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A STROLL THROUGH ELECTRO-MAGNETIC WORLDS

In this short essay I want to provide some background to my video work *#67*, which was intended as an homage to the works *Telc* and *Reminiscence* created by Steina and Woody Vasulka in 1974. This homage is based on a particular reading that was shaped by the ideas of Jakob von Uexküll. In the making of *#67*, I revisited the principle behind the Rutt/Etra Video Processor that was used by the Vasulkas, while retracing the lineage of the almost forgotten history of analogue computing. The resulting work is a reflection on the materiality of electromagnetic signals in an urban environment.

ALTERNATIVE PERCEPTIONS

The early 20th-century theoretical biologist Jakob von Uexküll is often cited as a precursor of concepts central to cybernetics and as an inspiration for the crossover between robotics and artificial intelligence that emerged in the 1980s. His ideas also influenced many philosophers, for instance Heidegger, Deleuze and Agamben. Around twenty years ago I found out about him via a footnote in Stephen Kern's book *The Culture of Time and Space, 1880–1918*. In that book, Kern mentions him as a contributor to the idea that space and time are not absolute but relative to cultures, individuals, or, in the case of Uexküll, biological species. A good example of this is Uexküll's discussion of what is one of the most poetic scientific experiments I know: a experiment involving a snail in his 1934 book *Strolls through the Worlds of Animals and Humans*. He writes: 'A snail is put on a rubber ball that can move frictionlessly because it is floating on water. The snail's shell is held by a clamp. In this way the snail is free to make bodily movements, but will stay on the same spot. When we touch its foot with a small stick, the snail will crawl onto it. When we touch the snail one to three times a second with the small stick, the snail will turn away. But if we repeat the contact four or more times per second, it will start to climb the small stick. In the *Umwelt* of the snail, a stick that moves to and fro at a speed of four times per second has already become a stick at rest.'

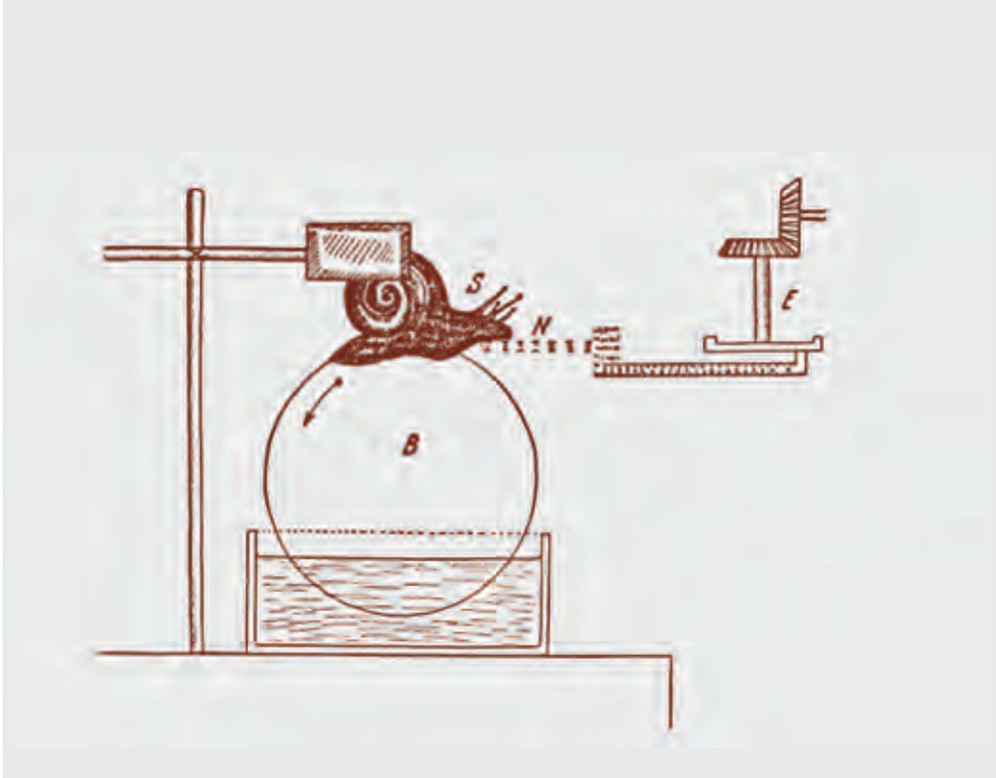
This simple but profound experiment offers us an external perspective on the radically constructed nature of an environment. It makes us wonder what the difference is between a snail trying to climb a stick that appears and disappears four times a second and humans granting continuous existence to the flickering images seen on film and video screens, or to the sparse clouds of fast-moving molecules perceived as solid tables and chairs.

What makes the work of Uexküll so interesting is that he develops a terminology around the central concept of *Umwelt* that is productive in thinking about perceptual worlds that are very different from ours. A simplified explanation of the concept of *Umwelt* might be that the world of every animal consists of the possible interactions it can have and which are therefore rooted in its biology. To further specify this idea, Uexküll introduces the concept of a 'functional loop'. In each one of these functional loops, an external 'meaning carrier' triggers a behaviour that is aimed at eliminating its trigger, so the functional loop crosses from the outside world into the organism and back again, until the organism closes the loop by making a change in the environment that in some way eliminates the reason for the meaning carrier being perceived. An example would be how some single-celled organisms are triggered by a lack of nutrients in their surroundings and will keep on swimming until they arrive at a better place where the concentration of nutrients is high enough. Simple organisms have a world consisting of two or three of such functional loops, complicated organisms like humans have many more, and two species share those parts of their world where these loops intersect in objects in which they have a shared interest.

Much of Uexküll's work can be seen as an attempt to understand the inner logic of the worlds of different species, while trying to stay out of the trap of presupposing our human sphere as a somehow privileged one that includes all others. His picture of intersecting

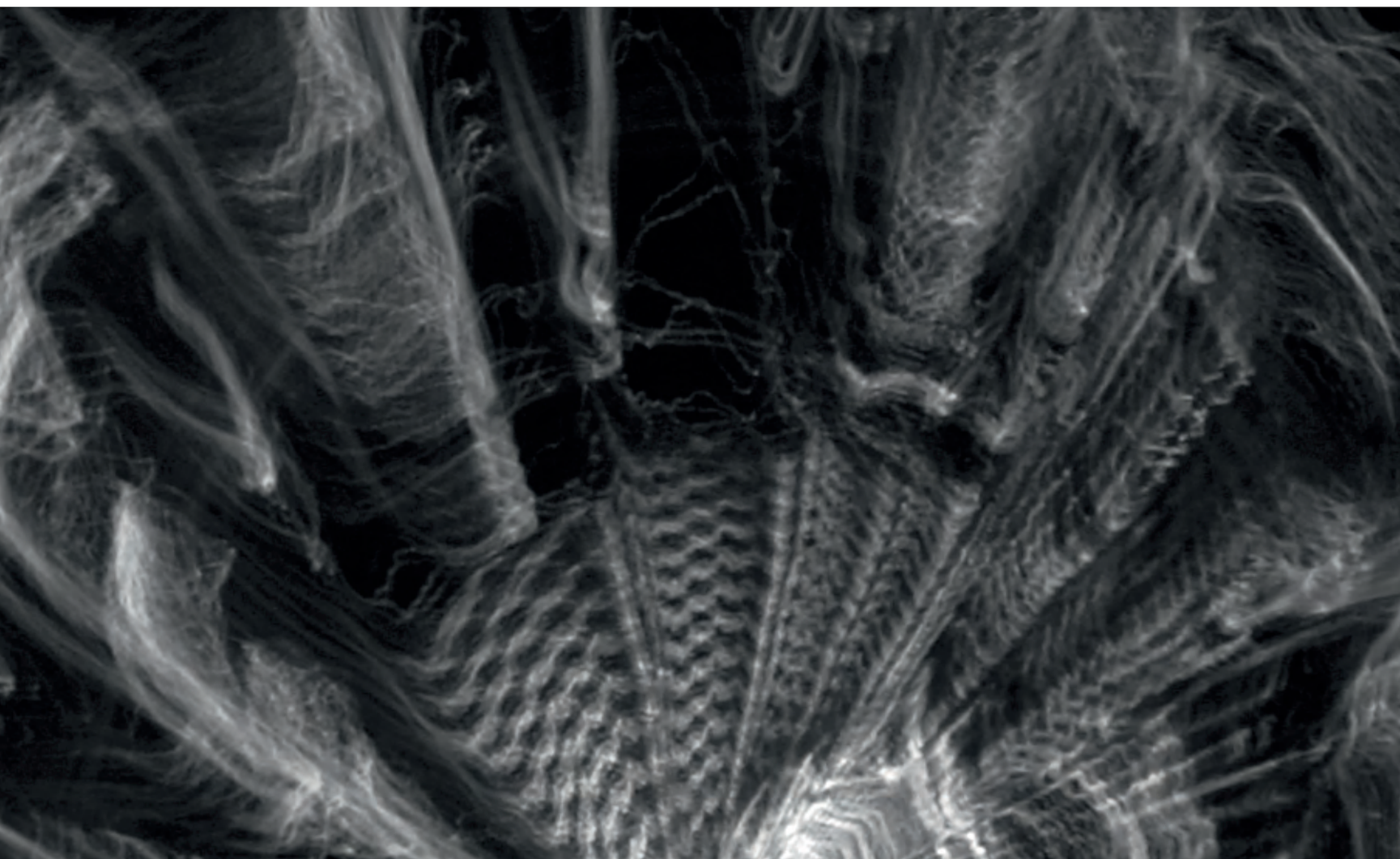
worlds that consist of nets of feedback loops triggers fantasies of how we could have access to alien modes of perception, and it also gives us important conceptual tools to act on those fantasies.

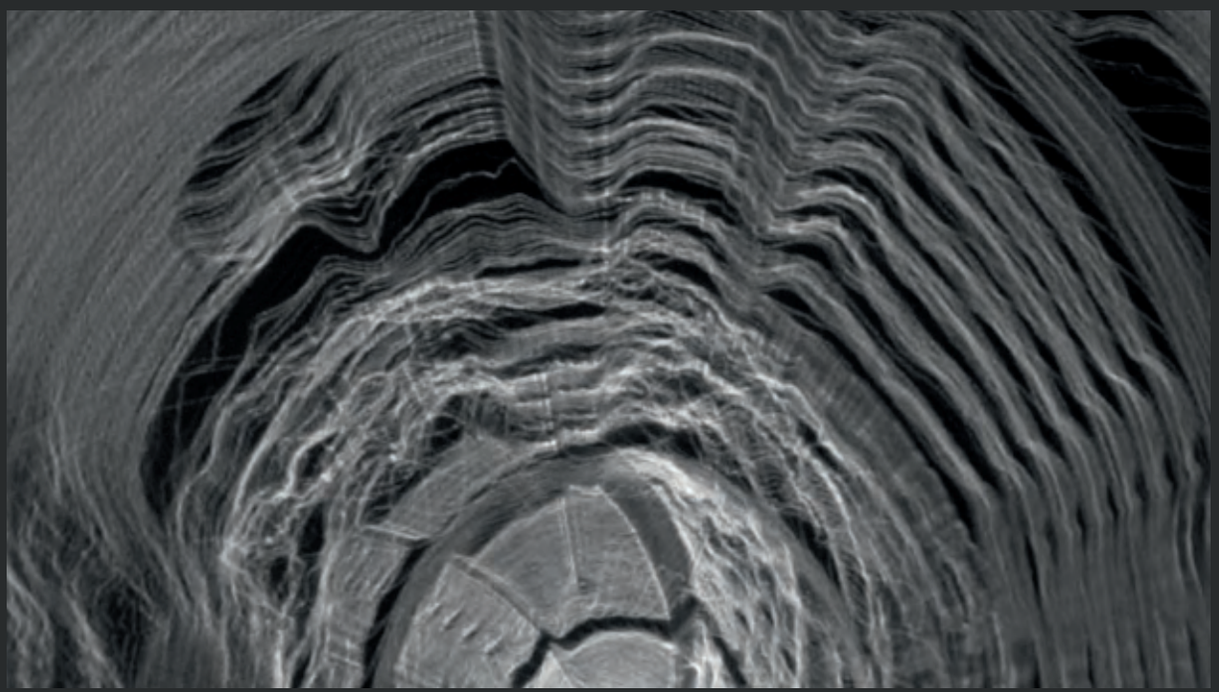
Over the years I have carried out various experimental projects – with students and as part of my own practice – to explore Uexküll's ideas in a very concrete way by asking the question whether we can construct new 'functional loops' by building devices that can act as new senses. These rather primitive experiments in sensory augmentation mostly took the form of wearable sensors that pick up things humans cannot perceive, with various translations of their output. I did experiments with very sensitive heat sensors and detectors of electromagnetic waves, but the most developed of these projects was inspired by the electrostatic sense organs of sharks, as I was curious about what the sensing of

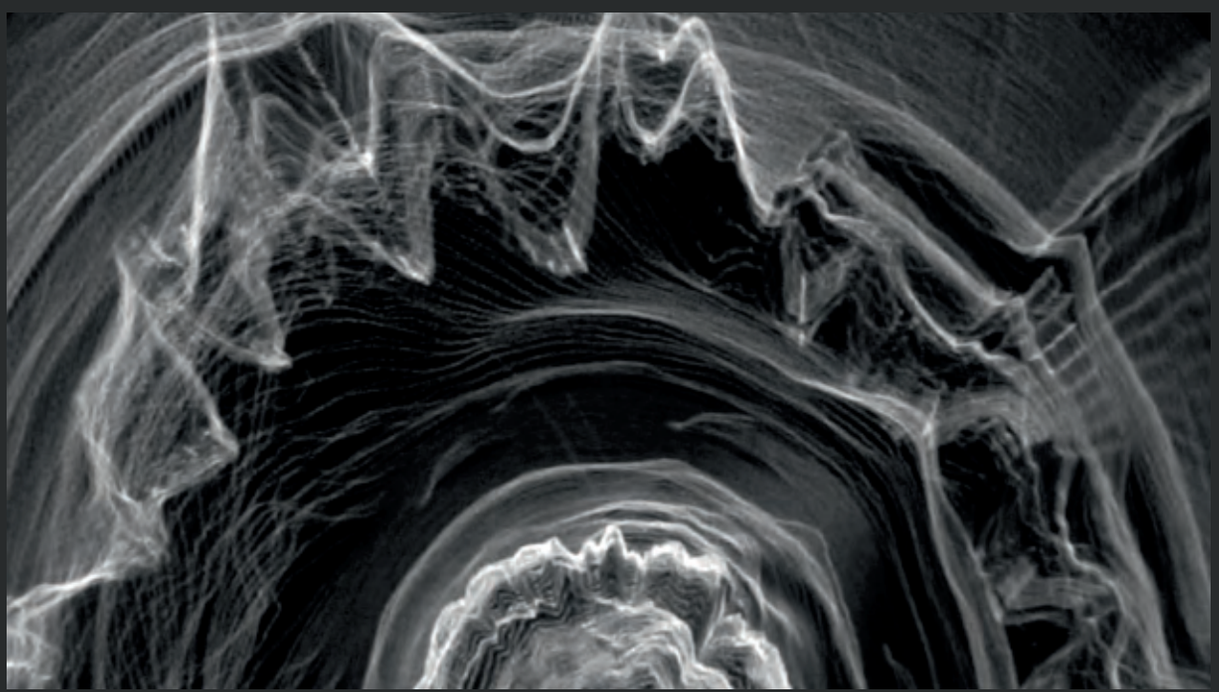


Jakob Von Uexküll, Snail experiment in 'Streifzüge durch die Umwelten von Tieren und Menschen: Ein Bilderbuch unsichtbarer Welten', 1934.

Joost Rekveld, *#67*, video, 2017. Stills.







electrostatic fields would yield in an urban environment. I built a crude device that detected electrostatic fields in several directions and which resulted in varying patterns of vibration on the skin of my left arm. I used this device to walk around in cities and discovered that I had acquired something like a sense for materials: large surfaces of glass and plastic accumulate electrostatic charges that could be felt through this device. I made one installation inspired by these experiences, but this is a strand in my work that still awaits further development in other forms.

Uexküll's ideas are in my view also relevant for thinking about certain kinds of experimental film and video. In experimental film there is a long history of critical attitudes towards the devices that serve to capture and distribute moving images. These attitudes are grounded in an understanding of how our visual perception is to some extent culturally constructed by these devices and the industries and technological cultures they are part of. In this tradition, the work of filmmakers like Stan Brakhage and Jordan Belson has always inspired me, and especially their approach to interventions in the apparatus of cinema as a way to achieve a personal vision. Stan Brakhage has famously written about how disrupting the camera is necessary to break out of standardized cinematic ways of representation, themselves largely based on the tradition of Western painting that emerged from the Renaissance on. Disruption is not an end in itself here, but necessary for a visual demonstration of a personal relationship to the world. The abstract filmmaker Jordan Belson bluntly described his own work as 'documentaries', not of a factual state of affairs in front of his camera lens, but of a world of internal imagery mediated by optical devices. The promise of these kinds of ideas is that, if our perception is to some extent the result of cultural construction, it is also to some extent malleable, and can be changed by example.

Ever since I first saw Steina and Woody Vasulka's *Telc* and *Reminiscence*, they have been a reference point for me when thinking about how moving images can capture or demonstrate alternative modes of perception. Both works were made in more or less the same way during a visit made by Woody and Steina to the area where Woody had spent time during his childhood: unedited video footage was visually transformed using a Rutt/Etra Scan Processor, leaving the originally recorded sound untouched. The soundtrack serves to anchor the images in an everyday reality with recognizable interactions with objects and people, while the images have been turned into complex patterns of lines. These are clearly of an analogue electronic nature, evoking radar or echograms, and show continual transformations of a connected visual field. Objects jump out from this field and can in rare instances be recognized, although most of the time we see only a flux of transformations. The patterns in this flux strongly convey the experience of a body navigating a series of spaces: whatever the unusual visual logic of this world may be, we still recognize how the changes in pattern are caused by a moving viewpoint. Through the alien landscapes they present, *Telc* and *Reminiscence* touch upon a visceral human experience of how our perceptions are the result of probing the environment with our bodies.

MEDIA MATTER

My video work *#67* was triggered by a commission from the LIMA media art archive in Amsterdam in the context of their 'UNFOLD' project. The invitation was to make a new piece connected to the oeuvre of the Vasulkas, as an act of 'reinterpretation' of works in the LIMA video art collection. Because *Telc* and *Reminiscence* have been such important references for me, it was obvious that those works would be the starting point. The plan was to continue my research into sensory augmentation by developing a wearable system that would generate images in real-time based on sensor readings, as a replacement for direct vision. As part of the LIMA project, I gave a workshop around this theme. For this, we initially developed mobile phone software that implemented a

crude version of the visual processing that Steina and Woody achieved with their Rutt/Etra processor. The image stream of the phone camera was transformed into a stereoscopic line-pattern, offering a very limited, but real-time, interpretation of *Telc* and *Reminiscence*. We used this as the point of departure in the workshop and explored other visual translations, sometimes also using input from other sensors and sometimes ignoring the camera stream altogether. The plan for *#67* was to use the workshop for preliminary experiments and make a video piece based on unedited footage of an urban walk, visually transformed by a later iteration of my software.

When rereading the manual of the Rutt/Etra processor as part of this process, I encountered this short description written by Steve Rutt and from thereon in the project took a very different turn: 'The RUTT/ETRA Synthesizer is a video analog computer. In operation the incoming video signal is separated into its vertical, horizontal and intensity components. These components are processed through a series of multipliers, summing amplifiers and function generators to modify both the raster format and the intensity of the processed video. The Synthesizer can lighten or darken specific portions of the picture and can control the raster which causes the image to be reshaped. The components of the processed video are fed into a specially designed kinescope display where they are reassembled into a standard image. This image is picked up by a monochrome camera, colorized, and fed into a switcher or video tape recorder.'

When I read that description for the first time, many years ago, I did not think much of the term 'video analog computer'. But this time my reaction was very different, because of the rather extensive practical and historical research into analogue computers I have been doing over the past five years. My interest in these machines started when I wanted to return to building physical devices instead of systems built purely out of code, but five years later I am still fascinated by the culture they were part of and the perspective they afford on fundamental concepts like 'computation' and 'information'. Electronic analogue computers work according to entirely different principles than digital computers: variables are represented by voltages, which can be added, multiplied, and integrated with relatively elementary circuitry, with the resulting curves plotted on paper or displayed on an oscilloscope. Large analogue computers consist of many computing modules and are 'programmed' using patch cables. These devices have been almost completely forgotten, even though they were very common between 1950 and 1975. They made possible supersonic airplanes, missiles, and nuclear reactors, facilitated the calculations for the Delta Works flood defences in the Netherlands and have helped put humans on the moon. Generations of engineers were trained in the concepts underlying analogue computing, and, until personal computers became ubiquitous in the early 1980s, analogue computers were pretty much the only way to do real-time exploration of mathematical models. Despite this, current histories of computing hardly mention analogue computing or even omit it altogether, and present a curiously linear account of progress.

Apart from this intriguing 'otherness', another reason for my current interest in analogue computing is the fact that it offers a way of thinking about the materiality of computation that is very different from digital culture. When your computer is based on the concept of the analogy between two material systems, there is little room for Neoplatonic visions of information as an immaterial substance that somehow strives to be free. And beyond the digital, the culture around analogue computation offers a very interesting vantage point to develop an alternative view on the intersection of information science and the manipulation of matter on a molecular scale.

The practical component of my research into analogue computing has so far consisted of restoring an EAI TR-48 analogue computer from 1963, learning how to use it and using it as a model to design and build my own, much faster analogue computer suitable for generating HD video

signals. When I received the LIMA commission, I was more or less halfway through building it, and I realized that I already had most of the modules that make up a Rutt/Etra processor, since both devices had the same ancestor. The only unplanned module that I needed to add was for video input.

This realization led to reflections on the difference between the Vasulkas using a Rutt/Etra processor in 1974 and my possibly using a high-definition re-embodiment of it forty-two years later, and how this might relate to my explorations of sensors that afford another kind of physical interaction with our urban environment. I have always looked at the Vasulkas as pioneers of the new, synthetic spaces opened up by electronic signals and early digital transformations of the image. Although firmly rooted in the devices they manipulated or co-developed, they were in some sense exploring immaterial worlds, doing some of the groundwork for the later arrival of cyberspace and virtual reality. Steve Rutt used the analogue computer as a model because that was the obvious way to do things for an electronics engineer in the 1970s, whereas I am interested in it because of the unusual vantage point it allows, in a conscious break with my earlier work in code. My reasons for being interested in sensory augmentation and analogue computing are related to my interest in how machines mediate the material world around us, questioning how the technologies of measurement and simulation become part of our ways of perceiving and thinking, and my curiosity about alternatives. So where the Vasulkas used the Rutt/Etra processor in their evolution towards digital technology and immaterial signals, I am consciously going back to the technologies of that period, looking for another perspective on current technological developments, the past being the most easily accessible repository of alternatives.
As Erkki Huhtamo says so simply and beautifully when explaining his views on media archaeology: it is interesting to look for the new in the old, and to look for the old in the new.

When considering the materiality of signals not only in my analogue devices, but also in our urban environment, I was concretely thinking about how capturing and using these would work in an analogue scenario without resorting to wearable digital devices. This reminded me of crude experiments I had done with induction coil microphones, inspired by the sound walks of Christina Kubisch. An induction coil microphone is essentially a coil of metal wire that acts like an antenna: when you amplify the signal and listen to it on headphones, the electromagnetic fluctuations around the coil are made audible. In a city, most electrical devices are connected to a power grid that delivers an alternating current of a frequency of 50 Hz [in Europe and most of the world; 60 Hz in the USA]. The invisible and intangible landscape of electromagnetic signals in a city is therefore dominated by this fundamental frequency and its many overtones, synchronizing our devices such as clocks, fluorescent lights and electromotors to the generators in our power plants. For a long time, television sets, too, were synced to the frequency of the power grid, which is the reason why it still is the basic frequency of most video signals. This also means that electromagnetic signals picked up in the city will result in interesting interferences when used as an extra input in the Rutt/Etra Video Processor.

The final piece is based on an unedited recording of a trip from a nearby power plant in the north-west of Amsterdam to my studio, a route that crosses a variety of interesting electromagnetic situations. From my point of view, making a connection between these material yet intangible landscapes and the video signal itself felt like a suitable homage to the work of the Vasulkas.

Joost Rekveld, *#67*, video, 2017. Stills.

Pp. 146-147: Joost Rekveld, Rutt/Etra inspired phone app.