Re-reading digitality through scientific discourses of cybernetics: Fantasies of disembodied users and embodied computers

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What kind of starting point could re-reading digitality be, since digitality is often referred to as a capacity to infinitely re-write without error, without changes in the stored information? I am proposing that the "error-freeness" of digital media is a paradox, which interestingly links digital media into the history of cybernetics. A pre-conception of technical devices as error-free has extended its reach to grasp the computer user as if within the system into a position of command and use, rather than to the position of interpretation, intuition and experience.

In my current research I have examined how the concepts "a computer user" and "interactivity" are constructed in discourses of computer science, system design, media arts and contemporary media theory. This approach is motivated by a realisation that recent interdisciplinary research has for the most part been uncritical about the differences that various genealogies bear on central concepts used in the field of new media. In this paper, I will discuss how cybernetics and cyber discourses construct both mechanistic and disembodied user positions while anthropomorphising computers. This is partly due to an understanding of human-computer interaction as a form of communication.

In the late 1940s and during the 1950s scientists and mathematicians, among them Vannevar Bush, Claude Shannon, Alan Turing and John von Neumann worked on computing and informatics, an area of research and technical development, which their contemporary Norbert Wiener coined as cybernetics. Cybernetics was anglicised from a Greek word for steersman, kybernetes, which Wiener chose to represent control (Wiener 1961, 11). One of the foundations of cybernetics was Claude Shannon's *Mathematical Theory of Communication* from 1948, where he wrote:

> "The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These *semantic aspects of communication are irrelevant to the engineering problem*. The significant aspect is that the actual message is one selected from a set of possible messages" (my italics, Shannon 1948, 1).
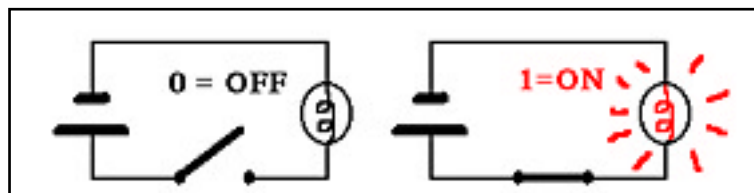
An illustration of a switch, which is an analogous mechanical system based on binary logic. (For Shannon's relay switch algebra, see http://www.cs.tufts.edu/~karen/ES4/workbook/gates.pdf).

In this and other essays, Shannon laid foundations for digital computing, according to which messages are delivered based on binary mathematics using logical switches that are on or off. He had arrived to this concept based on his work with telephone switchboards. (For a very articulate critical history of early cybernetics, see Hayles

1999, 1-24) In an ontological sense, digitality is a representation of the logic involved in a mechanical system.[1] He stressed the fact that his theories should not be applied to other fields of communication where semantics play a role.
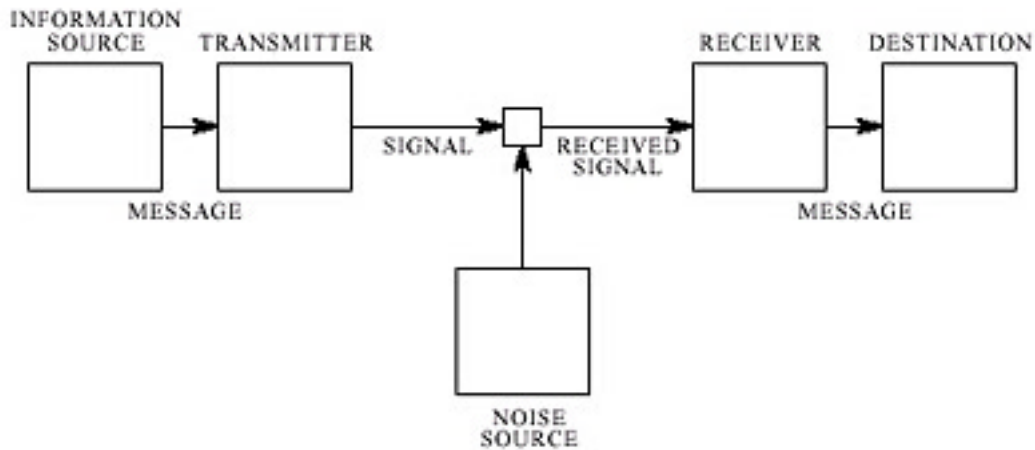

Fig. 1—Schematic diagram of a general communication system.

General communication system according to Shannon (Shannon 1948, 2).

Apparently Shannon's warning was not taken seriously. Communication models up till late last century were mostly variants of his 1948 model.[2] Reader and reception theories within comparative literature, and what interests me here, the user in relation to a computer have been understood as situations of communication. In literary theory, an implicit author was invented into the text thus enabling usage of a communication model. A cultural studies classic, Stewart Hall's essay on encoding and decoding marks a point of departure towards contextual communication models within the humanities, and a beginning for media studies paradigm within cultural studies. He emphasized the act of decoding as an act of interpretation by saying that "decodings do not follow inevitably from encodings" (Hall 1980, 136). Computer science on the other hand, placed a symbolic marker of a subject as part of the system. The user was seen as the computer operator and controller and later as a user of hardware and software.

The main problem of the digital system design or that of cybernetics is that the user is seen as a receiver of an unaltered message.[3] In other words, a computer is assumed to be a mimesis engine, where the user is not offered a position of interpretation or translation, but that of command and use. In a fundamental sense, a shift from analogue systems to digital ones in cybernetics meant managing noise, avoiding interpretation and by and large, denied that a computer would be a representational machine. It was not until 1991, when Brenda Laurel argued that the computer is a meta medium combining various previous media types, yet for the user "representation is all there is." Thus the user was not seen only as functional but also as experiental (Laurel 1993, 18-21, 32). Katherine Hayles writes about Shannon and his contemporaries in her essay *The Condition of Virtuality:*

> "Information conceived as pattern and divorced from a material medium is information free to travel across time and space. Hackers are not the only ones who believe that information wants to be free. The great dream and promise of information is that it can be free from the material constraints that govern the mortal world. If we can become the information we have constructed, we, too, can soar free, immortal like gods." (Hayles 2000, 75)

Digitality as a fantasy of information without errors and of a storage space indestructible in the course of time runs parallel with what Hayles criticizes as the disengagement of information from a material base and its cultural contexts. An underly-

ing assumption is a will for disembodiment through technology. Norbert Wiener for instance anticipated in 1950 that the telegraph would be able to transfer human beings (Hayles 2000, 75).

The dichotomy information/matter of information theory, according to Hayles, reflects an older dichotomy of spirit and matter. This is one of the underpinnings of cybernetics that have influenced several theories of interaction with computers. The assumption, by for instance Sherry Turkle, is that the user's identity is split between the corporeal body and the windows on a computer screen, which in turn represent the user's actions. Or more concretely, the user's identity would according to her be split between different agent selves on the Internet. (Turkle 1997, 178.) "The computer takes us beyond a world of dreams and beasts because it enables us to contemplate mental life that exists apart from bodies" (Turkle 1997, 22).

To enable the communication model of interaction, the computer is portrayed as an anthropomorphic object if not a subject, which assumably has a dialogic relationship with its user. Or, if one would think about dialogicity in Bakhtinian and Vygotskian terms, the interaction would be an act of inner speech or a kind of a monologue with a projected self on the screen. (On dialogicity, see Cheyne and Tarulli 1999, passim., on inner speech see Vygotsky 1994, 67-69). To be able to approve of such a model of interaction between two entities, one human, one an advanced calculation machine, one would have to accept Shannon's underlying notion that information *is* disembodied, or with Turkle that one's self partially migrates into the screen of the "beast", or with Alan Turing that the computer is a thinking machine. What kind of desires and economies are at play? Why is digitality represented as an enabling and empowering technology, with promises of eternal and immediate memory? What is gained by mystifying the computer as an anthropomorphic entity instead of an advanced calculating machine?

The computer seems to offer a slippery platform of interdisciplinary discourse, where embodiment and situated subjectivities are often ignored since there is no situation or location for representation in the cybernetic system. Looking back at post photography discourse of the 1990s, I wonder whether it is this denial of representation and assumption of a mimesis effect by computer science which "as if" seemed to be a paradigmatic shift in how to understand representation within digital environments?[4] I have not developed this thought very far, but I am also curious whether this claim of a paradigmatic shift in construction of meaning within new media acted as a claim for a radical break with identity politics of representation? In quite a few conferences a league of new media gentlemen have so often waved their hand at postmodernity as a post mortem condition, as if it was a fly bothering their pure digital discourse, a reminder of identity politics. The metaphor of digitality as a form of re-mixing and as a state of desirable being seems to have suggested that subjectivity would also be a digital technology of re-modelling, rather than a complex embodied construction.

In order to further discuss desires for disembodiment, I want to move forward from early cybernetics to brief overview on cyber and cyborgian popular discourses that have appeared in three main popular genres over the last decades.

Popular cyber imaginaries

Cyborgian popular discourse in film, animation and media art seem to offer a ground for contrastively different politics. Science Fiction narratives provide fantasies of omnipotent re-engineered male techno bodies in films such as Terminator (1 and 2) and Matrix. Re-modelled female bodies are spectacularized in such Manga animations as Ghost in a Shell, where a female cyborg emerges from liquid data as if from a total cosmetic surgery. In these narratives, cyborgs are presented as sexed-up combinations of flesh and robotics and varying degrees of artificial intelligence. A cyborg mannequin from media arts, who has appeared in several book covers with the prefix

cyber-, Stelarc describes his attempts to embed nanotechnology into his own body as "end of the Darwinian evolution as we know it". (Video interview, Mäkelä 23.8.1994) Popular imaginaries at first seem to suggest that cybernetic technologies are embodied rather than disembodied. Actually cyborg narratives suggest an ultimate dream of cybernetics engineer come true – a computer combined with bio-mechanical system not only may look human, but act and almost feel like one.

Cybernetics did not begin as a discourse within arts in the 1980s. Nam June Paik talked about Cybernated art in 1966, where he pointed out that Marshall McLuhan's Medium is the message was formulated by Norbert Wiener, for whom "the signal, where the message is sent, plays equally important role as the signal which is not sent" (Paik in Jordan and Packard 2001, 41). With television series such as The Six Million Dollar Man from the 1970s and cybernetics in popular psychology, control over and exceeding the limits of the human body have been central themes.

Another popular cyborgian genre emerged in the late 1980s, where rather clumsy virtual reality systems ignited dreams of total immersion with the computer interface. Cyber referred to a mystified understanding of computer imaging, as if another inhabitable dimension distinct from embodied reality would have become an every day life experience. Cyberpunk from Gibson's 1984 Neuromancer onwards found its way to other forms of fiction including strands of cultural studies. Magazines such as Mondo 2000 celebrated cyber sex, while artists and theorists considered that a radical paradigmatic shift in the history of representation had occurred (On Mondo, see Sobchack 1994, passim.). Whether due to the failed attempts at cyber sex or the fact that VR technologies did not provide support for the fantasies, the word Cyber was soon directed towards networked computing, especially the World Wide Web. Cyber would refer to various popular versions of net cultures, "being part of a larger network". In 1991 Tim McFadden elaborated on Gibsonian cyberspace by linking it to Shannon and Weaver. For McFadden, cyberspace was an information space, which is connected by information channels, through which exchanges are done by protocols between agents. Curiously enough, he says that:

> There are agents that can transform, abstract, and represent the information in the cyberspace so that a human can experience it as humans experience the space and "everyday" objects of the world. Humans may be "in" cyberspace as they are in space. This is the "delusional" part of the original definition (McFadden 1993, 341).

Cyberspace in McFadden's analysis anthropomorphises a technical network, by claiming that it provides similar every day presence as lived space. Cyberspace has provided a popular mythology that cyberpunk authors, researchers, and other fans have shared not only as a fantasy, but almost as if it was an immaterial fact, a space with dimensions. Indeed, it seems that a will to dematerialise what is known as human is met with a will to anthropomorphise technology, and thus to give it an imaginary physical, as if living sensibility or affectivity.

There are at least these three parallel genres of contemporary cyber or cyborgian discourse: human-machine, human-computer and human-network relationships. In addition, (bio) medicine and military are often discussed as separate genres of cyborgian discourse. In most cases narratives and theories about cyber or cyborgs appear without an explicit connection to cybernetics of 1950s to 1970s, but rather build links to cyberpunk fiction.

Anthropomorphic technologies

In his book *Turing's Man* David J. Bolter foregrounds a view on the history of technology quite parallel to the above described popular imaginaries, where what he calls "defining technologies" have played an important role in understanding what const-

tutes the human being. In a chapter titled "The Electronic Brain," Bolter explains how computers succeed clocks and steam engines ad "the defining technology and principal technological metaphor of our time...". He argues that this is a result of computer's capability to reflect the versatility of human mind. (Bolter 1984, 40.) He makes a prophecy: "With the computer, another step has been taken in this evolution of ideas, for we now have an inanimate metaphor for the human mind as compelling as the clock was for the planets" (Bolter 1984, 41). Bolter indeed depicts computers as animate objects, and even beyond that, he sees a miniature animate society within the electronic circuits: (Bolter 1984, 41.)

> "For the ancient mathematician, the world itself was composed of geometrical elements; for the computer mathematician, however, numbers are embodied in only a fragment of the world, within the cabinet of a digital computer. But within this tiny cosmos, numbers possess a life of their own. They rest in the core memory waiting to be called upon, they move into the central processor, combine with other numbers, and moves back into memory. They impress us constantly with their reality as they spinout answers to our queries." (Bolter 1984, 64.)

The body, having in earlier technical eras been represented as both an engine and as a clockwork system (Descartes), was now represented as a body of neurons that communicated with one another, a system of information. Warren McCulloch and Ralph Pitts demonstrated with their theory of neurons how a neural net could calculate any number that a Turing machine can. This, according to Hayles, "joined a model of human neural functioning with automata theory" (Hayles 1999, 59). The cultural perception of digitality of today is comparable to the secrets of the early automata machines that excited many generations in the 17th and 18th centuries. As a technology, a digital computer follows simple logics, but the Deus et machina nature of the invisibility of its action makes it into an ideal mythic object. Early automata were marvels and "believable" precisely due to their mechanical structure being hidden, mysterious. The machines imitated human or animal actions and thus reproduced the living world (see Stafford 1994, 88-103). The digital automatons, personal computers and the "drama of interactivity" are like a classical automata turned inward. The World Wide Web is often talked about as an imitation of the course of the world. One of the most used books on interface design teaching, Ben Scheiderman's Designing the User Interface, equals the pixels in the computer with atoms, interface metaphor with the universe, clicks on the screen with steps in actions (Schneiderman 1998, 206).
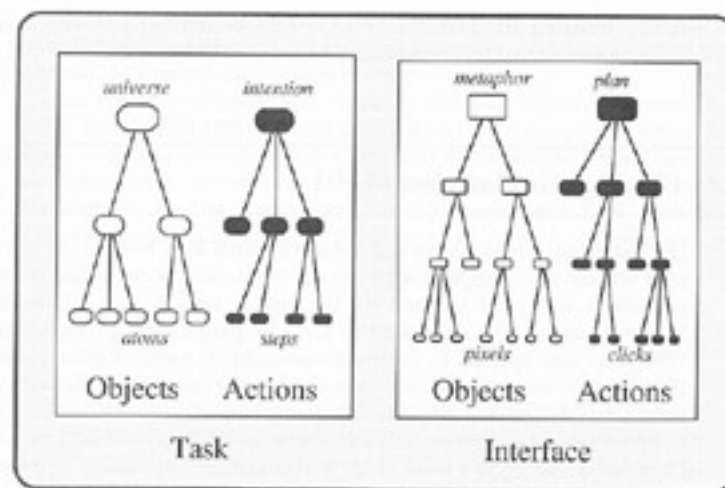

Figure 2.2

Task and interface concepts, separated into hierarchies of objects and actions.
(Schneiderman 1998, 206).

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Erkki Huhtamo points out accurately, that automation is not the opposite of interactivity, but its precondition (Huhtamo 1997, 26). If a doll pouring a cup of tea was automated with wooden clockworks, then binary processes and algorithms, boxed as computers, have automated the feedback that a user receives to the actions done by an input device such as a mouse. Theodore Roszak quotes Wiener saying that "to live effectively, is to live with adequate information." And further. "In my thesis that the physical functioning of the living individual and the operation of some of the new communications machines are precisely parallel in their analogous attempts to control entropy through feedback." (Wiener, quoted in Roszak 1986, 9-10). One of the issues to discuss further between system and communication theories, and how subjects are positioned in relation to computers as users, is to look at the Taylorisation of the subject. In the recent years of new media industry growth both leisure and work have become characterised by not automation, but new media as a creative environment. By saying that work is more or at least as much fun than leisure within new media, writers such as Pekka Himanen have valorised the optimised labour as "hacker culture" (Himanen 2001, 12, 24). Both hacker and cyborg have been considered to be politically subversive subject positions. While not denying that the possibility for subversion through those figurations exists even though in practice it would not have been proven true, I would like to call into question the interdisciplinary mobility of these terms as well as their ahistoric uses.

Cyborg figuration: to connect or not to connect

In her critique of Sadie Plant, Sarah Kember talks about "anti-politics of connectionism", a critique of theories that "proclaim autonomy of organic and inorganic systems from external, socio-historical forms of control" (Kember 1998, 102). Furthermore she suggests that contagion, alongside with connectionism, coexisted in the phenomenon of computer hackerism in the 1980s, which emerged at a time when biological and computer sciences converged to claim that humans and computers were regarded as information-processing systems susceptible to disease. (Kember 1998, 103) This transition from contagion to connectionism, according to Kember, has taken place via the concept of the cybernetic organism or a cyborg. (Kember 1998, 104) She considers Haraway's account of the cyborg to be most useful and authoritative because of the ways in which it "refigures the terms of knowledge, power and subjectivity" and provides "a productive conflict of its allegiance to science and objectivity and to postmodern theory and the politics of difference." (Kember 1998, 110) Kember agrees with Claudia Springer that popular cyborg images are masculinised and do not live up to Haraway's cyborg, which is genderless, feminist and socialist ideal with a modus operand of connection, not connectionist.

While not challenging Haraway's cyborgology as a critical figuration, I would like to understand why Haraway does not seem to provide an account, a deconstruction, a history, or hardly a connection with other discourses on cyborg or cybernetics. In her 1997 book there is a footnote where she talks about postmodernity's practice of flexible accumulation, where "the database is to the filing systems of monopoly capital as the computer is to the typewriter and cyberspace is to mundane space." (Haraway 1997, 291 60n) Her reference to the cyborg emerges from laboratory experiments of Clynes and Cline, who used rats to test self-regulating chemical injection systems for bodies to enhance space travel (Haraway 1995, xv). Cyborg anthropology examines boundaries between humans and machines, and from a cultural studies perspective explores "the production of humanness through machines" (Downey et.al. 1995, 342).

I find interesting here Chela Sandoval's remark about Haraway's cybergology and its connections with third world feminisms, and with indigenous figurations of resistance such as the trickster and mestizaje, which Haraway later herself talks about as "a family of displaced figures, of which cyborg is only one" (Sandoval 255).

While taking the viewpoint of the chemically enhanced rodent, she stares back at mammals. In some sense, her rhetoric does remind as Sandoval says, the ways in which indigenous cultures, for example Native American fiction, address contemporary phenomena through animist characters such as the Coyote. Trickster figures can be seen as catalysts for semiotic re-arrangements, making sense of relations by contrasting narratives against one another. If this is the case, Haraway has perhaps constructed an alternative mythology for non-indigenous techno cultures. In relation with narratives of digital technologies and new media culture, Cyborg Anthropology seems like an important narrative to think with, but lacking tools, tactics and strategies to deal with historical consructedness of digitality and cyber discourses and gender within them. I would like to illustrate my difficulty with projects that do take the position of rodent as a subject.

Media artist, Eduardo Kac, talks about his project GFP bunny, a rabbit that has been genetically modified with transfluorescent effects:

> "One very important aspect of "GFP Bunny" is that Alba, like any other rabbit, is sociable and in need of interaction through communication signals, voice, and physical contact. As I see it, there is no reason to believe that the interactive art of the future will look and feel like anything we knew in the twentieth century. "GFP Bunny" shows an alternative path and makes clear that a profound concept of interaction is anchored on the notion of personal responsibility (as both care and possibility of response). "GFP Bunny" gives continuation to my focus on the creation, in art, of what Martin Buber called dialogical relationship [9], what Mikhail Bakhtin called dialogic sphere of existence [10], what Emile Benveniste called intersubjectivity [11], and what Humberto Maturana calls consensual domains [12]: shared spheres of perception, cognition, and agency in which two or more sentient beings (human or otherwise) can negotiate their experience dialogically. (Eduardo Kac, GFP Bunny, http://www.ekac.org/gfpbunny.html)

The problem with GFP bunny as a critical partner in a dialogue is somewhat similar as what I have described as problematic by assuming a communication model paradigm in trying to understand interaction or a complex user position with personal computers or computer based applications. One easily forgets that computers are machines and pet bunnies are animals, yet the narratives, which anthropomorphise both technology and animals, are constructed by humans.

If the argument of this paper holds, binary logic has been the basis for mass communication theories, not only that of digital media. Thus the communication model with encoding and decoding processes is primarily based on a technical medium, not on messages, interpretations or contexts. I hope to have been able to point out that digital communication theory is applicable to automata, but not adequate to describe the user experience of situated subjects.
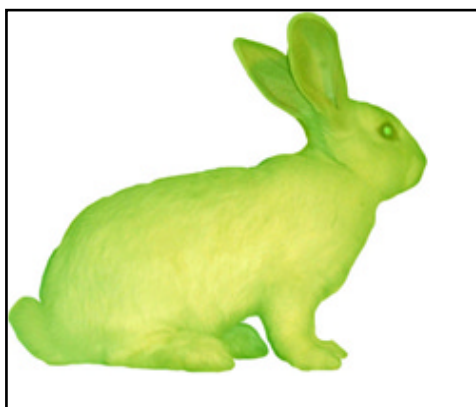
Alba, the fluorescent bunny.
Photo: Chrystelle Fontaine.
(Eduardo Kac, GFP Bunny,
http://www.ekac.org/gfpbunny.html)

Claude Shannon and his Theseus,
electromechanical mouse
Image Copyright, 2001 Lucent Technologies, Inc.
(http://plus.maths.org/issue15/features/shannon/)

Endnotes

[1] Digitality in a tehcnical and logical sense means storing binary information as ones and zeroes. What a digital computer does, as it is often expressed, is based on logical algorithms and varying layers of representational programmig languages, ie "machine language" as well as "natural language" commands that refer to stored functions and algorithms, which in turn operate with bits, which again are construted of ones and zeroes. A computer is thus a representational machine in many layers, of which the end user only sees selected parts. "User friendly" interfaces hide digitality of the machine from the end user. In other words, end users rarely operate with digital, but logical machines, or furthermore, with conceptual or narrative machines. Unless the electronics break down, logical machines still never make errors, program-mers do. Unless the interactive game fails to entertain the user with its narrativity, its interaction logic, or its mobile visual immersion, the very construction of the game is supposedly not present in the experience. One aspect of mystification and antropomorphization of computers is related to this aspect of "error-free": since there is no person to blame, the computer did it, or the software is stupid. If human-computer interac-tion was to be represented as a form of communication, it would be much more accurate to represent it as a communication between programmers (or interaction and content designers) and end users than between a machine and a human being. However, as I am pointing out later on, the very model of com-munication is problematic for interaction theory.

[2] In Finland, literally all communication students still read Osmo A. Wiio's Introduction to Communications, which use Claude Shannons and Warren Weaver's models as well as the input-output models of cybernetic machine theory (See Wiio 1980, passim).

[3] Usage of Shannon's theory of communication, originally intended to be used with logical mechanical sys-tems only, as a basis for human driven interaction would be today equivalent of using the logic structure of tcp-ip networking as a basis of journalism. Communication as signal processing versus a complex semantic act of interpretation parallels the often found paradox between information and knowledge, which is met within such contemporary contexts as "information society" or "information technology".

[4] Kevin Robins has argued in the post-photography debate that digital revolution in imaging has been yet another step in the rationalisation of vision, rather than a radical break from photography (Robins 1996, 167).

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