familien” Realität sein. Auch verwandtschaftliche Konstellationen auf der Basis neuer Reproduktionstechnologien erweitern die bisherigen Möglichkeiten. Neben Mutter, Adoptivmutter und Patentante kann ein Kind auch noch eine Leihmutter oder eine Ei-Spenderin als Mutter, einen biologischen Vater (Samenspender oder Liebhaber) und einen sozialen Vater haben. Der Einwand, die “biologischen Helfer” seien doch unbekannt, zählt nicht. Manchmal sind gerade Abwesende für die Identität entscheidend. Die Intensität beispielsweise, mit der Adoptivkinder in vielen Fällen im Erwachsenenalter nach ihren biologischen Eltern suchen zeigt, welche Bedeutung sie gewinnen können – und sei es nur in der Vorstellung.

Mobiles *eye-tracking* im Feld: Anwendung, Reaktionen und potentielle Probleme

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Mobiles Eye-Tracking ist eine relativ neue Methode in Bezug auf Besucherstudien in Museen. Im Vortrag wird es darum gehen, die Anwendung im Museum bzw. im Feld für Ethnologen zu diskutieren. Es wird über Reaktionen der beteiligten Personen (Teilnehmer, Forscher, Museumsmitarbeiter) aus der Besucherstudie am Linden-Museum berichtet und die technischen Probleme und Grenzen dieser Forschungsmethode bzw. des im Linden-Museum benutzten Eye-Trackers werden beschrieben.

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As the latest biannual meeting of the German Society for Cognitive Science (Gesellschaft für Kognitionswissenschaft, GK), KogWis 2010 at Potsdam University reflects the current trends in a fascinating domain of research concerned with human and artificial cognition and the interaction of mind and brain.

The Plenary talks provide a venue for questions of the numerical capacities and human arithmetic (Brian Butterworth), of the theoretical development of cognitive architectures and intelligent virtual agents (Pat Langley), of categorizations induced by linguistic constructions (Claudia Maienborn), and of a cross-level account of the “Self as a complex system“ (Paul Thagard).

KogWis 2010 integrates a wealth of experimental research, cognitive modelling, and conceptual analysis in 5 invited symposia, over 150 individual talks, 6 symposia, and more than 40 poster contributions.

Some of the invited symposia reflect local and regional strengths of research in the Berlin-Brandenburg area: the two largest research fields of the university Cognitive Sciences Area of Excellence in Potsdam are represented by an invited symposium on “Information Structure” by the Special Research Area 632 (“Sonderforschungsbereich”, SFB) of the same name, of Potsdam University and Humboldt-University Berlin, and by a satellite conference of the research group “Mind and Brain Dynamics”. The Berlin School of Mind and Brain at Humboldt-University Berlin takes part with an invited symposium on “Decision Making” from a perspective of cognitive neuroscience and philosophy and the DFG Cluster of Excellence “Languages of Emotion” of Free University presents interdisciplinary research results in an invited symposium on “Symbolising Emotions”.