Martin Warnke

Logic as a Medium

Computer games are rigid in a peculiar way: the logic of computation was the first to shape the early games. The logic of interactivity marked the action genre of games in the second place, while in massive multiplayer online gaming all the emergences of the net occur to confront us with just another type of logic. These logics are the media in which the specific forms of computer games evolve. Therefore, a look at gaming supposing that there are three eras of computation is taken: the early synthetical era, ruled by the Turing machine and by mainframe computers, by the IPO principle of computing; the second, mimetical era, when interactivity and graphical user interfaces dominate, the domain of the feedback loop; and the third, emergent era, in which the complexity of networked personal computers and their users is dominant.

Every game, every application running on digital computers uses computational logic as the base medium of its performance. However, compared to later stages of computer programming and computer use, the predominance of computational logic governs the rules of the game of this chapter. The dispositive of this kind of computation is the schema of input, processing and output, IPO, in German known much more nicely as the EVA-Prinzip.

Since even in the most advanced application of digital technology input, processing and out-put takes place all the time, in ever faster succession, I will have to recall the specific restrictions, or maybe better: deprivations, which are typical for this era. The first is: in case that there is a reaction to the output of the computation which determines the next input, the succession of IPO after IPO should be so slow that there is no inclination to think of it as a closed loop operat-

ing in real time. Typically massive computing is done every time in between input and output, response time is no central issue. It is not time critical, as Claus Pias (2002) calls the genre of action games. The second deprivation concerns deprivation: there is no significant contact to the surroundings, no communication with others that is worth being called so. The automaton works in autistic isolation.

Computational Logic is the Medium, and IPO is its Dispositive

So what types of games evolved in this medium of computational logic, which forms are observable? One class of examples are the digital variants of the classical board and card games. CHESS, CHECKERS, and TIC-TAC-TOE, GO, SKAT, BRIDGE. Despite the fact that there is a succession of IPOs, the computer operations are totally determined and confined by Turing computability, sometimes under the influence of chance. The von Neumann and Morgenstern game theory directs the moves, computational logic provides for the overall functionality. Ideally spoken, a Turing Machine operates in autistic isolation from move to move:
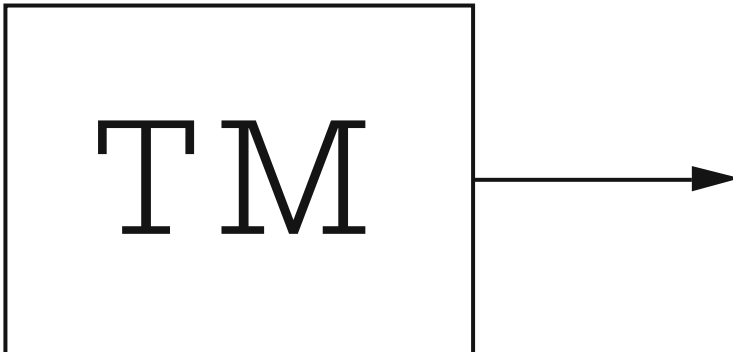

Fig. 1: A Turing machine working in a synthetical fashion: autistic

Out of the form of this medium, a style of these IPO-games emerged: it is the relentless perfectionism of computational logic, which becomes stronger with every cycle of Moore's Law. By searching immense numbers of possible moves in databases of positions, computers practice a seemingly error-free style of cold bookkeeping. This style is so strong that even World Chess Champion Gary Kasparov in 1997 falsely assumed that IBM's Deep Blue was unable to commit errors, thus giving up the game instead of trying to reach a remis, which Kasparov certainly would have done when playing against a human opponent.

But there is still another type of IPO-game. Pias calls them configuration critical and puts them into his category of strategy games. The most classical one in this respect is Conway's GAME OF LIFE (1970), belonging to the category of cellular automata, where the player prepares the board and just watches the configuration to evolve. The fun comes out of the guess which starting configuration is interesting und just watching its progression. The rules, by the way, are very simple:

- Any live cell with fewer than two live neighbours dies, as if caused by underpopulation.
- Any live cell with more than three live neighbours dies, as if by overcrowding.
- Any live cell with two or three live neighbours lives on to the next generation.
- Any dead cell with exactly three live neighbours becomes a live cell.

All depends on the seed, the initial configuration, the rest is done by computational logic. This game is so much due to computational logic that it is even possible to prove that it is equivalent to a Turing machine. That means: the game is the Turing machine. Or the Turing machine is the game. And some people find these games even more interesting, e. g. Stephen Wolfram (2002) tries to found nature

itself on the concept of cellular automata. In his book *A New Kind of Science*, he proposed to reformulate physics as a sort of GAME OF LIFE. Nature as a game. THE SIMS (2000) are a sort of GAME OF LIFE, too. You prepare and let things evolve. You are the creator of a world, including people, mostly bulimic, always autistic, that obey simple rules.

Fig 2: THE SIMS – an autist's get together

The genre of adventure games evolved from the misuse of computers to build the ARPANET (Pias 2002:199). The Mammoth Cave in Kentucky in 1973 found a digital counterpart within a computer installed to build parts of the ARPANET, and ever since, people found their joy trespassing databases, modeling caves or other complicated terrain.

All these games exploit the medium of computational logic. The forms that express themselves in this medium even form a style, and they still do today in ever new versions of the same dispositive.

Interactional Mimesis as a Medium

By grasping the arrow from input over processing to the output and bending it back to the input, the cybernetic feedback loop enters the world of computation.

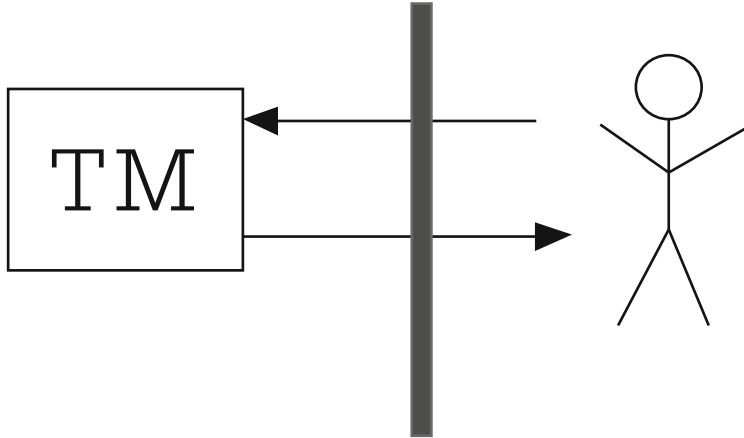Man and machine interact through a user interface:

Fig. 3: Man machine interaction through the GUI

Alan Turing (1973) described the computer in its full range of capabilities computationally, but his view did not take into account user intervention, as the early machines actually did not do either. Interactive gaming was invented by William Higinbotham in 1958, opening a brand new field of computer use, misuse, and thus also of enjoyment (Pias 2002:13). In his TENNIS FOR TWO (1958), William Higinbotham presumably showed the first fully fledged video game. It was being played on an analog computer, telling us that the demands for the Tennis game were far ahead of digital times.

Simulating the physics of free fall under friction and impact, it gave users the opportunity to interactively control the game's parameters, the exact moment in time when one of the two players hit

the ball with the virtual racket. Though it was not an enemy but a partner – a distinction that sometimes vanishes in real life as well – the dispositive was typically cybernetic: how to hit the flying object in real time? It was so much fun for those who came to Brookhaven National Laboratory's annual visitor's day that they queued back to the open door of the lab to be able to play the game.
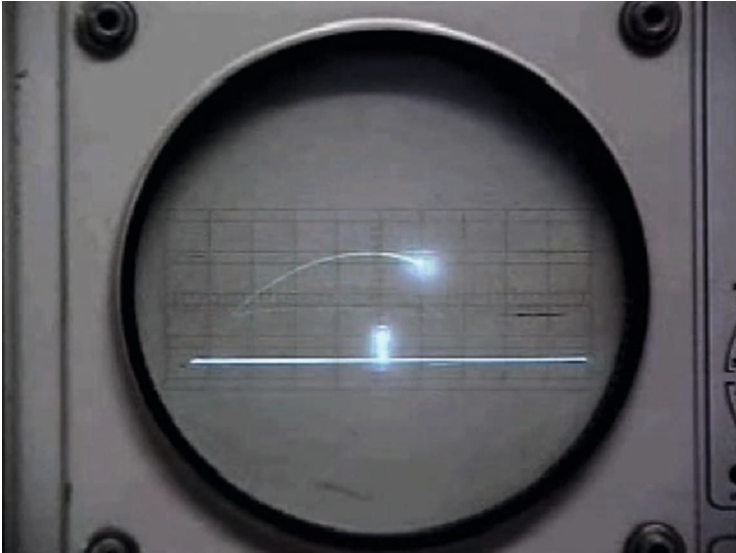

Fig. 4: TENNIS FOR TWO

That the computer being used was an analog one strikingly shows that the logic of this game was not computational complexity calling for a digital device but the real time mimicking of real world processes in a cybernetic feedback loop. Computing had to be fast in the first place here, not any kind of incarnation of a Turing computable function. It had to feel really real, and analog computing did just fine for that.

We are now in the realm of virtual reality, and what Myron Krueger (1983 and 1990) described as Artificial Reality; what he built in the late sixties as an environment that responded to the people that were in it is now being sold as commercial games, called Sony's EyeToy Play or Nintendo's Wii. The user mimetically enacts what happens on the screen, and this only works on digital computers once they are fast enough.

Computer sports games are closely related to computer animation, since there are avatars to set in motion on the screen. The term "mimetic" stems from antique theatre and denotes the dispositive that someone enacts what others have to feel (Kamper 1991). My favorite example of this kind of man machine interaction shows the chief animator of the heroine of *Finding Nemo* (USA, 2003), manic depressive Dorie, who pushed himself into a sad mood to better find the right facial expression for a fish suffering from mental pain. Have a look yourself, also at the fact that animator and animated are mimetically similar up to the shape of their heads:
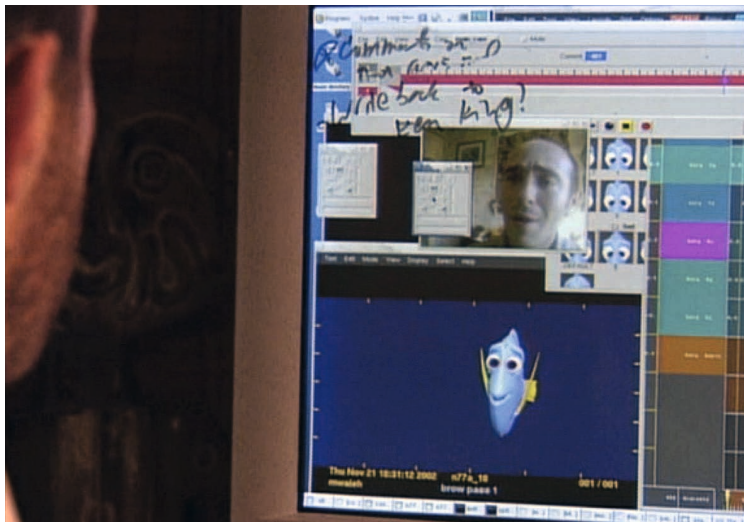

Fig 5: On Men and Fish

Mimetic enacting within a cybernetic feedback loop is the logic of this second set of games. Computation is no necessary precondition, maybe we will even experience a renaissance of analog circuitry for this type of gaming at some point. The form of these games is fast interaction over ergonomic peripherals, yielding wet hands and high blood pressure. Action!

Communicational Emergences as a Medium

Although nowadays there are several games with communicative elements, the overwhelming feeling of instantaneous conversation within a group of people meeting in the same room only emerges when playing a first-person-shooter like HALF-LIFE: COUNTER-STRIKE (2000). When I did this the first time, I experienced a flash-back that teleported me back again into the play-grounds of my youth playing cops and robbers.

It was actually a vision of Paul Baran, the inventor of packet switching, that became of eminent importance to the later Internet, when summing up his investigations on the basics of ARPANET. He wrote in 1964:

> An ideal electrical communications system can be defined as one that permits any person or machine to reliably and instantaneously communicate with any combination of other people or machines, anywhere, anytime, and at zero cost.

> It should effectively allow the illusion that those in communication with one another are all within the same soundproof room – and that the door is locked.

The commercialization of the Internet casts doubts on the "zero cost" vision, and caring parents cast their spell on "anytime", but the experience is exactly the one that Baran had in mind: telepresence, immediate communication. And indeed, the protagonists of an ego shooter

tournament do not care whether they talk over Voice over IP or over air with presumably little oxygen left in it after all that gaming: it does not matter anymore.

Lots of people at lots of machines communicate. It is impossible to distinguish between contributions of machines or humans, the user interface becomes foam-like.
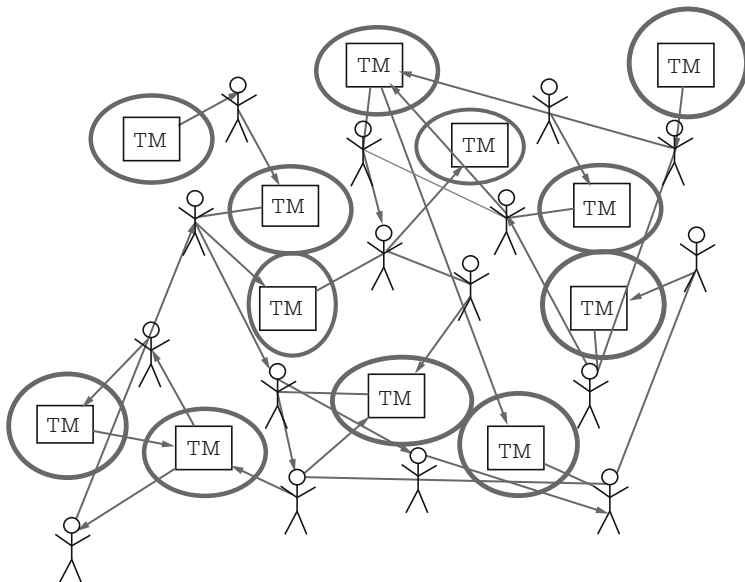

Fig. 6: Who is who we do not know: man and machine in foam

We arrived at the era of highly distributed communication spreading over the internet. Neither computational complexity nor closed feedback loops are the dominant dispositifs – although both of them are included – but the emergence of a communication system prevails. This is accomplished by being online. This now is the logic of the game. It is of such great importance that recent communication devices could do very well without the full computational power or all

of the ergonomic peripherals we got used to in virtual environments, but still being of utmost attractivity. Communication really matters, the more ubiquitous the better, it is the "anywhere" in Baran's vision.

This even provides the opportunity of blending real and virtual space. The first augmented reality applications arrived for mobile devices, and they give us an idea how virtual space will blend with real space, how, by being always on, computer mediated communication will boost gaming beyond Turing computability, beyond Wiener's feedback loop into the logic of the complexity of communication and its contingencies that is its medium.

What is the form of games in this medium of communicative meshing? It is community.

No one can still argue that computer games make people lonely. These games, like COUNTER-STRIKE or WORLD OF WARCRAFT (2004) meet a central need of mankind so much so that they are highly addictive. It is the need for community. It reflects the fact that communication reconstitutes society, and that the computer now fully has arrived in it.

References

Baran, Paul (1964): *On Distributed Communications: IX Summary Overview*, http://www.rand.org/pubs/research_memoranda/2006/RM3767.pdf.

Pias, Claus (2002): *Computer Spiel Welten*, Munich: Sequenzia.

Kamper, Dietmar (1991): "Mimesis und Simulation", in: *Kunstforum international* 114, 86-94.

Krueger, Myron W. (1983): *Artificial Reality, Reading*, Massachusetts: Addison-Wesley.

— (1990): *Artificial Reality II, Reading*, Massachusetts: Addison-Wesley.

Turing, Alan M. (1937): "On Computable Numbers, with an Application to the Entscheidungsproblem", *Proceedings of the London Mathematical Society 2* (42), 230-265.

Wolfram, Stephen (2002): *A New Kind of Science*, http://www.wolframscience.com/nksonline/toc.html

HALF-LIFE: COUNTER-STRIKE (2000), Vivendi, PC.
GAME OF LIFE (1970), John Horton Conway.
TENNIS FOR TWO (1958), William Higinbotham, analog computer.
THE SIMS (2000), Electronic Arts, PC.
WORLD OF WARCRAFT (2004), Blizzard Entertainment, PC.

Finding Nemo (2003): Andrew Stanton, Lee Unkrich, USA. Bonus material on DVD.

Biography

Martin Warnke, PhD

Associate Professor in the Institute for Aesthetics and Culture of Digital Media, Leuphana Universität Lüneburg

Research:

Digital Media, Computers and the Arts

http://www.leuphana.de/martin-warnke.html

warnke@leuphana.de

Publications:

– "Computer-Kriegs-Spiele. Oder: eine Kultur der Gewalt", in: *Bilderschlachten. 2000 Jahre Nachrichten aus dem Krieg. Technik Medien Kunst*, ed. by H. Nöring, T.M. Schneider and R. Spilker, Göttingen: Vandenhoeck & Ruprecht 2009, 380-389.

– *HyperKult II. Zur Ortsbestimmung analoger und digitaler Medien*, ed. (with Wolfgang Coy and Georg Christoph Tholen), Bielefeld: Transcript 2005.

– *HyperKult. Geschichte, Theorie und Kontext digitaler Medien*, ed. (with Wolfgang Coy and Georg Christoph Tholen), Basel: Stroemfeld/ Nexus 1997.

Rune Klevjer

Response

Martin Warnke's proposal that computer games have evolved within three different media or 'logics' is an innovative contribution to the discussion of mediality and genre. Like good speculative thought, it offers a perspective – however sweeping – that stimulates new thinking while at the same time connecting with established wisdoms on the field. Warnke's approach is decidedly medium-centered, and very much fitting within the theme of the conference. He articulates a rationale behind the often implicit (or vaguely expressed) assumption that online and multiplayer gaming is very different from single player gaming. Interestingly, he also constructs a model according to which real-time action games, in all their diversity, are seen as a separate medium, distinct from system simulations, strategy, and adventure.

The notion of cybernetic mimesis ('mimetic interaction') resonates with established ideas in game research literature on the significance of the 'cybernetic feedback loop' (Espen Aarseth, Ted Friedman), but with one important difference: Warnke's concept of cybernetic interaction is being exclusively associated with real-time interaction, and placed in contrast to the computational or calculating Turing machine that is seen as the underlying rationale or 'logos' behind strategy or adventure. Such a more narrow and exclusive concept of cybernetic interaction throws a sharper light on real-time graphics and real-time interaction as a particular genre form in games, even if it does not necessarily conflict with the broader and inclusive idea. It is on this point that I find Warnke's intervention especially interesting. He opens up a productive discussion on the unique nature of real-time interactive graphics in games, offering three contentious claims:

Can real-time graphics, from SPACEWAR! (1962) onwards, be subsumed under a more general and not necessarily *computational*

paradigm? Is real-time cybernetic interaction in computer games essentially about pure action – "wet hands and high blood pressure"? And finally: is real-time cybernetic interaction essentially about *mimetic* interaction? The two first claims seem to be interlinked. If we choose to take out digital computation as a defining factor of real-time games, from TENNIS FOR TWO (1958) to Nintendo *Wii*, we will be left with a much narrower range of interactions and experiences; there will be just 'action' in its strictest sense (as with pinball machines or mechanical arcade games), because there will be no world-simulation, and no world-experience, of the kind that only a digital computer can produce.

As for the mimetic part, the central claim is difficult to grasp in its brevity. We must assume that a notion of 'mimetic enacting' that includes playing TENNIS FOR TWO as well as animating Dorie in *Finding Nemo* (2003) is a broad one, possibly bordering on the metaphorical. At the same time, the phrases "someone enacts what others have to feel", and 'mimicking of real world processes' point towards something much more distinct. In any case, the question remains: in what sense would playing TENNIS FOR TWO be a mimetic activity? Is the mimetic dimension essential to its form? Or is it, in this case, in the game's title only? To this reader, Warnke's suggestion that 'virtual reality' captures the central rationale of not just Nintendo *Wii*, animation, and theatre, but also classic arcade-action (including pinball machines?) points to a notion of 'virtuality' (and mimesis) that seems slippery yet intriguing.

References

SPACEWAR! (1962), Steve Russell, PDP-1.
TENNIS FOR TWO (1958), William Higinbotham, analog computer.

Finding Nemo (2003): Andrew Stanton, Lee Unkrich, USA. Bonus material on DVD.

Biography

Rune Klevjer, Dr. Polit.
Associate Professor at Department of Information Science and
Media Studies, University of Bergen.

Research:
Theory and philosophy of computer games, media education.

http://www.uib.no/personer/Rune.Klevjer
rune.klevjer@infomedia.uib.no

Publications:
– "Enter the Avatar. Prosthesis and Telepresence in Real-Time 3D
Computer Game Environments", in: *The Philosophy of Computer
Games*, ed. by H. Fossheim, T. Mandt Larsen and J.R. Sageng. Lon-
don/New York: Springer 2011.
– "Model and Image. Towards a Theory of Computer Game Depic-
tion", in: *Proceedings of The Philosophy of Computer Games Confer-
ence 2009*, http://proceedings2009.gamephilosophy.org.
– "La via della pistola. L'estetica dei first person shooter in single
player", in: *Doom. Giocare in prima persona*, ed. by M. Bittanti and
S. Morris. Milano: Costa & Nolan 2006 (english: http://folk.uib.no/
smkrk/docs/wayofthegun.pdf).