Anders Michelsen
amichel@hum.ku.dk

COMPUTED FUNCTION, CREATIVE ACTION AND PROSOPOPOIESIS – FROM THE 'REAR-VIEW MIRROR' – notes on the genealogy of pervasive computing

Abstract

The paper treats the philosophical underpinnings – the genealogy, of pervasive computing from a historical – 'rearview', perspective. The current focus on this notion reflects the ever increasing impact of new media and its underlying complexity of computed function, which has spread vertiginiously since Mark Weiser coined the term. While Weiser's original perspective may seem somewhat fulfilled, it is however, pointing to a much more important perspective of creative action upon novels forms of artifice, what Ezio Manzini has termed "an unknown artificial world that we must examine to discover its qualities and laws." Most importantly for this paper, pervasive computing is seen to point to a continuous existence throughout the computational heritage of *a paradoxical distinction/complicity* between the technical organization of computed function and the human Being in the sense of creative action upon such function. On this background the paper treats issues of ontology in the post war genealogy of computing, 'the computational heritage'. First the paper introduces the idea of a paradoxical distinction/complicity by debating Gilbert Simondon's notion of the 'margin of indeterminacy' as a first approximation. Second, it debates Bernvard Joerges's notion of a "prosopopoiesis" of technical systems in relation to the issue complex modeling of computed function, pointing to the principal role of the paradoxical distinction/complicity from *within of* the computational heritage. Third, it concludes with a brief re-situating of Weiser's notion of pervasive computing on this background, as a current articulation of a founding paradox in the computational heritage.

Keywords: pervasive computing, computed function, Turing machine, prosopopoiesis, Simondon, margin of indeterminacy, perpetual innovation, enaction, modeling, complexity, Joerges, Weiser , Dupuy

1. Pervasive computing – beyond use as interaction

One of the best concealed truths of new media success in the past 20 years or more is the creative role of the user in an ontological sense of the human. This claim may outrage any serious observer of new media – after all, isn't new media about user interface, user interaction, media (user) culture, appealing graphics and applications (to the user) and so on? What about Web 2.0 and social software? Not to mention pervasive computing? Isn't the history of computer use since the 1940s one long process of accomodation of the user in still more sophisticated manners?

The short answer is no.

The creative *action of use* as an instance of a human ontology, that is, principally different from computed function – i.e. a different form of Being, yet of crucial importance, has never been put in its proper place. Most often it has been ignored in debates on computing, new media etc. – think about the ongoing thrust of etymology; the term for socially inclusive software, 'social software' – networked communities of humans, is still 'software', and so on. As if human relations could be determined by software forms ...

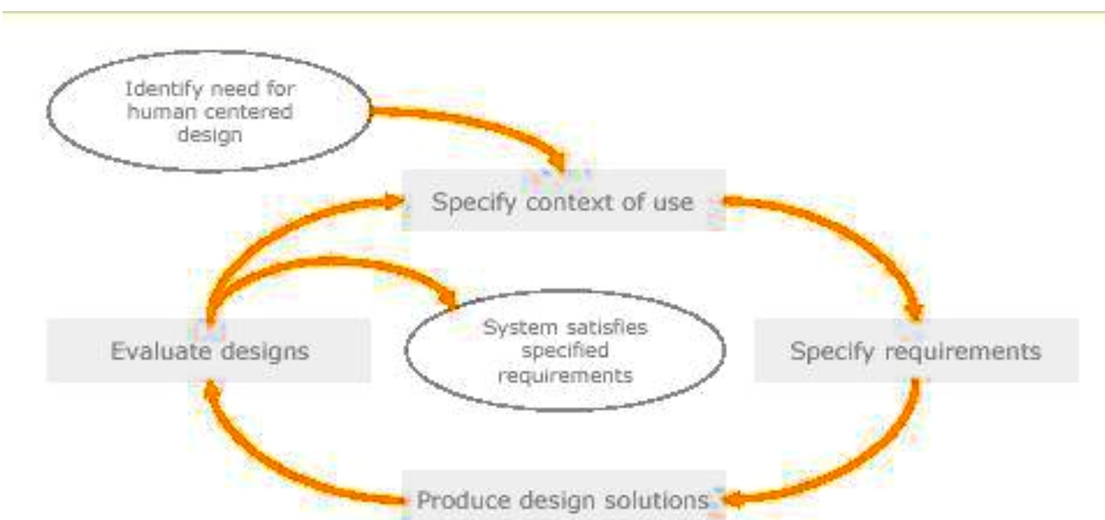
Even worse, the human has grosso modo been rendered an ontological entity to be eradicated by the spread of computed function into all aspects of the human's Being, from computer chips in model trains and intelligent buildings, over robotics, cyborgology, and models of the brains functionality, to recent ideas of a connectionist network sociology (Watts 2003, Barabási, 2003). The predominant assumption – and a tenet of a basically cybernetic origin, has been that computer use is ontologically predicated on implications of the technical organization of computed function: that is, formal algorithmic modeling of functions based on mechanical procedures as basis for any consideration of use.

A preliminary sketch may indicate three common frameworks for understanding use in this regard in the post war era: (a) Use derived as directly as possible from computed functionality (e.g. Jakob Nielsen's "useability" (Nielsen 1993)), (b) Use derived from perception of computed functionality (e.g. Donald Norman's "affordance states" (Norman 2001 [1998])), (c) Use derived from computed functionality as context somehow (e.g. Susan Leigh Star's assumption of new media "community building media" (Leigh Starr 1995)). Put differently, the technical organization of computed function has been posited as ontological determination of the human Being, e.g. of the body, the psyche-soma, intelligence, behavior, emotions, even creativity; further social forms of human Being etc., thus also use in whatever form. More precisely: use has been seen as use of the machine, and only secondarily as creative action upon something from a human perspective.

Use has most often, if not always, been a question of getting the user to tackle the machine. Even in arguments for user centric and interaction based design, "an approach to design that grounds the process in information about the people who will use the product. UCD processes focus on users through the planning, design and development of a product" (http://www.usabilityprofessionals.org/usability_resources/about_usability/what_is_ucd.html), the process of use is merely seen as a much extended portfolio of computed function. E.g. in the shape of "information about the people who will use" the product "through the planning, design and development of a product."

In figure 1., a graphic represnentation of the ”ISO 13407: Human-centred design process,” (Ibid.) the complexity of the user-centric design idiom is clearly apparant. But so is the extended functional definition of the user. The user is seen as a context of parameters and affordances to be integrated in a complex methodology which at the bottom has the focus of bringing the human user closer to the center of any given computed function – not the reverse. Neither less nor more: design is seen as an extended circuit or system of feed back and feed forwards based on a cybernetic tenet of communication in animal and machine – to paraphrase the inventor of cybernetics Norbert Wiener (Wiener, 1991 [1948]). The cybernetic horizons of computer development in the post war era is still the image mirrored in the rearview somehow.

Figure 1.



2. Pervasive computing – "unknown artificial world"

The broad offspring of these positions has been a determinism with regard to the role of the human. The human has been seen as factor to be integrated somehow, in no simple way, to be true, but still integrated in computed function. This has gone along with a stunning accumulation of new issues, disciplines and knowledge formations closely related to the vertiginous spread of new formalizations, techniques, and artifacts – of models of very diverse kinds – most probably a major achievement of science and technology in the second half of the 20th century.

Included in this major contributions and issues such as self-organization, cognitive science, connectionism, complexity, nanotechnology – to mention a few, also with relevance to the understanding of the human Being as an ontological form. Added to those, further important offsprings into 'posthuman' (Hayles 1999) and constructivist social and cultural theory and philosophy, exemplified by the thought of Niklas Luhmann and Gilles Deleuze, and further, the impact of new media theory (Michelsen 2005, 2007). All this has solidified the fundamental grasp on the human by computed function in the important sense of *complexity modeling*, from real time models of nervous activity in the brain to models of the stock market and further to cusps of creativity in famous artists - a paradigm of "complexification" (Casti 1994, 2002, Eve et al., 1997, Mainzer 1994, Watts 2003, Barabási, 2003).

However, with the scope and complexity of computed function in todays society – the importance of computer-based and -involving artifacts at large – the issue of pervasive computing as a real and metaphorical state of ubiquity and general embeddedness – there is an impending need for a look at computed function in different terms. Ezio Manzini has argued for an issue of pervasion from this perspective, based on the existence of a discrepancy between the creation of the artificial *and* the lack of insight into the distinctive character of the artificial, not least as a dedicated aspect of the human. "To man the artificial is a completely natural activity," (Manzini 1994, p. 44) he writes, but the resulting artificiality, nonetheless appears as "an unknown artificial world that we must examine to discover its qualities and laws" (Ibid., p. 52).

It is necessary to establish positive connotations for the artificial, Manzini argues. In the present paper the current interest in pervasive computing will be the used as occasion for debating such connotations in terms of creative action beyond ontological determination of the human Being by computed function.

3. Pervasive computing – paradoxical distinction/complicity

A lone voice in this regard is found in the ground breaking work of the French pioneer of cybernetics, Gilbert Simondon from 1958. Simondon here writes on the relation between the aesthetic and the cybernetic organization of "technicity," what he terms the "ensemble" (Simondon 1989 [1958]). For Simondon, the problem of the aesthetic has a further prospect in certain situations of what he terms acts of primary importance. The aesthetic form of thought, the aesthetic object – fundamentally the *aesthetic* – as he argues by implication in a dense overview, points to what may be taken as a peculiar origin – a 'remarkable moment' [point remarquable] of cultural issues which is further related – netted and distributed to other modes of organization, e.g. the technical organization of computed function (Simondon 1989 [1958]: p. 179ff).

The aesthetic suggests a specific bifurcation of the natural world which makes explicit a cultural world of humans, further a human form of Being. This world stands out as a particular bounding of the aesthetic in between 'pure objectivity and pure subjectivity' (Simondon 1989 [1958]: p.187).

The ensemble thus indicates the prospect of a different organization bounded not by computed function but by reappraisal of a human mode somehow. To put it differently: it is possible to conceive of the human in an ontological sense, which is on the one hand principally different from the technical organization of computed function, but, on the other hand, still related to this organization. It is possible to envision two ontologies of organization without creating a conflict with the cybernetic tenet, because they refer to principally different forms, yet open to each other. There is – with Cornelius Castoriadis's later terms, an ontological 'distinction/complicity' between the human and the 'ensemble': in his vocabulary, it is necessary to undertake the project of *distinguishing between and thinking* 'together' the "ensidic dimension (e.g. the ratio of computed function A.M.) and the proper dimension of the imaginary (e.g. the human in an ontological sense of creative action A.M.)" (Castoriadis 1986: pp.16-17).

To Simondon it is important to avoid a definition of the ensemble (Simondon 1989 [1958]: p.11) as extended determination of computed function. On the contrary, a computing machine exhibiting a range of operative options is not an automat determined by a vocabulary of closed functions, but a machine which *qva* its technological definition, introduces a *principal margin of indeterminacy* relating directly to a human issue, defined by Simondon as "perpetual innovation:" (Simondon 1989 [1958], p.12)

> ” (...) the being of the human intervenes as regulation of the margin of indeterminacy, which in the final consequence is adapted to a more comprehensive exchange of information." (Ibid.)

The technical organization of computed function, it may be argued, resides with an *enforcing openness* by way of the human Being. Simondon thus argues not only for a distinction/complicity beyond the determinism of the computational heritage. He indicates that in the ongoing and increasingly complex modeling of the human is implied a paradoxical relation between technology and human regulation. Put differently, there exists a paradoxical distinction/complicity *between the ratio of the technical organization of computed function and the human Being in the sense of creative action upon such function*. Despite the comprehensive impact on the human by computed function it remains in definitory need for a ’regulation’ by a perpetual innovation of a human origin, that is, bound to a human Being.

This perspective opens for a much different ontological perspective of a creative human Being which, nevertheless, remains in dialogue with the cybernetic tenet of ”a more comprehensive exchange of information.” A user may be seen as an ontological instance which activitates computed function, e.g. through creative action – but stems from somewhere else. Moreover, the relation between the ontological instance of computed function and of creative action may be related in novel and paradoxical ways.

With regard to the actual history of use of computers, this makes a lot of sense. Take the history of the internet. From the first drafts of internet architectures in the late 1950s and 1960s by Baran and Davies, up to the breakthrough of the World Wide Web in the mid-1990s, important cusps have emerged with unpredictable and surprising forms of human creative use. In Janet Abbate's words the network architectures developed over several decades did accommodate a variety of computed functions, yet were also paradoxically open. Their later success was closely connected to this feature, ”the ability to adapt to an unpredictable environment” (Abbate 1999):

> ”No one could predict the specific changes that would revolutionize the computing and communication industries at the end of the twentieth century. A network architecture designed to accommodate a variety of computing technologies, combined with an informal and inclusive management style, gave the Internet system the ability to adapt to an unpredictable environment.” (Ibid., p. 6)

From the Home Brew Computer Club (1975-1977) and its focus on amateurish openings of a centralized technology away from corporate, military and research uses, to the spread of cell phone technology in the past decade, such unpredictable environments have played a massive role for any new formation of use on a mass scale. Every crucial turn has presupposed and implied a perpetual innovation by an instance of human use – what Abbate, perhaps somewhat vaguely, terms ”an unpredictable environment.” And vice versa, every instance of human use, at every cusp, have triggered a huge development of computed function. In direct contrast to the majority of assumptions in the computational heritage, the human has not been an entity to become eradicated. It has bounced back with every cusp, to the point where current new media growth is almost wholly reliant on a deep human presence, as we see in Facebook and Youtube.

It is possible, indeed necessary, to argue that every time a technical organization of computed function has leaped on to new successes, this has resided paradoxically with an instance of *the human Being in the sense of creative action upon such function* in a still more comprehensive manner and form.

The current focus on the notion of pervasive computing make up no exception to this. Notions such as 'pervasive', 'ubiquituous' and 'embedded' are yet another example of Simondon's *paradox*. On the one hand they point to what Mark Weiser considered a more human, "calm" form of computing, interfaced on more whole terms with an environment of use, e.g. "tabs" and "pads" ready to hand – that is, emphatically open to the human Being in the sense of creative action upon the technical organization of computed function. On the other hand these notions reflect the ever increasing impact of computed function in the sense of making the human world 'an integral part of', 'to surround closely' (Merriam-Webster's definition of: 'embed') by computed function, or to make such function 'become diffused throughout every part of' (Merriam- Webster's definition of: 'pervade') of a human being because it is 'existing or being everywhere at the same time' (Merriam- Webster's definition of: 'ubiquitous').

Whereas Weiser's focus on absence is mostly technical, thus in favour of a more comprehensive technical organization of computed function, the pervasion of computing in social forms such as Youtube relies on distinctive localized interfaces from within of which all sorts of creative actions take place – e.g. the screen of a laptop or a cell phone. In fact many aspects of social software, web 2.0 etc. take computed function granted to such an extent that it merely is a merely a ressource out of a whole in the wall, or pervasive as WIFI in the air; computed function has reached a state of almost complete indifference and anonymity for the user, in favour of a momentous human creativity. While this aspect is of course also present in Weiser's argument, he still places the main burden of design on the technical organizations of computed functions, e.g. in artifacts such as ”tabs” and ”pads” which may obtain an engineered disappearance of computing.

However, current forms of computer use seem to go beyond this engineered calm to the advantage of the coupling of two ontological forms of organization, emergent in between ‘pure objectivity and pure subjectivity’ (Simondon) which is in need of account. In the following I debate this further by indicating that *within* pervasive computing *is lurking a human ontology* in the sense of *of creative action upon the complex modeling of computed function*.

The paper uses Bernvard Joerges's interesting note on the need for prosopopoiesis of large technological systems (e.g. like the internet), as a stepping stone for the argument (Joerges 1996). With prosopopoiesis Joerges refers to the rendering meaningful of large technological systems in a human mode: prosopopoiesis will be seen as a field of elucidation of what I term paradoxical distinction/complicity. The paper focuses on the relation between prosopopoiesis and the crucial issue of complex modeling in the computational heritage, pointing to the paradoxical distinction/complicity in three aspects of modeling: heuristic, simulation and transcendence. On this background, it concludes with a brief re-contextualization of Weiser's notion of pervasive computing on this background, as a current articulation of a founding paradox in the computational heritage.

4. Prosopopoiesis and paradox – zone of enaction

Bernward Joerges (Joerges 1996) has argued for an issue of ”prosopopoiesis” of large technological systems, e.g. new media. Large technological systems institutes a ”Macht der Sache” [power of things] in a social context which needs to be rendered meaningful in their technical organization in the sense of ’showing’ (Ibid., p. 15ff) as a specific human mode, as ”Körper der Gesellschaft” [embodiment of society]. For this form of enaction,[1] he uses the term ”prosopopoiesis” derived from classical rhetorics, exemplified by the way the rain embodies the roof by an appearance of a delicate sound pattern intelligible to the aisthesis of a human underneath, who thus become enactively aware of the technical organization of the roof (Ibid., 265ff). The rain appears by a particular gestalt which makes sense to a human – a sound to ear, enveloping into a range of implications emergent with this enaction of the system roof by sound.

Large technological systems must enact a response in the user in order for the system to exert function. This enaction is paradoxical in the sense that it transfers the meaning of the technical organisation into something which may be much different, but not less effective: the hard surface of roof may break the raindrops into ”A Hard Rain's a-Gonna Fall” (Dylan). The fall of rain on the roof is thus potentially full of meaning which enact the function of the roof, and this broader human significance is needed in order to situate the system fully in a human mode. Or more radically, the action of the roof is immediately situated within a plenitude of creative meaning.

Prosopopoiesis may thus be described as *a zone of enaction* of Simondon’s paradoxical distinction/complicity in a way which situates the margin of indeterminacy over a range of possible uses: to be precise, situates the use of the technical organization of computed function *as any form* of human use. Further the zone of enaction becomes the locale for creative action upon such function where we may discover a new complex quality of coupling two ontological forms of organization in between 'pure objectivity and pure subjectivity' (Simondon) – de facto making up an ontological intertwining, or "chiasm" (Merleau-Ponty 1983 [1968]). This chiasm is coupling the two ontologies of organization, making the one appear chiastically in the other and vice versa – now you see, now you don't. In a zone of enaction we find not only prosopopoiesis but a real form of human creative action upon the technical organization of computed function: the perimeters of paradoxical distinction/complicity. In the following I will pursue some further indications in three steps:

4.1 Prosopopoiesis and paradox – heuristic and modeling: basic traits of enaction – Paul Ricoeur's idea of heuristic inscription and the complexity of calculus in the Turing machine.

4.2 Prosopopoiesis and paradox – simulatory modeling : the response to enaction in the computational heritage – Herbert Simon's idea of simulatory interface as a response to complexity.

4.3 Prosopopoiesis and paradox – verum et factum convertuntur: negotiations from within the comptational heritage - Jean Pierre Dupuy's observation of complex modeling as product and transcendence of human finitude.

4.1 Prosopopoiesis and paradox – heuristic and modeling

According to Wikipedia, ”A prosopopoeia (Greek: προσωποποιία) is a rhetorical device in which a speaker or writer communicates to the audience by speaking as another person or object:” (http://en.wikipedia.org/wiki/Prosopopoeia.)

> “This term also refers to a figure of speech in which an animal or inanimate object is ascribed human characteristics or is spoken of in anthropomorphic language. Quintilian writes of the power of this figure of speech to "bring down the gods from heaven, evoke the dead, and give voices to cities and states (…) “ (Ibid.)

In order to enact meaning vis-a-vis an “inanimate object,” the object in question must be made to procure a gestalt which can couple with the human. This may be defined as the basic trait of a zone of enaction. In the history of computing – the computational heritage, this basic trait first occurs as a poietic action upon the complexity of calculus in the Turing machine. Prosopopoesis may thus be taken as another term for a basic creative and imaginary heuristic of the Turing machine. The Turing machine as specified in concrete computed function, e.g. the chaotic cablings of the ENIAC from 1946 must be somehow invented in use by a ‘heuristic force’ of fiction, residing with a repeated imaginary and metaphorical inscription, “a general function of what is possible in practice.” (Ricoeur 1994, p. 127)

In a very narrow sense this is what took place in the first programming of ENIAC[2] and other early Moloks of pioneering computer design by an intuition of how to combine cables in order to calculate. Despite the eccentric expertise required this operation immediately spurred a host of other prosopopoietical meanings. The most famous without doubt being John von Neumann’s famous sketch of the ENIAC as a principal logical design of a computer, after a few days of inspection, in the First Draft of a Report on the EDVAC from1945. In order to model the technical organisation of computed function in a human mode, it was entered into a general function of what is possible in practice, according to Ricoeur, a ”mode in which we radically rethink what family, consumption, government, religion and so on are.” (Ibid., p. 132) Despite von Neumann being quite technical competent, the report nevertheless was a momentous documentation of preconditions for future technical organisations of computed function, thus a radical ”rethink” of the ENIAC-inventors (Mauchley & Eckert) feat. The mechanical workings inside the ’black box' of the ENIAC – of the ”inanimate object,” i.e. the calculus of the Turing machine, thus appeared in a chiastic aisthesis coupling Mauchley & Eckert's engineering with von Neumann's logical competence in an imaginary act of ”what is possible in practice.” Thus enabling creative action upon not only the specificity of the ENIAC but the Turing machine in general – i.e. computing as such. Here we may start to explore the sense of creative action upon the technical organisation described by Manzini as “an unknown artificial world that we must examine to discover its qualities and laws” (Manzini Op.cit, p.52)

From the very beginning of the computational heritage – e.g. as summarized by the notion of ’the universal Turing machine', it was clear that this calculus was not only implying a new issue where the question of human proof in the traditional sense of compelling human embedded logic was somehow superseeded by technology. When it came to the mathematics and algorithmics of computed function, the computer could, in plain words, calculate much more than any human and important, in modes with a comprehension, scope and intrinsic purport which a human could only, at best, address intuitively – that was the birth of mechanical approaches to complexity which until then had at best been a vague metaphor (Merriam-Webster dates complexity to 1661, at the time of the origin of modern ratio in a sense somehow of mechanical computing, c.f. ”reckoning” in Hobbes’s usage from the same time) .

However models of the complex in the form of Turing machine calculus were only models, that is effect of effectuations within a proceeding pattern of calculus which needed to be prosopopoietically put at disposal of the human (Turing himself attempted this in the mataphor of the famous ’tape’). That is, inversely, be entered into a general function of what is possible in practice for humans. This would raise the issue of from where and how to enact, i.e. the possible and optional zone of enaction for the calculus in question: of how to procede, grasp, deal - imagine creatively, the artifact of computed function, which would remain a challenge for decades to come – much to the contrast of any idea of technique as ’ready to hand’ (Heidegger would revise his assumptions in the postwar essay on technique).

In the very first years of computing this task was left in the concrete to the cybernetic pioneers – often in quite practical senses, when fumbling with chaotic cablings such as the ENIAC’s in the mid-40s, and later in the 1950s and 1960s extending to a new expert culture of a cybernetic and systems theoretical definition. E.g. in the program for artificial intelligence launched In 1958 by John McCarthy, which was to make up the burgeoning computational science under the motto that ”machines will be capable, within twenty years, of any work that a man can do” as Herbert Simon stated in 1965 (Dupuy 2000, p.39).

By then the prosopopoiesis of these experts had for long been into wild speculations which would imagine in diverse and increasingly public ways the Turing machine calculus as a “general function of what is possible in practice.” Animated machines, electronic brains, an entire world systems trespassing the realm of God was in the creative making, as a ”mode in which we radically rethink what family, consumption, government, religion and so on are.” Not for nothing is the title of Norbert Wiener’s last book, *God & Golem,* Inc. *A Comment on Certain Points Where Cybernetics Impinges on Religion* (Wiener 1964).

Thus the zone of enaction appears here as a very basic form of making sense of the inanimate object, or better, the apparant ’anima’ of its Turing machine calculus (!) However, such deliberate fancy would also function to situate the ’planned rationalism’ of the technical organisation of computed function into a ’situation’ of broader human use, in the words of Lucy Suchman (Suchman 1987), writing much later when user-centric design was clear in sight. A first description of the prosopopoiesis needed to situate the complex modeling of the Turing machine calculus is thus to adapt this to a heuristic force of inscription by creative action.

In a sense computed function had to be re-invented “a general function of what is possible in practice” (Ricoeur Op.cit., p. 127) by paradoxically rethinking what is taking place inside the complexity of Turing machine calculus. The cybernetic pioneers struggled bravely to put everything straight, but by doing so they also testified to the dynamic of prospopoiesis by their creative production of προσωποποιία, of a ” figure of speech in which an animal or inanimate object is ascribed human characteristics or is spoken of in anthropomorphic language” (Wikipedia, Op.cit.) And over the coming decades all sorts of paradoxical issues which had little to do with computing senso strictu came into being, from Kubrick's *2001: A Space Odyssey* (1968) to William Gibon's *Neuromancer* (1984) (Bukatman 1993).

Se figure 2. for a summary of the argument.

Figure 2.

Technical organization of computed function // complexity of calculus in the Turing machine
RATIO

Zone of enaction // chiastic aisthesis in between of two ontological forms of organization
PARADOX

Ontological human Being // creative action upon computed function
CREATIVITY

4.2 Prosopopoiesis and paradox – simulatory modeling

The zone of enaction has several important prosopopoietical features:

a. It basically enables a chiastic aisthesis whereby a locale in between two distinct two ontological forms of organization emerges: a paradoxical distinction/complicity (see the middle layer in figure 2.)

b. It moves the emphasis of use away from the technical organisation of computed function in whatever complex form, toward a heuristic force of inscription which make couplings possible.[3]

c. It makes possible a new approach to the common frameworks for understanding use in this regard in the computational heritage (e.g. useability, affordance, context, see above section 1.).

A further substantiation, or step, of my argument may be found in Herbert Simon's discussion of simulation at the front of end of use in the programmatic treatise *The Science of the Artificial* (1996 [1969]). Here, it may be argued, heuristic inscription is tackled by the announcement of appropriate forms of *simulation* of complexity appearing with a technical organization of computed function. Simon argues that the computer makes up a particular form of complexity which cannot and may not be put wholly at the disposal of the user. What is needed is a "meeting point – an "interface" in today's terms – between an "inner" environment, the substance and organization of the artifact itself, and an "outer" environment, the surroundings in which it operates" (Simon 1996 [1969], p. 6).

To Simon the intrinsic complexity of the inner environment of the artifact (i.e. the resources of the Turing machine calculus) need not be wholly disclosed. Appropriate measures of simulation at the front directed towards the users attention may be enough. This argument is in strict accordance with the deterministic positions of the computational heritage: the technical organisation of computed function is simply too comprehensice for any form of prosopoiesis beyond simple simulatory presentations. That is, by what would be known from the 1960s as GUI, "graphic user interface" – the desktop metaphor still being almost wholly pervasive, in combination with other interactive devices such as mouse, keyboard etc, based on Ivan Sutherland, Douglas Englebart's and others experiments throughout the 1960s. This would in the late 80s and

90s evolve into comprehensive design issues of useability, affordance and context, further user-centricity etc.

Simon's solution thus appears to fix the zone of enaction with a controlled and programmed ratio of the technical orgnization of computed function which at the time of his writing, 1969, was well under its way to become a commonplace strategy exemplified in norms such as the "ISO 13407: Human-centred design process." What would be less clear to Simon and the computational heritage was that this simulation was not only a restricted form of prosopopoiesis whereby the chiastic aisthesis was subsumed under the technical organisation of computed function. It would result in a bland substitute for the complexity of the Turing machine calculus would parade over decades, e.g. as the desktop. It was in fact a creative action upon the technical organisation of computed function, leaving the intrinsic complexity at the mercy of a prime metaphor from 19th century bureacracy – the desktop.

Simulation was thus a veil to cover the paradoxical distinction/complicity, merely bearing witness to the fact that the technical organization of computed function would far supersede the human capacity for ratiocination, leaving it at the front end as the infamous 'dumb' end user. But a creative action upon the technical organization of computed function, nevertheless. Simon's book can be read as a manifesto which by disregard affirms the prescient assumption of Simondon. He grants human use by simulation but fails to understand the deeper issues residing with (his) creative action.

4.3 Prosopopoiesis and paradox – verum et factum convertuntur

The reduction of the zone of enaction to a determinist simulation of a desktop (in Microsoft's version ironically underwritten by the infamous hilly landscape of an Anglo-American definition) would be quite convincing to all the buraucracts becoming prime users of computed function throughout the 80s and 90s. Nevertheless, it also shows the paradoxical distinction/complicity *between the ratio of the technical organization of computed function and the human Being in the sense of creative action upon such function* in fully fledged operation. Today this GUI appears increasingly daft and unconvincing most often functioning as a mere entry to fast internet access to all sorts of uses. Reductive simulation would hardly fit the connectionist and e-literate society which evolved along with GUI and the computational heritage in 1990s and 2000s.

By 2000 the cell phone and WIFI technologies made widespread options for creative action possible as we see in the phenomena of web 2.0 and social software. Here it becomes clear that the technical organisation of computed function is at its most intrinsic, a creative instrument for action. In his book on the origins of cognitive science Jean-Pierre Dupuy considers further the importance of the new perspectives of modeling which appeared with the Turing machine calculus, which places it in a more reflected relation to issue of prosopopoiesis. (Dupuy, Op.cit.).

Dupuy emphasizes the importance of complex 'modeling' discovered by the computational heritage and does in a principal manner highlight the paradoxical distinction/complicity by a profound reference to Giambattista Vico's dictum of "*Verum et factum convertuntur,*" meaning that humans can " (…) have rational knowledge only about that of which we are the cause, about what we have ourselves produced" (Ibid., p. 27ff, 28):

> “A model is an abstract form (…) that is embodied or instantiated by phenomena. Very different domains of phenomenal reality (…) can be represented by identical models, which establish an equivalence relation among them. A model is the corresponding equivalence class. It therefore enjoys a transcendent position, not unlike that of a platonic Idea of which reality is only a pale imitation. But the scientific model is man-made. It is at this juncture that the hierarchical relation between the imitator and the imitated comes to be inverted. Although the scientific model is a human imitation of nature, the scientist is inclined to regard it as a “model,” in the ordinary sense, of nature. Thus nature is taken to imitate the very model by which man tries to imitate it” (Ibid., p. 29-30)

The creation of a complex model is paradoxically both a product of and a transcendence of human finitude. The model abstracts from phenomenal reality “the system of functional relations” putting aside everything else (Ibid.), and in its mechanical sphere of calculus, by computed function, such a model comes to obtain a life of its own, “ (…) an autonomous dynamic independent of phenomenal reality” (Ibid., p. 31)

Now, according to Dupuy, this principle of *Verum et factum* gains a particular emphasis from the 1930s onwards. With Alan Turing and Alonso Church’s alignment of computation and mechanics a new significance of the artificial is conjectured by the issue of “effective computability:”

> “It seems plain to us now that the notion of effective computability that was being sought [in the 30s A.M.], involving only blind, “automatic” execution procedures, was most clearly illustrated by the functioning of a *machine*. It is due to Turing that

> this mechanical metaphor was taken seriously. In his remarkable study of the development of the theory of automata, Jean Mosconi makes an interesting conjecture about the nature of the resistance that this idea met with in the 1930s: "Considering the calculating machines that existed at the time – the perspectives opened up by Babbage having been forgotten in the meantime -, any reference to narrowing the idea of computability … If for us the natural meaning of "mechani cal computability" is "computability by a machine," it seems likely that until Turing came along "mechanical" was used in a rather metaphorical sense and meant nothing more than "servile" (indeed the term "mechanical" is still used in this sense today to describe the execution of an algorithm)." (Ibid., p.35)

Thus the idea of Turing and Church *not only* expands on the notion of computed function, further the notion of what sort of technical organization computed function can be seen to be: i.e. the road which takes the universal Turing machine into forms of modeled complexity, futher a paradigm of "complexfication" (Casti Op.cit.).

It opens the issue of a zone of enaction // chiastic aisthesis in between two ontological forms of organization which were either ignored of subsumed by the determinism of the computational heritage. In fact verum et factum embodies an accept of an integral need for prosopopoeia, "a figure of speech in which an animal or inanimate object is ascribed human characteristics or is spoken of in anthropomorphic language."

Not only the machine *but also the human* will henceforth have all the options of computation as "an autonomous dynamic independent of phenomenal reality." The machine may create something, not in its capacity for incorporated mathematics or in its capacity of calculating mechanics (Turing machine calculus in various forms), but in its capacity of effective computation, thus *foregrounding 'effect'* in terms of models which reside chiastically also with the human: paradoxically situated in a zone of enaction. *For all its capacity for effective computation,* any computer, any technical organization of computed function is only meaningful in a zone of enaction which will effectuate it, in its Turing universality as "*Verum et factum*": ontologically transcending and ontological relying on *creative action upon computed function.*

4. Concluding remarks – Weiser's notion of pervasive computing

Read through my notes on the genealogy of pervasive computing from the 'rear-view mirror', Mark Weiser's pursuit of pervasive computing takes on a specific quality, which is somewhat on distance from his argument, albeit, I think, not from his spirit. Texts like "The portable Common Runtime Approach to Interoperability" (1989), "The Computer for the 21st Century" (1991), "Libraries are more than information: Situational Aspects of Electronic Libraries" (1993a), "Some Computer Science Issues in Ubiquitous Computing" (1993b), "The Last link: The Technologist's responsibilities and social change" (1995), and "Designing Calm Technology" (1995) read like an engineer struggling to expand the technical organization of computed function into a zone of enaction proper, focused on the challenge "to create a new kind of relationship of people to computers, one in which the computer would have to take the lead in becoming vastly better at getting out of the way so people could just go about their lives." (Weiser 1993b, p.1).

For one thing they expose the paradoxical distinction/complicity between the ratio of the technical organization of computed function and the human Being in the sense of creative action upon such function. The machines may, if not must, be designed so that creative action is rendered possible in a Heideggerian sense of ready to hand. The paradox must be solved, so to speak, by *inversion* of the technical organization. This is a huge step away from Simon's simulatory strategies and along the lines of verum et factum debated above. In order to transcend the finitude of the technical organisation of computed function, the technical organisation must transcend pervasively the realm of human finitude as ever-present, yet absent. The paradoxical distinction/complicity restated as engineering effort.

However, second, by this move away from the determinism of the computational heritage Weiser also installs, if one likes, a benevolent super-determinism, which in the period after the mid-90s appears increasingly outdated. The constant development of prosopopoietical options and still more effectual zones of enaction, notably by way of the www and cell phone technology restates the paradox in its own way. While the engineerig aspects are focused on a quite restricted locales – the physical definition of lap tops and cell phones, zones of enaction expands and billions of prosopopoiea appear as blunt cultural content of new media.

What we see, I believe, is cultural turn of new media which by now is generally acknowledged, and which has turned the engineering of Weiser, not to mention the simulatory techniques of GUI into quite useable but absolutely minor issues of computed function today - out of a whole in the wall. In this respect Weiser appears as a highly sympathetic engineer adressing us from a history long gone. The cultural world now driwing and interacting with the new tools of e.g. connectionist sociology is a social world of new media that we have just begun to see the perspective of. But it is a world that increasingly exploit the paradoxical distinction/complicity that for so long was a problem for the computational heritage.

I will close with advocating an increased interest in forms of such 'cultural enaction', e.g. in regard to new generations of new media for the developing world, where a cultural paradigm may make wonders of use. Also this should entail an increased focus on the lurking human ontology of creative action upon the complex modeling of computed function in the sense of of creative action *per se*. Where the Turing Machine calculus at the time of von Neumann and even Simon was still a real enigma to be translated by heavy expertise, real enigmas today may reside much more with the latter part of the distinction/complcity: that is, with our enigmatic and human creativity.

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[1] See ”Enaction is one of the possible ways of organizing knowledge and one of the forms of interaction with the world (...) Enactive Knowledge is information gained through perception-action interaction in the environment”, (http://en.wikipedia.org/wiki/Enaction). The notion of enaction is one of the important offsprings of the computational heritage, e.g.Varela et al. (1993). It is, however, beyond the scope of the present paper.

[2] ”The first general-purpose electronic computer. It was a Turing-complete, digital computer capable of being reprogrammed to solve a full range of computing problems” (http://en.wikipedia.org/wiki/ENIAC)