From Modulation to Algorithm
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Signal processing enables mobile telecommunication and global navigation, geolocation tracking and site-specific responsiveness as well as ubiquitous control and remote warfare. It significantly modifies our sense of space-time – changing habit and perception, proximities and spatio-temporalities. Algorithms are designed to automate decision-making, gatekeeping and distribution of information. To keep pace with the progress, we increasingly rely on machines which require compatibility and continuous updates. This increasing dependency, coupled with the decrease in clarity of their inner workings, which is in part inherent in their expanding complexity, may create unprecedented forms of automation, normalisation, uneven distribution, segregation and exclusion. In the context of this concrete entanglement between abstract machines and sensing bodies, or abstract space-time and social realities, how could we address the problem of spatial control in order to recuperate the recognition of the right to actively engage in making our habitat? and how to develop the means to do so?

The formation of today's architectures of spatial control cuts across different levels, with respective scales and temporalities. On the one hand, we can identify transnational entities intervening in geopolitics and spatial governance (Google, for instance, in particular with its Google Maps component, or SenseTime, or G4S, to name a few and to indicate the range). On the other hand, they operate at the level of interactions and relations between people and machines. For example, they can govern access to resources, spaces and infrastructure, or modify perceptions and spatio-temporalities.

As 'planetary-scale computation' increasingly transforms modern geopolitics, Benjamin B. Bratton (2016) proposed a specific diagram (*The Stack*) to map the shifting political geographies. Along with Bratton, I think it is needed to develop diagrams that allow for mediating between different scales and temporalities. This requires abstraction, and a sense of modularity – that is, independently operating units that can be linked in various ways. The emphasis of my research, however, lies on signal processing rather than specifically on computation or the digital – on signal more than interface and process (or structuring process) more than pre-established structure mediating between body-machine and space-time.

A signal is the physical carrier of information, of content and expression, transmitted through a medium. Modulation impresses the information into the signal by varying the properties (e.g. amplitude, frequency, phase, pulse width or pulse sequence) of a carrier wave that transmits the information. Demodulation is needed to make the signal become heard. With the development of electric telecommunication from the late nineteenth century onward, the term signal became more significant. Coupled with the increasing precision of clock time, from mechanical to electric to atomic clock, signal transmission enabled the development of radio-navigation systems, such as the satellite-based Global Positioning System.

Umberto Eco defined signals as 'units of transmission which can be computed quantitatively irrespective of their possible meaning' (Eco 1976, 20-21). They are precisely what Antoinette Rouvroy understands as the raw data of a new mode of government after the computational turn. 'Raw data function as deterritorialised signals, inducing reflex responses in computer systems, rather than as signs carrying meaning and requiring interpretation.' (Rouvroy 2012, 147-48) She argues that 'algorithmic governmentality' implies a shift from targeting actuality (facts) to targeting potentiality (relations). For example, page ranking based on the number of hyperlinks rather than on content, or profile-based advertisements and focused political propaganda. In short, the utilisation of predictive algorithms, especially when motivated by

neoliberal logic, anticipating events in real time and affecting one's choices at a preconscious stage, tends to prevent no less than the very possibility of critical thinking (i.e. the process of individuation) and action or event.

The research seeks to explicate the transformative power of signal processing in the production of space by means of in-depth theoretical research and historical analysis intertwined with explorative spatial and sonic experimentation – or practice-driven research. It is an interdisciplinary study situated within architecture and sonic practice. Amid the spectral complexities we are confronted with, amplified by technological advancements in signal processing, a renewed interest in sonic space has emerged. The expanding field of sound studies moves across many disciplines and interconnects them in different ways. Sonic practices, however, are rooted in a much longer tradition in the arts, which developed alongside electric and electronic media – for example, Italian Futurists' noises and radio in the first half of the twentieth century, electroacoustic music (elektronische muzik and musique concrete) from the late 1940s onward, acoustic ecology, stochastic and algorithmic composition and design (for example Iannis Xenakis), computer music, media and sound art.

The research is divided into three parts. The first part explores the relations between control and signal processing with respect to waves, information and abstract space-time. It seeks to explain how signal processing – from modulation to algorithm – brought about not only the bifurcation of energy and information, and signal and meaning, but also a shifting sense of space-time and mode of governance and the difficulties these shifts entail for both spatial practice and critical thinking. It moves from time-continuous oscillations and analogue thinking to time-discrete functions and digital logic, situating them as intertwined technologies of mediation and modes of thought.

The second part elaborates on the shifting modes of operation in relation to aesthetics in architecture, art and music – focussing on spatial and sonic practices. This analysis seeks for the correlations and isomorphism between cultural, politico-economic and technological developments in relation to spatio-temporality. In particular, it explores the shifting sense of space and time, from early telecommunication (telegraph, telephone, radio) and time-based reproduction (phonograph, tape, film) onward. It contextualises the modern concepts of space, time and signal, and tries to identify certain paradigmatic shifts, from absolute representation and notation to abstract diagram, for example, as well as from tonal harmony to noise and symbol to signal. It investigates correlations between these shifts within the broader historical context – the development of industrial capitalism from the nineteenth century up until now. Furthermore, it looks more closely into cross-disciplinary relations, for instance, in early telecommunication and neurology, in artistic and scientific experiments, and in dual-use (military and civil) signal processing technologies.

The third part explores more deeply the concrete entanglement of abstract machines and sensing bodies, and its spatio-temporal implications, by means of sonic and spatial experimentation and design, or practice-driven research. In reciprocal relation with the theoretical study and historical analysis, this part seeks to develop diagrams, compositions and strategies, which expose, and ultimately explore ethico-aesthetic alternatives to, the processes of machinic subjugation we are encountering today.

Bibliography

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Design Driven Research

The research consists of (1) a theoretical research which provides conceptual and theoretical
framework; (2) a historical analysis contextualizing different artistic strategies; (3) a practice-based
research which seeks to develop and test new diagrams, compositions and strategies.

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Bio

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Taufan ter Weel is an architect, artist and researcher with an interdisciplinary approach at the
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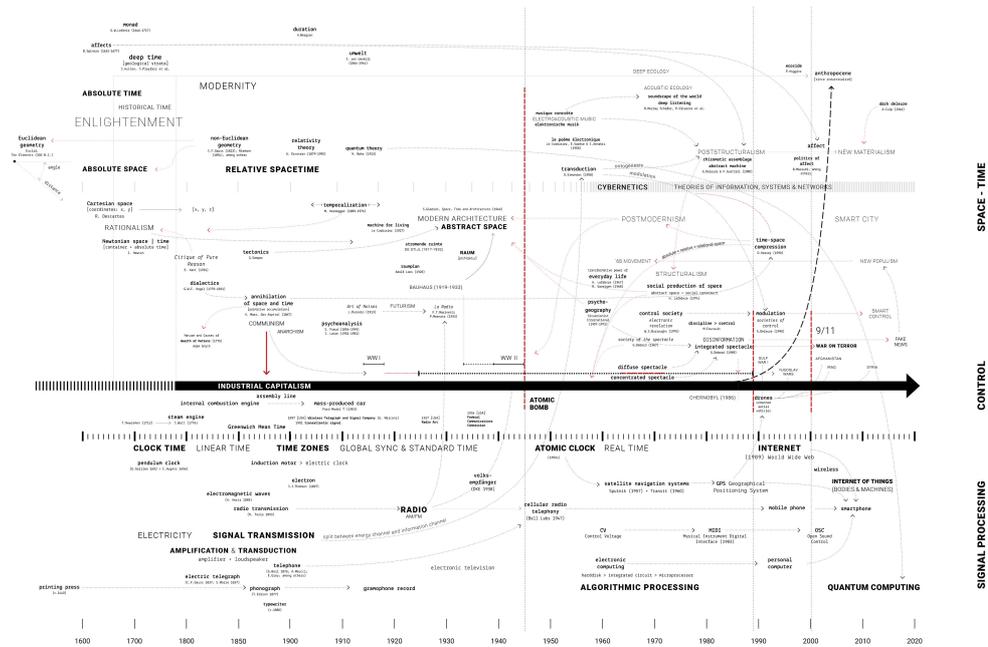
Conceptual framework and timeline by author.