DIGITAL MATERIALITY – MAKING THE UNGRASPABLE (UNBEGREIFLICHE) PERCEPTIBLE

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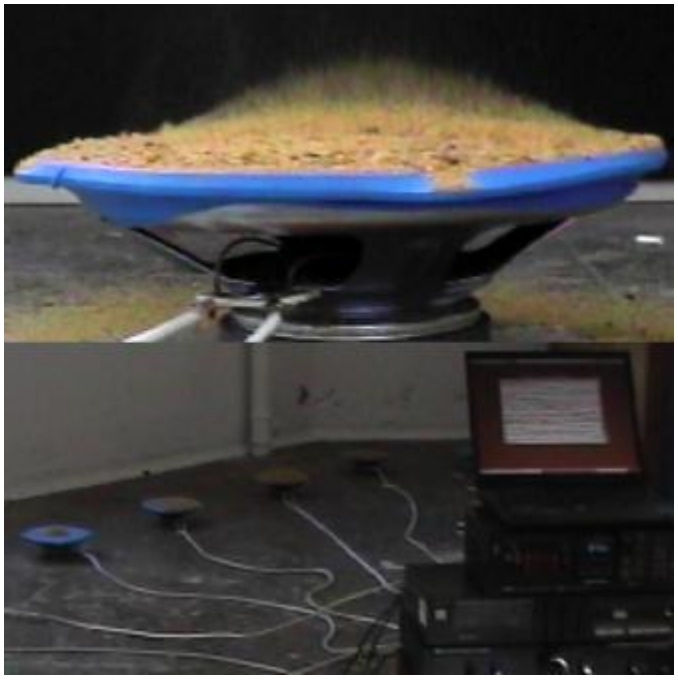
This paper reports on a series of experiments that were conducted as part of a practice-led PhD, which explored the digital potentials at the interface of hardware and software through creative practice. The laboratory-style experiments develop along a trajectory from noise within existent (computer) systems towards speculative interfaces, where conceptions of materiality of hardware and software are brought into question.



Digital Transformations - Sand.

How do we conceive of contemporary Digital Culture? More specifically, how do the concepts of time and matter offered by digital technologies relay into culture and produce present conceptions of Digital Culture? And what methods and strategies can be applied to challenge dominant conceptions of it? Is it possible, for example, to think of and to produce the interface of software and hardware differently?

These were some of the questions I investigated as part of my practice-led PhD, which explored the digital potentials at the interface of hardware and software through creative practice. The research focused on this interface specifically, because it is potentially problematic in the context of conceptions of the digital as immaterial.

This paper reports on a series of laboratory-style experiments that were conductedalong a trajectory from noise within existent (computer) systems towards more speculative interfaces, where conceptions of materiality of hardware and software are brought into question.

Digital processes are omnipresent and yet remain imperceptible and ungraspable (unbegreiflich). Unlike mechanical devices, which can be opened up and inspected, the processes of digital devices take place beyond human perception – leading to them being easily (mis)understood as immaterial. That which is incomprehensible can also be described as ungraspable (or unbegreiflich in German). Understanding and comprehension can and often does work through a tactile process and has something to do with being able to grasp or grab something – comprehension can be a physical process.

In terms of technological developments, the concept of information as immaterial was already discussed during the Macy conferences in the 1940s and 1950s in the US. The Macy conferences were interdisciplinary events, attended by mathematicians, engineers, anthropologists, biologists, psychologists, neuroscientists and sociologists. Katherine Hayles identifies the Macy conferences as being crucial in the development of the conceptions of 'bodiless information.' [1] During the first Macy conference in 1946, information was already a dominant concept and, as Hayles argues, Claude Shannon's theory – although only meant to be used within communication engineering and not as a universally applicable theory of information – contributed to the construction of the idea of information without a body by making information a mathematical function that did not need a material base to be send from sender to receiver: "frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical principles or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem." [2]

What was a breakthrough for communication engineering, was, as Hayles argues, a step back for its relay into culture because, when understood outside of a communication engineering context, "the definition allowed information to be conceptualized as if it were an entity that can flow unchanged between different material substrates." [3] Hayles points out that the definition of information taken out of its communication engineering context had a strong influence on, for example, Hans Moravec's vision of downloading human consciousness into a computer, Norbert Wiener's suggestion that it was theoretically possible to telegraph a human being and also the producers of Star Trek, whose method of transport required dematerialisation and rematerialisation of the body without a change to the material itself. According to Hayles, this cultural conception of information without a body does not stop at early cybernetic theories or sci-fi of the late 1960s, but continues for example, in current molecular biology that understands the genetic DNA information as the key to the human body, making the idea of bodiless information a thoroughly contemporary phenomenon.

Since the implementation of the von Neuman architecture, which makes software and data interchangeable, it can be argued that the development of software took place within the framework of bodiless information and highlights the cultural conception of the division between hardware, or material substrate, and software, or immaterial (bodiless) element. Software as data is largely conceived of as an immaterial entity that can flow freely and without any material boundaries between material substrates. The German computer scientist Friedrich L. Bauer exemplifies this hierarchy of immaterial software over hardware in the following quote: "How did a few people come to construct software? Roughly speaking, it was an attempt to compensate for the inadequacies of the hardware by using programmed features – in many cases features that hardware designers had forgotten or had not even thought to provide for." [4]

Variations of this dualism can be found in much of western history. This paradigm of the digital immaterial however is highly problematic, and challenging it becomes particularly important in the light of relays between technological developments and cultural concepts that develop into so-called Digital culture.

Friedrich Kittler constructs a counter argument to the software/hardware dualism and argues that 'there is no software' in the as such titled essay. Computer languages exist on several layers, from the HCI and application software to simple operation codes, which exist as hardware configurations in the form of silicon chips. For Kittler everything that is digitally produced exists as binary data and voltages. If one magnifies the process of descent from software to hardware, one finds "signifiers of voltage differences," which strongly suggests that there is no software without hardware –that "software does not exist as a machine independent faculty." [5] This describes a much more ambiguous relationship between hardware and software.

This is the context within which a series of experiments was constructed. Creative practice and in particular critical practice has a particular position from which to challenge existing paradigms – it uses speculative propositions to challenge existing ideas and assumptions; it asks questions rather than giving answers. The experiment here was not used in the strictly normative scientific method – rather the experiment in the context of speculative and critical practice enables a continuous and open-ended process of evolvement and invention. The experiment here also celebrates the constructedness of the pseudo scientific laboratory – it plays with the rational approach to classical science and the potential fictional aspect of the constructed scientific experiment.

The series of experiments were set out to challenge and to question the hardware/software dualism. They attempt to challenge the materiality of the digital, and more specifically the 'softness' of software. They make use of the von Neumann architecture that treats software and data the same. The operating system and the application software (as data) is piped to the parallel port, where the ungraspable (unbegreiflich) process of software becomes perceptible as voltages. In the series of experiments this is amplified and materialized using a range of different materials. Through different processes software is transformed into perceptible (and literally graspable) dynamic matter.

References and Notes:

1. *Katherine Hayles, How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics (Chicago: University of Chicago Press, 1999).*
2. *Claude Shannon, "A Mathematical Theory of Communication," in The Bell Systems Technical Journal 27, no. 3 (1948): 379-423.*
3. *Katherine Hayles, How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics (Chicago: The University of Chicago Press, 1999), 54.*
4. *Friedrich Bauer, "A Computer Pioneer's Talk: Pioneering Work in Software During the 50s in Central Europe," in ICHC Proceedings of the International Conference on History of Computing: Software Issues, eds. Ulf Hashagen et al., 11-22 (New York: Springer, 2002).*
5. *Friedrich Kittler, "There is No Software," in Literature, Media, Information Systems (Amsterdam: OPA, 1997), 151.*