PLAYFUL POTENTIAL – A SHORT GENEAOLOGY OF LUDIC INTERFACES

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This paper proposes that the ludic plays a fundamental role in the development of digital culture. From the beginning, personal computing and its interfaces have shown playful characteristics. The following will reconstruct a short genealogy of playful interaction, focusing on the development of *Spacewar!* as a pivotal moment; and take a critical look at the applicability of ludological concepts to digital media culture.

In a broad sense, ludic interfaces have been around since the beginning of cultural history. Their genealogy is at least as old as archaic board games like Mehen or Senet from Egypt's predynastic era (ca. 3500-3100 BC). The boards of these games offered recreative play in the full sense of the word, bringing together fun and spirituality while interfacing the earthly sphere and the netherworld. However, I would like to use a narrower definition of ludic interfaces that binds the term closer to digital technology, keeping in mind that, on the one hand, computers are related to board games insofar as the architecture of both implements a recursive rule governed process; and underlining, on the other, the qualitative leap in the genealogy of ludic interfaces that Alan Turing's conception of the “universal machine” from 1936 marks, insofar as it is programmable and offers the architecture of a meta-game, i.e. is capable of modeling every conceivable symbolic system. Both games and Turing machines enact the collision of freedom and determinism, “paidia” and “ludus” (Caillois), variable input and processed code, thereby offering an experience that oscillates between contingency and necessity.

Rule based games are key artifacts that helped develop the thinking about computer programs. Turing – as well as other computer pioneers like Charles Babbage, Konrad Zuse, Claude Shannon, John von Neumann and Norbert Wiener – spent time thinking about chess and the possibility of implementing it on the computer. The media theoretician Claus Pias emphasizes the essential role of games in the development of the computer:

The fact that Babbage, Zuse, Shannon, Turing or Wiener spent time thinking about playing chess, is neither biographical coincidence nor ex post ›use‹ or ›misuse‹ of the computer for the sake of play, but rather a ›thought picture‹ [*Denkbild*] (Benjamin) of the computer itself. [1]

Games were exemplary applications in the early years of computer science that offered important solutions for programming problems, which reached far beyond the purpose of play. Furthermore, it was only a few years after the construction of the first computers that the first simple games were implemented on them, one of the oldest documented ones being Noughts and Crosses from 1952.

At the end of the decade, the A.I. pioneer John McCarthy began to work on his chess program at MIT, with the help of students from the Signals and Power Subcommittee of the Tech Model Railroad Club (TMRC). Shortly thereafter, a group of these students formed around McCarthy's assistant Steve Russell and developed the first digital action game between December 1961 and April 1962 on the Electronics Research Laboratory's brand new PDP-1 (Programmed Data Processor): *Spacewar!* [2] The PDP-1 was equipped with one of the first programmable cathode ray tube screens and, more importantly, followed the direct interaction paradigm that had been inaugurated by its predecessor the TX-O (Transistorized

Experimental Computer Zero), the first transistor based computer that had been developed at MIT's Lincoln Laboratory in 1955, leaving the design philosophy of batch processing behind.

Even before the PDP-1 arrived the group around Russell was planning a new demonstration of its possibilities. In harmony with the Zeitgeist, the ludic interface pioneers were fascinated by spaceflight and their fantasies revolved around galactic battles between spaceships, drawing upon science-fiction films of the Toho Film Studios as well as the Lensman pulp space-novels of Edward Elmer Smith. According to J. Martin Graetz, the group came up with three criteria that a good demonstration should fulfill:

1. It should demonstrate as many of the computer's resources as possible, and tax those resources to the limit; 2. Within a consistent framework, it should be interesting, which means every run should be different; 3. It should involve the onlooker in a pleasurable and active way – in short, it should be a game. [3]

Thus Russell's group developed *Spacewar!*, a game that simulated a duel between two spaceships. Both ships began at opposite ends of the screen, while a randomly generated star-field was shown in the background. The action unfolded in real-time, with visual output and manual input. The movement of the ships obeyed the laws of a virtual physics – acceleration demanded time as well as valuable fuel and when a ship gained momentum, the law of inertia applied. In the first version of the game, each player had four binary switches at their disposal to control their spaceship: thrust, turn left, turn right, fire torpedo. However, since the switches that had been delivered with the PDP-1 hadn't been developed to be flicked hundreds of times within a few minutes, they quickly broke. Therefore, the ludic interface pioneers had to quickly develop new controllers. Kotok and Saunders developed the first 'game-' or 'joypad' out of parts made to steer model trains – a simple controller with four buttons for the four functions. In later versions, the group used an U.S. Air Force control stick that they found among discarded military equipment – the first 'joystick.'

The game was a huge success in the community surrounding the TMRC, even though the MIT administration gave all other uses of the PDP-1 a higher priority. The game's real-time visual-manual-interaction fascinated and captivated almost everyone who played it and the game ran during every free moment of the PDP-1 that spring. A large amount of the time spent playing with and working on *Spacewar!* – a difference that was steadily being subverted by the digital medium – occurred during late hours. The original version of the game was continually modified in the course of the following weeks during night time hacking marathons: Dan Edwards implemented a sun with a gravity field in the middle of the playing field; Peter Samson replaced the random star-field in the background with a precise replica of the night sky that ran through a 24 hour cycle every 60 minutes; Graetz developed a hyperspace jump that made the player's ship teleport to a random position on the screen; and Russell programmed a subroutine that showed the score for an open house day in spring of 1962.

Spacewar! was so successful that the producers of the PDP-1, the Digital Equipment Corporation, included it in the main memory of the computer thereafter. Furthermore, the game was also ported to other computer systems. Thus, it became popular in university computer labs nationwide, reaching as far as Stanford on the west coast. As it spread, further modifications were made such as space mines, invisibility, partial damage, an electric shock to accompany the destruction of one's ship, a multi-player-mode and a 2½-D version. The program permeated digital culture at the turning point from mainframe computing to personal computing. It influenced the pioneers of the PC-paradigm shift, for example Alan Kay who not only considered *Spacewar!* a standard application for his Dynabook – a prototypical laptop

for children that he worked on at the Xerox Palo Alto Research Center (PARC) – but also, and more importantly, built conceptually upon the playful real-time multisensory interaction the game offered. [4]

Playful Interaction

Spacewar! is one of the first computer hacks and the most elaborate that had been performed at the time of its implementation. It emerged from the young hacker culture at MIT that can be characterized by a playful relationship to technology and the world at large. The game was developed through a reappropriation of the digital computer – a machine that had previously been almost exclusively used for supposedly 'serious' endeavors such as breaking encryption, processing large amounts of statistical data or running military simulations – to model a science fiction fantasy. The question of what constitutes a sensible use of computers has a different answer for different people. The hackers saw much of the authorized use as unnecessary, just as many sanctioned users saw the development of *Spacewar!* as a waste of computing resources. Pias underlines the relativity of 'legitimate' computer use that the hackers brought to the fore:

Every program that runs is legitimate. There are no false games in the true, but only aborted play and crashed programs. Every use can only appear as a misuse within a context that is delimited by law or economy, encoded by normality or passed down through institutions. [...] Hacking subverts the terms of right or wrong use, it deconstructs in a sense »misuse« itself, by showing that an idea of technical function, which is bound to a human intentionality of purpose, doesn't make any sense with regards to computers. [5]

In closing, I would like to sum up the relevant ludic dimensions of this complex web of human and technical "actants" (Latour) that cannot be grasped with the idea of the "homo ludens" (Huizinga), but rather calls for a conceptualization as "ludic cyborg." [6] The first ludic dimension of this human-machine interaction network that must be mentioned are the "affordances" (Gibson) of the PDP-1. The hardware offered a new mode of interacting with the universal machine that marks a radical shift in the philosophy of computer design: instead of focusing on maximizing the efficient use of computer cycles through batch processing and time-sharing it enabled users to interact with the machine directly, along different sensory channels in real-time. This shift in design philosophy imparted the technological artifact with ludic potential; unfolded within it an invitation to play that was joyously accepted by the first generation of computer hackers.

The attitude of the hackers toward the hardware is the second ludic dimension that needs to be underlined. They approached the hardware with a playful spirit. Hacks were defined, at the time, as autotelic endeavors that were performed for their own sake and the aesthetic pleasure they offered, as opposed to utilitarian tasks performed for some external purpose, out of a sense of duty or for a reward – the opposite figure to the hacker being the "tool." This intrinsic motivation is a defining quality of play. Hackers such as Richard Stallman confirm the playful character of the hacking mindset: "[H]acking means exploring the limits of what is possible, in a spirit of playful cleverness. [...] Playfully doing something difficult, whether useful or not, that is hacking." [7] The more playful shrewdness an endeavor exhibits the more 'hack value' it has. For no other reason than to satisfy a playful impulse the ludic interface pioneers not only reappropriated the universal machine in the form of the PDP-1 – turning it into the first 'Playstation' *avant la lettre* – but also reengineered model train and military controllers in their striving to perfect the aesthetic experience of *Spacewar!*. The hackers realized the playful potential of the computer by interacting with it, not as a tool, but as an aesthetic and ludic medium.

The third ludic dimension that needs to be highlighted is the openness of the game program. From its inception onwards, *Spacewar!* was constantly modified. The code was part of the budding computer culture's commons and this unleashed a wave of collective creativity. The productive interaction among programmers that condensed around the game points to the community generating power of play; furthermore, it also implemented the highest ludic form: the transformation of the rules and the frame of play.

The final ludic dimension that demands foregrounding is the deterritorialization of play space that occurred around *Spacewar!*. The line demarcating the sphere of work and the sphere of play – a strict division formatting our culture over the last 200 years – began to dissolve in the development of the program: the hackers played while working and worked while playing. In light of limited computer resources and the paradigm of time-sharing under which they had to work, hackers of the first and second generation used every free hour of the mainframes they had access to. They had to use these expensive machines when 'serious' tasks were not being run on them. Thus, the customary rhythmic alteration between daily work-time and nightly recreation was quickly suspended. At the same time, the hackers took a liking to programming during late hours, because they were more conducive to fusing with the machine code in inebriated hacking marathons and achieving a state of "flow" (Csikszentmihalyi). In short: their activity pattern subverted traditional 9 to 5 rhythms. Places like MIT's Electronics Research Laboratory, Xerox PARC or Stanford's A.I. Lab (SAIL) were places where the separation of work and play was undermined during the emergence of popular computing. Or as Les Ernest, the director of SAIL stated: "Sometimes it's hard to tell the difference between recreation and work, happily." [8] Here, for the first time, a playful labour or "playbour" [9] paradigm emerged that has continually unfolded and gained currency up into the present, parallel to the exponential growth in playful interaction with the universal machine. This expansive tendency of play in digital culture – which can also be seen in the rise of alternate and augmented reality games, time consuming online game worlds and full-body kinaesthetic interaction – calls classical ludological theories (Huizinga, Caillois, Bateson), which put their emphasis on the distinct demarcation of the ludic, into question and draws our attention to the transgressive productivity of play.

References and Notes:

1. *Claus Pias, Computer Spiel Welten (Munich: Diaphanes, 2002), 198. All translations from German by the author.*
2. *Steven Levy, Hackers – Heroes of the Computer Revolution (London, New York, Victoria: Penguin Books, 1994), 20ff.*
3. *J. M. Graetz, "The origin of Spacewar," (online reprint), original in Creative Computing 8 (1981), http://www.wheels.org/spacewar/creative/SpacewarOrigin.html (accessed July 23, 2011).*
4. *Stewart Brand, "Spacewar. Fanatic Life and Symbolic Death Among the Computer Bums," (online reprint), original in Rolling Stone, December 7, 1972, http://www.wheels.org/spacewar/stone/rolling_stone.html (accessed July 23, 2011).*
5. *Claus Pias, Computer Spiel Welten, 84.*
6. *Natascha Adamowsky, Spielfiguren in Virtuellen Welten (Frankfurt a. M.: Campus, 2000), 175; Mark Butler, Would You Like to Play a Game? Die Kultur des Computerspielens (Berlin: Kadmos, 2007), 208f.*
7. *Richard Stallman's official Web Site, "On Hacking," April 10, 2011, http://www.stallman.org/articles/on-hacking (accessed July 23, 2011).*
8. *Quoted in Brand, "Spacewar."*

9. *Julian Kücklich, "Precarious Playbour. Modders and the Digital Games Industry," in The Fibreculture Journal 5 (2005), http://five.fibreculturejournal.org/fcj-025-precarious-playbour-modders-and-the-digital-games-industry/ (accessed July 23, 2011).*