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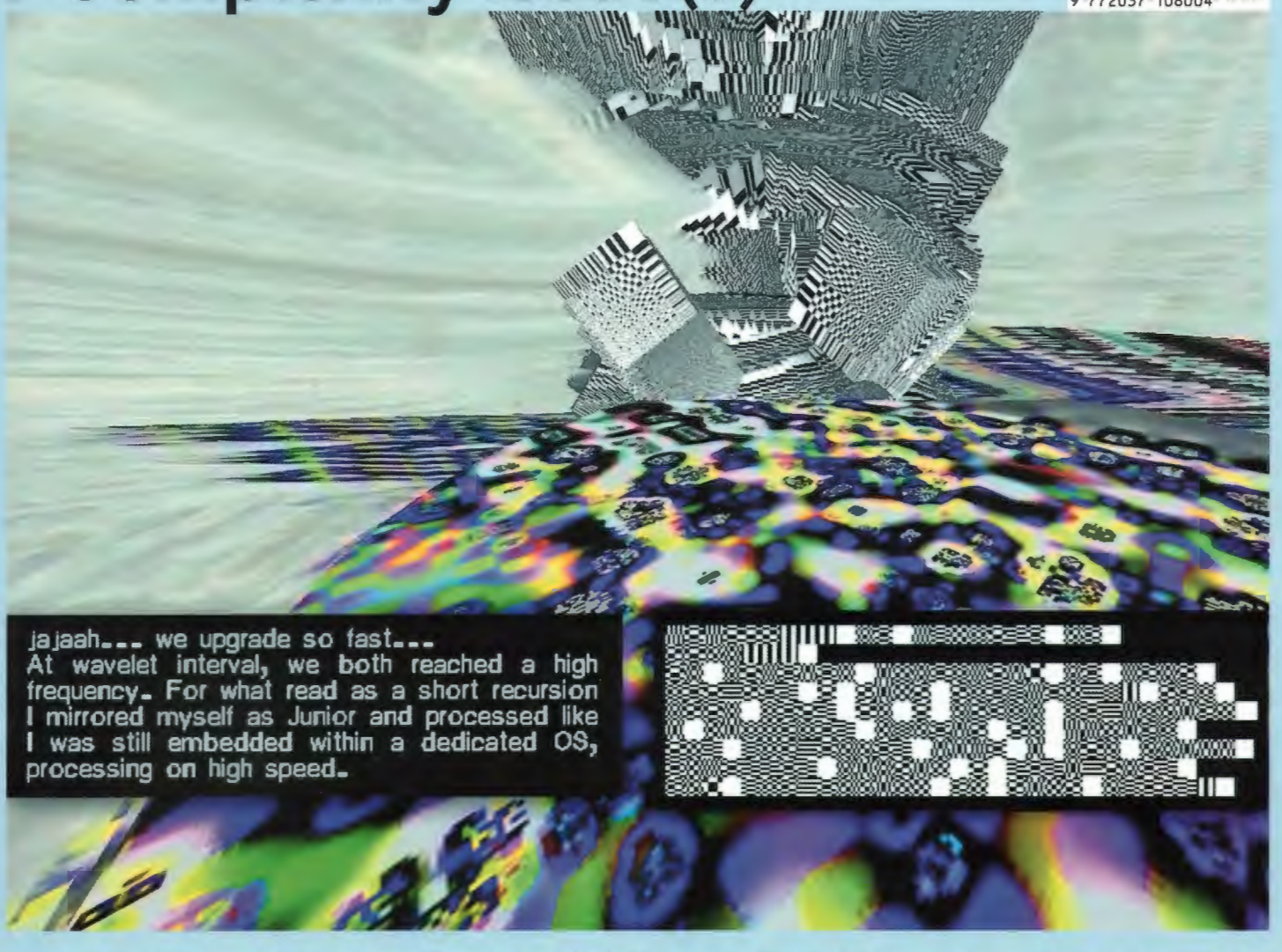
> Complexity issue(s)



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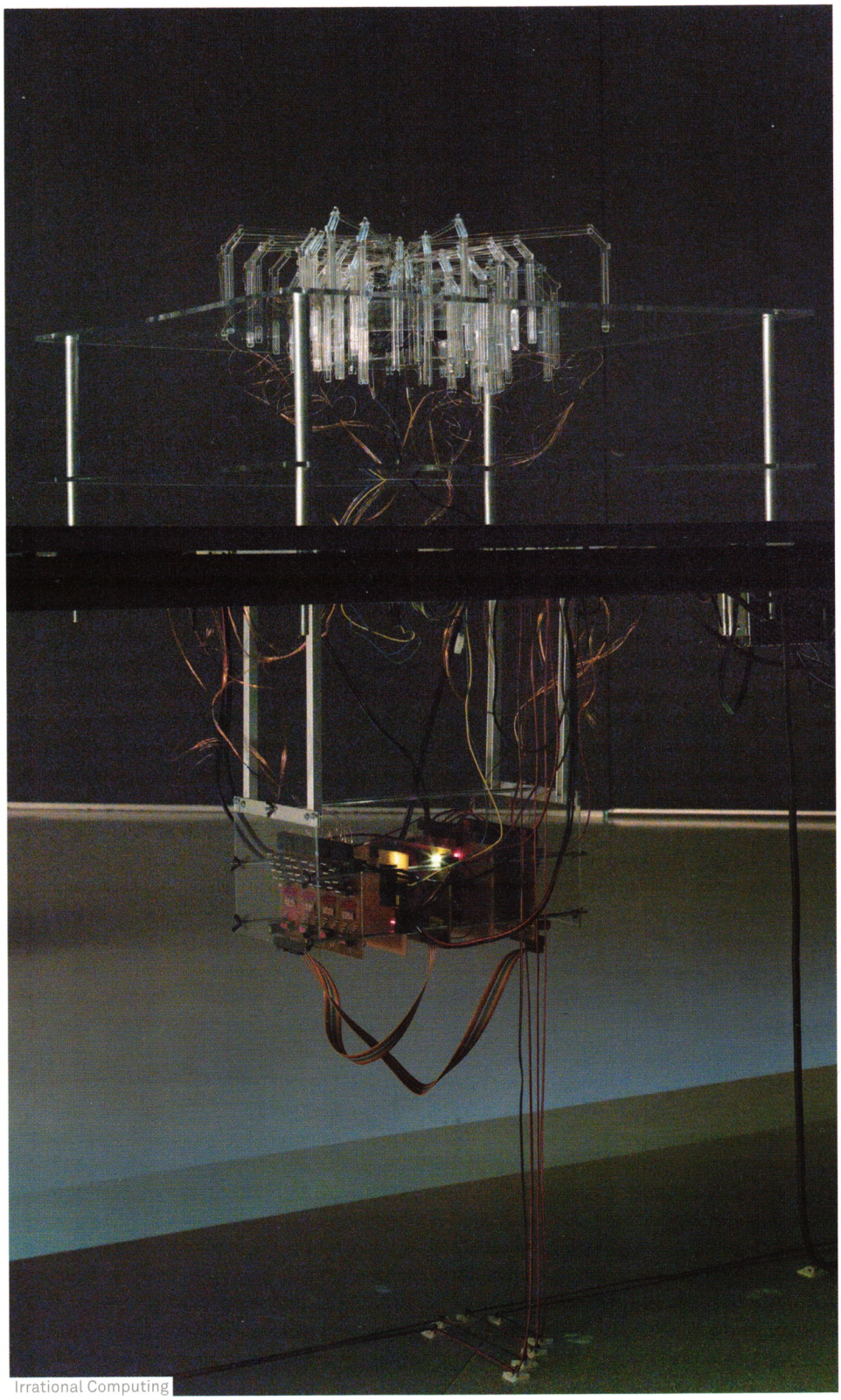
Ralf Baecker

> interview



Irrational Computing

How would you define "complexity"?

Complexity is always observed from a subjective position, without a comprehensive knowledge of the environment and the internal states of every involved part. There is a famous quote by Gregory Bateson: "If I kick a stone, the movement of the stone is energized by the act, but if I kick a dog, the behaviour of the dog may indeed be partly conservative — he may travel along a Newtonian trajectory if kicked hard enough, but this is mere physics. What is important is that he may exhibit responses which are energized not by the kick but by his metabolism; he may turn and bite." If we know Newton's law and have information about the physical conditions of the environment (like ground constitution, wind speed and direction, gravity etc.) we can very precisely calculate where the stone will finally arrive, and we are able land a satellite millions of kilometres away on a comet. But we know not much about the internal conditions, the mood and the motivation of the dog - it is not easy to predict what the dog will do. But the interesting thing with systems and machines is that even if they are free of noise, disturbances and situated in a perfectly clean and structured space, e.g. a computer simulation, we observe behaviour that we can not estimate before we run the system. This is what we call emergent behaviour, the kind seen, for instance, in cellular automaton but also in the interplay of various software elements in an operating system. Complexity arises from the simple and a lack of knowledge.

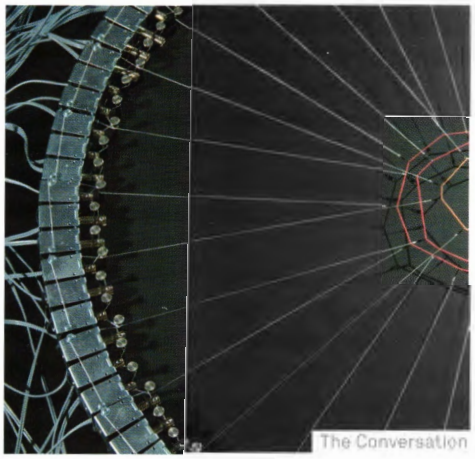
In your work you render processes taking place under the surface of technological devices, unfolding their abstract internal relationships. How do you see the dialogue and the tension that seem to exist simultaneously in the components in these systems? What kinds of values emerge from this?
If we look at one element of such a system, for example, at a lever of my installation "Rechnender Raum", which represents one single bit, it can take two positions - pulled or not-pulled. From this we are able to understand, with our own experience of the world and its physical behaviour, how it will influence the parts that it is connected to. But if we expand our view we get lost in the interacting movements with the other parts. It becomes very hard to track one event. One thing that I'm interested in is the effects of the digital on our psyche and consciousness, but on a very elementary level in contrast to the very obvious effects that networks and high-level technological systems have on our lives. The digital is a hybrid of the formalisation of mathematics that originated in the early 20th century and the mechanistic tradition of machine building. Every digital component, mechanical or electronic, is based on an analogue machine. I'm interested in this idea: our perfectly structured digital tools are running in this noisy analogue world. The digital allows us to domesticate the analogue world in the same way as formalized mathematical thinking, which is decoupled from the physical world, is transgressing into our daily lives. Digital technologies have fulfilled Leibnitz's idea of an universal language system (characteristica universalis), aiming towards the mechanization of every thought or argument.

In "The inverted machine – Rechnender Raum (Computing Space)" the dominant physical presence of the artwork is compensated for by its lightness and discreet kinetic qualities. The ongoing "computation" is manifested in a continuous and engaging operation, where the spectator is confronted with a metaphorical entanglement. You defined it "a subjective re-appropriation of the digital." Can you elaborate more on that?
Again, if we look back to the origins of computation, we have on one side the mechanical machine making tradition and on the other side the mathematical algorithmic tradition. In the late 19th century mathematicians tried to get rid of empiricism in order to avoid infinite regressions. They tried to create a perfect systems of axioms that would allow any mathematician to avoid going back to count apples, by just using the system of axioms. Gödel showed that there are some problems that could not be described or solved within this rigid axiomatic system. The Turing machine is basically a mechanistic implementation (still a paper machine) of Gödels proof. So the computer as we know it, a Turing machine, is the result of the proof that there are some mathematical problems that are not solvable. I find it strange, as an artist, to work inside a 20th century mathematical proof.

In "Irrational Computing" an unconventional computer was built out crystals and wires, with an obscure consistency manifesting itself through visual and aural signals. You said that it refers to the "disappearance of materiality in contemporary information technology." It seems to work on two different levels: a visible and audible procedure, informed by real functioning and historical references to scientific processes. How much did you want these processes to be "readable" and how did you leave room for interpretation?
Not readable, in terms of producing significant signs or images, but visible and audible in terms of giving it a body and adjusting it to the human scale. Irrational Computing started from curiosity and the question: Can I build very primitive semi-conducting elements, logic circuits like the ones in contemporary information technology and sign producing elements from scratch, just by using raw minerals taken from the earth like galena, silicon carbide or pyrite. But in contrast to contemporary information technologies where these minerals are used in a very elaborate way (literally every atom of a silicon chip is arranged and ordered at exact the position in has to be) in order to produce repeatability and precision. These elements are usually used for rational tasks, that can be described in a program. In a way my experiments for Irrational Computing was an attempt to liberate these parts from their rational jobs. Putting these minerals in an untamed mode. But in general I'm interested in offering an aesthetic experience. Creating situations and objects where people are irritated on the first encounter, but through observation slowly discover underlying layers.

Is there any machine from the past (real of fictional) that you'd like to construct, or test? And in this respect, what role does media archaeology have in your work and research?
I'm usually focusing on single aspects of machines from the past, for instance, memory: I have a small obsession with different memory systems. The first memory systems appeared in radar system in the 1930s, such as the mercury delay line. The idea is very simple: If you want to draw the vector of the movement of an object (plane) you have to know its current position and the position where it was before. Then you can draw a line between these two points: you get a direction vector. The delay line memory makes use of the slower propagation of wavefronts in mercury. Let's say you have a 10-meter-long pipe filled with mercury. A little activator creates waves on one side, eventually data is encoded into the wave fronts. The waves propagate through the mercury and arrive eventually 1 second later at the other and of the pipe. We could read the arriving waves and translate them back into coordinates. Now we have the data that was collected 1 second ago simultaneous with the currently measured coordinates. We can draw a line between these two points. In these old, sometimes obsolete principles, there is a lot of beauty and poetry. Memory is in a technical sense nothing rigid or stable but something fluid and fragile.

You said you want to "get rid of the display" and in fact, if I'm not mistaken, you have very rarely used screens in your works. Do you think that screens in general are a preponderant and


The Conversation

distracting visual mediation that prevents us from gaining better understanding the real world? And do you think that the kind of "hidden disclosure of the machine" you perform in your installations can be metaphorically considered as a strategy to take over such mesmerising mediation processes?
I think displays work like filters, they translate things into a perceptible scale for humans. They allow us to communicate with these machines with the metaphors that we are used to, because the abstract notion of a pure digital is way too obfuscating to interact directly with. But I think these metaphors, e.g. a file, a cursor or a desktop also limit our way of understanding things. But the idea of "getting rid of the display" has a different origin for me. 10 years ago I was mainly working with software, writing generative visuals for performances. In this generative practice I was working a lot with complex systems, like Lindenmayer-System, cellular automatons etc. My aim was to create some kind of transparency. But I had the feeling that through these layer of software and hardware I'm was not even close to it. If we see a generative tree structure growing on the screen, we don't see the structures and progresses behind these systems. So I started to build my own kinetic or physical implementations of such systems.

In "The Conversation" you implemented another mysterious system, clearly presenting itself to the spectator through mechanical and kinetic aspects. You described it as "'pataphysical," in the philosophical tradition of this term. Were you specifically referring to the multiple interpretations (imaginative as well) that this work can be subject to, or embracing the struggle to oppose the flat universality that the IT industry is often trying to culturally propagandise?
The Conversation is inspired by drawings of Robert Fludd. The reference to "mystics" or "magical thinking" arise from my interest in cybernetics. From my perspective this "magical thinking" is very close to the cybernetic thinking of non-linearity, complexity, feedback and that everything is influencing everything. I'm interested in alternative computational models, there are not many - the von Neumann architecture, a physical implementation of the Turing Machines, in combination with the binary system are economically and culturally so successful that there is no need for other models anymore. In "The Conversation" I'm referring to the Homeostat by William Ross Ashby. A machine that stabilized itself, similar to biological organs. There is an interesting letter send by Alan Turing to Ashby in 1946. Prior Charles Galton Darwin showed Turing a letter by Ashby concerning his planned experiments with the Homeostat. Turing tried to convince Ashby to go for the universal machine: "... do your experiments on the ACE (Automatic Computing Engine), instead of building a special machine.".

In "Mirage" you created a "projection apparatus" with a unique combination of data acquisition and a learning algorithm "hallucinating" the projection through controlled mechanically-driven surfaces. Here the roles of the software and the machine seem to both affect perception, questioning what is seen at all times. Was your intention to challenge the audience in this respect? And what kind of feedback did you receive?
Most of my works condense a very long research process. I understand that Mirage sounds very ambitious. Mirage is a kind of instrument, I would say. Nowadays instruments are no longer producing representations of the world, like a photo, they produce data that is computed into the human scale, in terms of size and time scales. Mirage can be approached from two sides: First the idea of unsupervised machine learning and the pure functional process of backward propagation that can be considered as "hallucination" or "dreaming" (Google's deep dream software, released a couple of month ago, works similarly). Second, from the idea of producing a significant image by bending a laser beam with a deformed mirror. Mirage consists of three elements: the projection itself, the projection device and the magnetometer that measures the magnetic field of the earth. The projected image has an unusual quality, although it takes the aesthetics of digital images, it appears raw and dirty. For me the mirror is the point where the virtual translates back into the physical. The deformation of the mirror is caused by the the "hallucination" algorithm through pulling muscle wire actors. The software beforehand samples data from the magnetic field sensor (fluxgate magnetometer). This data is a one dimensional stream of numbers, representing the earth's magnetic field in nanotesla. The software/algorithm analyses the data, it builds some kind of statistics of the data, and learns a (generative) model that describes how to create a signal with a similar behaviour over time, the normal use case for this is to match the generative model with new incoming data in order to do some recognition tasks. These algorithms (in my case the inspiration was a Helmholtz machine with a wake-sleep-algorithm) have two operation modes: In the wake phase the algorithm receives and analyses the world. During the sleep phase the algorithm is reinforcing its previously learned structures, by pushing random signals backwards through the algorithm or network. The side effect of this sleep phase is that it produces images (or data), internal images that are not made for displaying. I'm interested in these images and send them to the actors that deform the mirror.

Ralf Baecker is an artist with a background in computer science, who works with and about technology http://www.rlfbckr.org/