Procedural Films:

Algorithmic Affect in Research Media Art Practice

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Declaration of Authorship

I, Alexandra Anikina, hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

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Acknowledgements

Abstract

This thesis explores the political aesthetics of 'procedural films'—media works that use generative algorithmic procedures and manifest as moving images. In contrast to long-held techno-positivist understandings of generative art, the thesis reframes procedural films as a critical media art practice aiming to understand the 'procedure' as an affective engine of moving image experience. It employs an interdisciplinary approach that borrows from materialist theories of media, experimental film, artificial life and computational culture, and draws on my practices as artist and curator. These processes of making, curating and experiencing serve as enacted research, as a scalable architecture of thinking through and thinking with the technical media. The thesis proposes a conceptual framework for exploring procedural films as techno-cultural artefacts, addressing the 'apparatus', the affective space-time of their viewing and their sociopolitical operation. It proposes that algorithmic autonomy brings an affective renegotiation of the traditional roles of the spectator and the moving image, instead seeing it as a complex entanglement of human and non-human agencies, computational temporalities and generative procedures. Furthermore, it addresses procedural mediation and automation as a part of the political aesthetics of media art, exploring the techno-capitalist commodification of attention, time and images. The thesis investigates two case studies—screensaver and game engine—as procedural apparatuses. It explores these media artefacts as sites of labour, design, affect and experience, addressing their techno-cultural construction, as well as their processes of liveness and emergence.

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Procedural Films: Introduction

If I were to map the history of accidents that contributed to the decision to undertake this research project, I could recall two distinct moments. The first moment was in 2013, when I made a film entitled *Some Entropy in Your Tea,*[1] an arbitrary but somewhat engaging collage of found and original footage, self-made aphorisms and titles of Wikipedia articles. Inspired by online repositories of film archives in the public domain, the work contemplated a sci-fi scenario of a cinematic consciousness emerging out of the endless archives of footage. I was convinced that I was attempting a cinematic interpretation of artificial intelligence, something inheriting Epstein's 'metal brain' and Vertov's 'kino-eye'. The second moment was when I first saw Ian Cheng's *Emissary Forks at Perfection* in 2015 at Pilar Corrias Gallery in London. The work, a live filmic environment made in a game engine and bearing distinct aesthetics, was described on the wall as a 'live simulation'. At the point of encounter I was researching experimental film and artists' moving image, which led me to recognise that something that I propose to call 'procedural films'—media art works that use generative algorithmic techniques but operate in a succinctly filmic domain—did not really exist in academic and artistic discussions. Generative filmic works have been discussed as art objects, simulations, sometimes software, but rarely as a unique synthesis of computational logic and filmic experience.

The word 'procedural', while appearing in many contexts, was in this case borrowed from the field of game design, where 'procedural generation' means automating processes such as creating landscapes or game levels. As algorithmic processing enters higher levels of complexity, such as machine learning, various procedural operations of automation become more and more common. In digital visual culture, this means that decision-making is often delegated to algorithmic processing. In this thesis I aim to analyse the consequences of this for film and media art, in terms of broader artistic methodologies as well as my own practice.

Taken broadly, the idea of procedural film can be extended to almost anything that has some kind of operative logic at its core and produces moving

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[1] See Practice Overview and Documentation section of the current thesis, p. 167.

images, such as train schedules, clocks, advertisements or mobile devices. After all, they are also operated by a program and, in most cases, if one watches long enough, the images will move. What separates procedural film from other, more familiar and established, moving image forms? I suggest that we should understand procedural films as films that are generated, with the help of software or a custom algorithm, as opposed to being reproduced, and that the generative process happens live. I also restrict procedural films in the current investigation to media artworks and artefacts. While any video file is already enabled by the various protocols and *procedures* that render it visible each time it is played, this rendering, as a rule, results in perceptually identical copies. The distinct emphasis of procedural film, therefore, falls precisely on the generative and autonomous nature of the algorithmic procedures insofar as they can offer exceptions to this rule, resulting in a live process that exhibits variation, unpredictability and randomness.

Procedural works, often made by independent game designers or artists, have autonomous operation as their primary goal. For example, in his work *San Andreas Deer Cam* (2015–2016), artist Brent Watanabe automates the environment of the game *Grand Theft Auto V* by running a modified version. The camera is attached to a model of a non-player character—a deer—that is programmed to operate autonomously, wander and interact with its surroundings. As mentioned in the description on the website that streamed the work live at the moment of its installation, 'in the past 48 hours, the deer has wandered along a moonlit beach, caused a traffic jam on a major freeway, been caught in a gangland gun battle, and been chased by the police'.[2] In works such as this, the hidden and often comically absurdist 'life' of images comes to the surface, and the figure of the human viewer recedes into the background. In this thesis, procedural films are investigated in direct relation to the idea of autonomy that comes from the algorithmic automation of the image.

Research Background and Scope

Procedural film is an object of study that exists at the intersection of moving image, media and computational cultures. In academic research, the algorithmic

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2 Brent Watanabe, 'San Andreas Deer Cam', 2016. http://sanandreasanimalcams.com/.

and filmic intersection has become the focus of various areas, including the so-called 'digital turn' in film studies, media archaeology, new media and, to some degree, game studies. However, a specific focus on how cinema can become generative, and how the computational and the cinematic can be seen as equally co-constitutive sides of the experience of media art works, has been rare. The intersections of film and media art have been addressed by important exhibitions such as *Future Cinema: The Cinematic Imaginary after Film* (2002) at the ZKM Center for Art and Media in Karlsruhe and *Dreamlands: Immersive Cinema and Art, 1905–2016* (2016) at the Whitney Museum of American Art. Even in these cases, however, generativity was only one of the aspects surveyed. Academic conferences such as SIGGRAPH, Media Art Histories and Society for Cinema and Media studies have touched upon the topic, producing some of the papers that were instrumental in this research. The idea of procedural or automated film practices is currently attracting more scholarly attention. In 2019, two conferences addressed this specific intersection: the International Film Studies Conference (2019) in Gorizia, Italy, which was themed *Moving Pictures, Living Machines: Automation, Animation and the Imitation of Life in Cinema and Media,* and the Besides the Screen conference (2019) with its theme of *Graphic Intelligences & Algorithmic Fictions.* Scholars with focuses on more mainstream practices, but with the same understanding that it is impossible to see the cinematic as separate from the computational, have produced relevant approaches—Gabriel Menotti-Gonring has worked on executable cinema[3] and Kyle Joseph Stine on calculative cinema.[4]

This thesis focuses on procedural film as a research media art practice. I understand it as an art practice that is not only tasked with creating new affective spaces, but also with unpacking the socio-technical and epistemological conditions of producing these spaces. In the current moment, in which computational processes are increasingly difficult to separate from the

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3 Gabriel Menotti-Gonring, 'Executable Cinema: Demos, Screensavers and Videogames as Audiovisual Formats', in *Re: Live Media Art Histories 2009,* edited by Paul Thomas Sean Cubitt (Conference Proceedings, The University of Melbourne & Victorian College of the Arts and Music, 2009), 109–13; Gabriel Menotti-Gonring, 'Executable Images: The Enactment and Distribution of Movies in Computer Networks', *The Velvet Light Trap* (September 2012): 49–58.

4 Kyle Stine, *Calculative Cinema: Technologies of Speed, Scale, and Explication*, PhD dissertation, University of Iowa, 2013.

cultural processes, such investigations become particularly important. Besides keeping to the strict definition of procedural films as media artworks that employ generative algorithmic processes, I also highlight the implications of algorithmic autonomy as central to the experience, discussion and interpretation of such works. Seeing film as a result of procedural operation orientates artistic consideration towards specific questions of how agency is assigned or removed from technical media, what kind of affect it enables and how to consider the experience of film when computational culture enters filmic culture as a procedural operation. For this reason, the distinct aims of the current research include, first, outlining a materialist framework for considering procedural films as techno-cultural artefacts that would allow for a nuanced and critical reflection on them and, second, investigating their specificity in the context of my practice.

The challenge, therefore, lies in constructing procedural films as an object of study, while navigating the various frameworks that relate to its iterations and marginal genealogies, from artificial life to screensavers. One of the existing debates most relevant to procedural films in a media art context is the discussion of generative art. However, the generative art approach is insufficient for a discussion of procedural film because it fails to address the sociopolitical context of such works and their critical potential as media art. In order to respond to this challenge, I suggest approaching procedural films in their material specificity as techno-cultural artefacts, drawing on media studies and visual culture.

The affective space-time of procedural films is the nexus of my argument. Where algorithmic autonomy enters the process of watching a film, it also renegotiates the traditional roles of the film and the spectator. Furthermore, in the context of the increasing automation of various cultural operations, including film-making processes, the question of affect in wider networks of media infrastructure, as well as algorithmic autonomy within vectors of algorithmic governance, requires further discussion. The question of procedural films, therefore, requires an investigation of political aesthetics of an extended procedural apparatus that involves algorithms, interfaces, temporalities and software operations.

It is important to underline that my approach, in relation to frameworks of media art practices, also insists that the media in question are *filmic* and relate

to the long history of cinema practices as much as they do to software and interfaces. In particular, this includes experimental film and artists' moving image works that have often been developed in opposition to, or at the margins of, the mainstream cinema industry. In this sense, procedural film can be seen in light of the critical potential of media art, as well as within the space of experimental practices that Akira Mizuta Lippit calls 'ex-cinema',[5] works 'outside' cinema that nevertheless continuously return back to it, displacing traditional notions of cinematic space, time and experience. I situate procedural film within debates on media art and media studies, but also film studies, and within the discussions of spectatorship in particular. This helps to show that the challenges outlined above can be addressed by seeing procedural film as an artefact in transversal connection to its affective and epistemic spaces—through the technical conditions of its existence—to the broader cultural and political implications.

This transversal approach to procedural film allows me to unpack its salient aspects that come from the automaticity at the core of this practice. The emphasis on the autonomy of procedural film becomes important as it reveals the cultural imaginaries of technology in a new light. Both of the two case studies—the screensaver and the game engine—represent complex entanglements of procedures, affects and filmic space-times that work with such imaginaries. Moreover, through practice-led research they conjure up fictional worlds that introduce ideas of liveness, emergence and multiple choices into the traditionally linear understanding of time within moving image.

Research Questions and Chapter Overview

The main research themes of this project can be summarised with the following questions:

-       What distinguishes procedural films and what schools of thought would be most useful in situating them?

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[5] Akira Lippit, *Ex-Cinema: From a Theory of Experimental Film and Video* (University of California Press, 2012).

- What distinguishes our experience of procedural films? In what way do generative algorithmic procedures change the film-watching experience?

- What role does algorithmic autonomy play in the investigation of affect in procedural films?

- What is the potential of seeing procedural mediation as a part of political aesthetics of media art? What kind of infrastructural entanglements of affect, economic and political motivations shape the human experience in information technology frameworks?

- How can the two case studies—screensaver and game engine—be seen as sites of labour, design and experience, and as affective space-times in artistic research on procedural films?

The overall structure of the argument reflects these questions. The first two chapters are dedicated to situating procedural films among other experimental media practices, taking a materialist approach to media and technical affect. The third chapter relies on my curatorial practice to address the questions of political aesthetics in wider infrastructural scaling. Finally, the last two chapters are dedicated to the case studies, each situating the technical artefact and then addressing their affective space-times and their techno-cultural apparatuses.

The first chapter constructs a conceptual framework for 'procedural film', situating it in existing debates. I start by outlining the initial problematisation of procedural film through the debate on generative art. I then propose procedural films and procedurality as a distinct area of research, outlining its major theoretical trajectories of filmic-algorithmic entanglement and algorithmic autonomy. Further, I argue for a materialist methodology that approaches procedural films as techno-cultural media artefacts. I consider how procedural films renegotiate the traditional film spectatorship model, how their apparatus can be addressed, drawing on the work of Karen Barad, and how materialist view of computational processes opens new ways to investigate affect.

The second chapter analyses how the affective space-time of procedural films can be considered in the light of questions of autonomy, agency and liveness, drawing on experimental film and contemporary media art practices. I address the process of construction of affect as materialist and techno-cultural,

offering a posthumanist reading of affective space-time of procedural films. Further, I suggest a tentative genealogy of autonomy in moving image, from structural film-makers to contemporary generative films. I investigate the idea of logics of liveness—the ways in which the experience of autonomy in films draws on the specificity of their technical apparatuses. Finally, I introduce notes on my artistic methodology, responding to the particular challenges identified in the chapter.

The third chapter investigates the concept of 'algorithmic superstructuring' that developed as a part of my curatorial practice. The questioning of algorithmic superstructuring allows me to address the issue of political aesthetics as processes of procedural algorithmic remediation and to align transversal connections with the questions of labour, design and affect within the unwieldy configurations of algorithmic infrastructures. Drawing on the work of Jacques Rancière, I propose a reading of algorithmic superstructuring as a distribution of the sensible, and I consider how algorithmic autonomy operates within vectors of algorithmic governance. Further, I analyse procedural media artworks in order to see how artistic approaches construct the questioning of algorithmic superstructuring. Finally, I address the position of the media artist in relation to critical capacity of art, as well as the readings of literacy, visibility and opacity, as specific to media art.

The fourth and fifth chapters are dedicated to two bodies of artistic work that are based on two software artefacts—the screensaver and the game engine. The fourth chapter takes on the materialist temporalities of idle and productive time with regard to screensavers and situates my work *Chronic Film* and its two iterations as procedural film and lecture-performance. I investigate the transition of the screensaver's design from its initial hardware function of protecting screens towards a decorative and affective element of computer's personalisation. I further analyse the socioeconomic design of screensavers' affective space-time as situated at the centre of cognitive labour, its patterns and temporalities of idle and productive time. I argue that considering the screensaver as a site of reflection and boredom within the attention economy opens up a productive questioning of both traditional models of cinematic perceptions and perceptions of machinic autonomy. The final section offers a

discussion of my work *Chronic Film* and its iterations as they participated in this questioning.

The fifth chapter explores the idea of topological gamespace, emergence and liveness of non-human agents such as bots and non-player character in order to conceptualise procedural films made with game engine, drawing on my work *Non-Player Character*. I draw on McKenzie Wark's reading of gamespace as an hierarchical site of power relations and further analyse it as a space where human and non-human participants meet. Drawing on cultural imaginaries of autonomous agents, I argue for the potential of considering the logic of liveness coming from the simulation apparatus of artificial life software as a non-hierarchical construction of the gamespace. The last section further situates *Non-Player Character* as a direct investigation of issues of autonomy, liveness and simulation techniques in the gamespace.

Finally, this thesis includes an additional section titled 'Practice Overview and Documentation'. This is not an 'appendix' but an integral referencing system, which acts in the same way as the bibliography does with theoretical references. As a practice-based PhD requires a certain amount of flexibility in order to conform to accepted formats, I introduce this element here as a necessary contextual tool, reflecting the fact that the context of this research expands beyond academic coordinates.

The Context of Practice-Based PhD

While the interdisciplinarity of the current research already calls for an imaginative reconfiguration of existing frameworks, there are additional difficulties presented by the nature of practice-based PhD projects. In the context of academia, which has itself been undergoing a process of commercialisation, art practice-based research is a comparatively recent idea. The questioning of art as research has produced a multiplicity of methodologies that now characterise the field.[6] These methodologies are by necessity diverse, reflecting their respective fields, institutional boundaries, economic constraints and national policies for education. The distinctions between these

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[6] Mika Hannula et al., *Artistic Research: Theories, Methods and Practices* (Academy of Fine Arts, 2005).

methodologies are sometimes lost in the process of flattening into the administrative apparatus, and reversing this becomes again the task of the graduate student, their supervisors and examiners. Therefore, the current ambiguity within the field of artistic research is at the same time a challenge to the administrative framework and an opportunity for the researcher to develop methodologies that work outside traditional academic boundaries and even open up routes to institutional critiques.[7]

More importantly, in the encounter with academia, or in taking on the position of an educator, the processes of articulating practice inevitably enter practice itself. Speaking about practice, without reducing it to an illustration of theory and without resolving or explaining tensions that are present in the direct experience of the work, requires careful negotiation. This requires the artist to develop tactics of resistance and ways of articulating practice that cannot be subsumed by or reduced to academic arguments. Artist and film-maker Hito Steyerl addressed that when she prefaced one of her lectures presented in an academic context with the words 'This is not research. This is not theory. This is not art'.[8] At the same time, it opens up ways of enriching and expanding both practice and theory.

While the feedback loops between my artistic, curatorial and academic practices has been invaluable for their development, I consider keeping distance from the protocols of formalisation of artistic research a valuable tool that ensures that the critical approach to knowledge production is anchored in the situated, affective understanding of moving image. My artistic methodology is informed by the idea of art as a method of knowledge production. I work with film-making and software, but also with lecture-performances and other forms of technical media. The technical investigation assumes the role of an affective engine that provides a continuous questioning of the conditions and contexts, of the 'givens', of underlying historical, political and cultural currents. Artistic research is enabled by, but not limited to, aesthetics and affect, and I consider addressing epistemological challenges as its main function, suggesting the

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[7] Danny Butt, *Artistic Research in the Future Academy* (Intellect, 2017).

[8] Hito Steyerl, 'Withdrawal from Representation', paper presented at the conference *The Psychopathologies of Cognitive Capitalism,* Berlin Institute for Cultural Inquiry (ici), Berlin, 7–9 March 2013. http://www.ici-berlin.org/event/476.

ways of experiencing, living, sensing or comprehending the techno-materialist configurations in question.

While being an art-making endeavour at the core, my practice is also sustained by curating, teaching and film programming. In this regard, I consider the different activities I engage in, such as making and curating artworks, teaching and programming films, as a part of my research process, where I am positioned more as an 'actor in the world' rather than confined to any of these specific positions. For this reason, this PhD project draws equally on my curatorial and artistic work, and artistic research is seen as a method of knowledge construction in both. Theory and practice inform each other through feedback loops, both defining the limits and opening new possibilities. Artistic works that I submit with this project also serve as records and as witnesses of the long-winded process that lead to their creation. For this reason, and the discussions of my artistic works are interwoven into the structure of the thesis by concluding the two case study chapters.

Chapter 1

Conceptual Framework for Procedural Films

In the context of the current research, procedural films are media artworks that employ generative algorithmic procedures and manifest as moving images. The term 'procedural' puts focus on the procedure as an affective engine of moving image experience, and on the tactics and problems of procedural automation (as follows from the connection of the term to game design). It navigates through conversations in media arts, computational culture and experimental film and maps procedural films onto their territories. I argue that the focus on the 'procedural', as opposed to other relevant terms, such as 'generative' or 'operational', is useful because it highlights its image's algorithmic autonomy, opening it up for questioning and debate.

In this regard, I suggest that we should see procedural films as a kind of operational images, following Harun Farocki's idea of images 'that do not represent an object, but rather are a part of operation'.[9] There is, however, a distinct difference between the two terms. While Farocki speaks about the machine images that might not even be visible to human eye, or about the 'inconsequential', transitory image records that are not even stored,[10] procedural films still imply the existence of 'film' as a moving image work perceived by a human subject. Therefore, where Farocki distances operational images from representation, procedural films consider this distance as a source of productive tension between the human faculties and the technical media. What generative algorithms produce are not only transitory images, but also a dynamic, persisting, animated process. Furthermore, procedural films, in the tradition of experimental film, refer to, and continuously reconstruct the established modes of film-watching. Algorithmic autonomy, then, becomes one of the operations that challenge the centrality of human subject within film studies by refocusing the experience of film-watching on material aspects of computation, and on temporality of algorithmic affect.

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[9] Harun Farocki, 'Phantom Images', *Public*, no. 29 (2004), p. 17.

[10] Harun Farocki, 'Phantom Images', p. 18.

Procedural films therefore can prove their usefulness within the contemporary debates in film, media arts and media studies. The fact that questions of technology have shaped and complicated discussions of media art has led to varied approaches, and an even greater variety of terms.[11] In the past two decades, however, as attention has turned towards the increasing presence of algorithmic processes in the world, researchers in media studies have pointed out the necessity of a more integrated view of technical media as complex material phenomena that transverse political, economic and cultural contexts. In particular, the complexity has been reflected in new materialist approaches towards technical media,[12] as well as in the adoption of the terms 'media ecology' and 'post-digital' in relation to media arts.[13] Many other discussions signal the urgent need for critical investigations of software and algorithmic culture.[14] The philosophical understanding of artificial intelligences of different kinds, including machine learning and other advanced algorithms, now includes readings of algorithmic thinking that exhibit autonomy from human agency.[15] In addition, with the growing interest in machinic subjectivities and non-human algorithmic agents, a similar urgency has also been imparted to the task of de-mythologising the various imaginaries of technology, as well as with the deliberate artistic use of such mythologies.

In response to these investigations, I position procedural films as a distinct area of study, in which they can be seen both as an affective technical artefact

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[11] By that I mean terms such as 'computer art', 'new media art', 'digital art' and 'post-digital art' in relation to certain periods and/or theorisations of technological arts. It is also worth mentioning the terms 'creative artificial intelligence', or 'creative AI', which usually signify a more techno-positivist attitude, or 'machine art', which can be traced to technological artworks from before the advent of the computer.

[12] See Jussi Parikka, 'New Materialism as Media Theory', *Communication and Critical/Cultural Studies* 9, no. 1 (1 March 2012): 95–100; Sean Cubitt and Paul Thomas, 'Introduction: The New Materialism in Media Art History', in *Relive: Media Art Histories* (MIT Press, 2013, e-book), 27–82; Nathalie Casemajor, 'Digital Materialisms: Frameworks for Digital Media Studies', *Westminster Papers in Communication and Culture* 10, no. 1 (2015): 4–17.

[13] See Matthew Fuller, *Media Ecologies: Materialist Energies in Art and Technoculture* (MIT Press, 2005); Ryan Bishop et al., *Across & Beyond: Transmediale Reader on Post-Digital Practices, Concepts, and Institutions* (Sternberg Press, 2016).

[14] Alexander R. Galloway, *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006); Matthew Fuller, *Behind the Blip: Essays on the Culture of Software* (London: Autonomedia, 2003); Olga Goriunova, *Fun and Software: Exploring Pleasure, Paradox and Pain in Computing* (Bloomsbury Publishing USA, 2014).

[15] Luciana Parisi, *Contagious Architecture: Computation, Aesthetics, and Space* (MIT Press, 2013); Luciana Parisi, 'The Alien Subject of AI', *Subjectivity* 12, no. 1 (2019): 27–48.

and as a symptomatic media object, inextricable from larger data infrastructures. The current chapter serves as a literature review and as an introduction to the debates that contextualise procedural films. I will present procedural films as artistic artefacts within the context of contemporary debates in media art and media studies in general. I will argue that in order to be seen as a distinct phenomenon, with its own unique challenges and relations, procedural film needs to be regarded in the light of multiple understandings of agency, and as a part of the scalable architecture of algorithmic-affective entanglement, in which data infrastructures necessarily plug into the production of affect. The next two chapters will engage more closely with the aspects of this scalable architecture: the affective space-time of procedural films and their entanglement in processes of algorithmic governance and automation of cultural and artistic processes.

The first section of the current chapter is dedicated to the debate that developed around generative art, which provides the initial problematisation of procedural films as a media art practice. By contextualising the practice of procedural film within existing debates, I aim to focus the discussion on the perception of algorithmic autonomy. The second section responds to this debate, outlining the idea of procedural films and the distinct questions that they pose for understanding moving image experience. The final section proposes conceptual and methodological considerations of this new term. It also outlines the materialist conception of the apparatus of procedural film, drawing on media studies and on the work of Karen Barad. Taken together, the two final sections address the necessary and easily overlooked oscillation between the computational and the filmic in such media art practices. I argue that by approaching these two sides transversally, one can explore the affective space-time of procedural films as techno-cultural artefacts—part of algorithmic and media art culture, and part of filmic practices and experiences.

Generative or Procedural?

The term 'procedural', relying on the generative capacity of algorithmic as its distinguishing feature, shares in the complicated history of generative art. The discussion of differences between the terms will therefore help clarify the value

of selecting the 'procedural' as the main operational term. The instrumentalist connotations of the term 'generative' in the area of software and media art have constituted one of the most persistent debates in the technological arts. This debate reflects a larger epistemic rift that involves not only the specifics of institutional frameworks, but also the discussions of medium-specificity in art and of human agency in relation to technological arts, both of which have been historically complicated by the two different understandings of 'media'. As Cramer notes,

> there are two almost unrelated notions of 'media' that clash in art theory today: the notion of medium as a means of artistic expression, such as painting or sculpture, that has existed in English literature since the eighteenth century and continues to structure the study disciplines of most art academies in the world; and the notion of medium as a carrier of information that has its roots in nineteenth-century physics.[16]

The difference between these two senses of 'media' can be illustrated by a historical anecdote. In 1936, the same year that Turing published the famous paper 'On Computable Numbers, with an Application to the Entscheidungsproblem', German engineer Konrad Zuse constructed the first programmable computer—a mechanical calculator that operated with the help of a tape with punched holes that contained instructions. On the advice of his friend, ex-movie projectionist Helmut Schreyer, Zuse used discarded 35mm celluloid film for the tape. Lev Manovich reads this story as a metaphor for the way an older cinematic medium passes the baton to the medium of the computer, computation ultimately subsuming all the other media within itself in the form of software operations and interface instruments.[17] Zuse's film, as he writes, 'with its strange superimposition of binary over iconic code, anticipates the convergence that will follow half a century later'.[18] However, while this convergence delegates to the computer the role of the ultimate 'meta-medium'[19] to end and subsume all media, it also paradoxically keeps the definition of the

16 Florian Cramer, *Anti-Media: Ephemera on Speculative Arts* (Rotterdam: nai010 publishers, Institute of Network Cultures, 2013), pp. 12–13.

17 Lev Manovich, *The Language of New Media* (MIT Press, 2001), pp. 47–48.

18 Ibid*.,* p. 25.

19 Ibid*.,* p. 33.

'medium' contained as functional traits that can be interchanged, inherited or subsumed. In response, Geoffrey Batchen constructs a media archaeological analysis that shows that rather than a sudden convergence, an intertwining history of computation, photography and telegraphy already existed in the century preceding the inventions of Turing, Zuse and others.[20] The formal signs of the new media that Manovich points out—'numerical representation, modularity, automation, variability, and cultural transcoding'[21]—were already present in the inspirations and thinking of the inventors before the arrival of Zuse's computer.

Similarly, the distinctive gap between the thinking computer as a 'medium' of artistic expression and as a 'media' artefact that is included in cultural, social and political life, can be identified in the history of media art. The first theorisations of computer art in the 1960s were conducted by scientists and engineers who had little involvement with theories of contemporary art, much less with the contemporaneous criticism of minimal and conceptual art. As Taylor notes, computer art in its early years did not want for public interest, but it also did not rise to the status of 'real art' in the eyes of art critics and artists.[22] Therefore, while its status could not be described as entirely marginal, up until the 1990s it was excluded from art discourse. Instead, computer art was developing along the waves of innovation and corresponding aesthetic configurations: 'the pioneering phases of the 1960s and 1970s, the commercial software of the 1980s, and the multimedia of the 1990s'.[23] Accordingly, the early studies that aimed to analyse this new field tended to ignore the sociopolitical reality of computers, concentrating on the discussion of its role as a novel art medium.[24] Cubitt and Thomas attribute some of the reasons for this epistemic

[20] See Geoffrey Batchen, 'Electricity Made Visible', in *New Media Old Media: A History and Theory Reader*, edited by Wendy Hui Kyong Chun and Thomas Keenan (pp. 27–44) (Routledge, 2006).

[21] Manovich, *The Language of New Media,* p. 20.

[22] Grant D. Taylor, *When the Machine Made Art: The Troubled History of Computer Art* (Bloomsbury Publishing USA, 2014), pp. 4–9.

[23] Ibid.*,* p. 10.

[24] See John R. Pierce, 'Portrait of the Machine as a Young Artist', *Playboy* 12, no. 6 (1965): 124–25, 150, 182–84; A. M. Noll, 'The Digital Computer as a Creative Medium', *IEEE Spectrum* 4, no. 10 (October 1967): 89–95; Herbert W. Franke, *Computer Graphics, Computer Art* (Phaidon, 1971).

rift to the changing methods of art-making: where contemporary art at the time asserts the transcendence of its own materials and aesthetics in favour of conceptual development, and where the post-medium condition is introduced into art discourse,[25] media art has an inherent insistence that the work needs to operate well and therefore should be well crafted.[26] In this situation, such insistence is taken by contemporary art as 'a return to medium-specific aesthetics of classical modernism'.[27] At the same time, the leading theorists, curators and critics of contemporary art have often been found to be out of touch with media art.[28] For these reasons, when in the 1990s the term 'computer art' slowly receded into the background, new kinds of techno-art, and among them generative art, gained traction. Generative art found a great deal of inspiration in the field of artificial life, the most popular direction taken by techno-science. It comes as no surprise, then, that generative art has found itself indebted to models of complexity, chaos theory, fractals and evolutionary biology, rather than any theorisation coming from the discourses of art or the humanities.

The perception of generative art as a matter of craft rather than art has persisted in recent discussions. In a widely cited definition by Galanter, generative art is described as 'any art practice where the artist uses a system, such as a set of natural language rules, a computer program, a machine, or other procedural invention, which is set into motion with some degree of autonomy contributing to or resulting in a completed work of art'.[29] While this provides a good formal description, it does not specify any sociopolitical motivation behind the work. Galanter underlines that he considers generative art to be 'ideologically neutral'.[30] By disregarding the potential ethical, social or critical role of the artist, this definition tends to fall back on modernist

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[25] See Rosalind E. Krauss and Marcel Broodthaers, *A Voyage on the North Sea: Art in the Age of the Post-Medium Condition* (Thames & Hudson, 2000).

[26] Cubitt and Thomas, 'Introduction: The New Materialism in Media Art History'.

[27] Ibid., p. 29.

[28] Ibid., p. 30–43.

[29] Philip Galanter, 'What Is Generative Art? Complexity Theory as a Context for Art Theory', in *GA2003 – 6th Generative Art Conference*, 2003, p. 4. https://philipgalanter.com/downloads/ga2003_what_is_genart.pdf.

[30] Ibid., p. 19.

discussions of the artist's practice as autonomous, internalist and aiming at aesthetic excellence—the view that was made popular, in particular, by the writings of art critic Clement Greenberg.[31] This view also tends to colour the contemporary contributions that come from the domain of science and technology. For example, in the widely cited paper 'Ten Questions Concerning Generative Computer Art' the questions revolve around the ideas of originality, creativity and authorship.[32] Where the affective regimes of visual generative art are discussed, they are often considered in terms of complexity[33] and information theory,[34] approaching the optimal aesthetic as a calculated output rather than discussing it within a cultural context.

At the same time, Galanter cites a long historical perspective for generative art that stretches from so-called system-, rule- or instruction-based works found in Dada and Fluxus, as well as in the works of Sol Lewitt or John Cage, to a wide range of contemporary computational art and design practices that embrace live coding, music composition, VJ-ing, robotics, animation and others. By omitting the diverse motivations that underpin these movements (some explicitly political, such as the Dadaist attack of bourgeois culture, or Fluxus's anti-institutional stance), such historicising appears as a legitimising instrument. This directly connects to the nature of financing of many existing art and science programs, where the techno-positivist attitude is promoted by the necessity of obtaining corporate funding, and where such legitimising becomes necessary. Many of these discussions return to the original concerns of 'authorship', 'authenticity' and 'creativity', especially in the fields adjacent to commercial art context where such questions aid in processes of establishing value.

In the writings of media theorists, artists and curators working within critical media studies and cultural studies, the idea of technical media and of software as a given condition is denounced, and the attitudes of generative art are

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[31] See Caroline A. Jones, *Eyesight Alone: Clement Greenberg's Modernism and the Bureaucratization of the Senses* (University of Chicago Press, 2005).

[32] Jon McCormack et al., 'Ten Questions Concerning Generative Computer Art', *Leonardo* 47, no. 2 (2014): 135–41.

[33] Lev Manovich, 'Abstraction and Complexity', in *MediaArtHistories*, edited by Oliver Grau (pp. 339–354) (MIT Press, 2007).

[34] Galanter, 'What Is Generative Art?'

criticised. Cramer suggests drawing the line between generative art and software art in the sense of a culturalist–formalist opposition, where the former addresses the code as a culturally embedded construction, and the latter is preoccupied with the formal operations of the code.[35] Cramer points out that both can be reductionist: the formalist view by remaining a purely aesthetic exercise, and the culturalist view by ending up as 'a critical footnote to Microsoft desktop computing, potentially overlooking its speculative potential at formal experimentation'.[36] Mitchell Whitelaw, arguing that neither position is productive on its own, calls for 'critical generativity'.[37] He suggests that to read a software critically means looking at it as a 'system story'—as a cultural text that exists not only as a source code, but also as 'specific figurations, relations, decisions, values and ideologies'.[38] The ideological potential of generative art then lies in exploring and re-combining these aspects in order to create new configurations, and to sketch and model 'possible worlds'.[39]

Inke Arns, in a preface to Whitelaw's text points out, however, that even approaching generativity as a 'system story' would ultimately mean appropriating the sociopolitical context of the work as another formal feature—in other words, that world-building within a system is bound to reproduce the system. Like Cramer, Arns treats the term 'generative art' as an instrumentalist endeavour and argues for 'software art' as the designation for art that aims to engage with the seemingly invisible aesthetic, economic and political currents concealed by the black box of technology.[40] Arns suggests that in Galanter's definition, which strives to be universally applicable and includes such diverse areas as VJ-ing, electronic music, animation and others, generativity appears

[35] Florian Cramer, 'Concepts, Notations, Software, Art', in *Software Art: Thoughts,* edited by Olga Goriunova and Alexei Shulgin. read_me 1.2 media art festival catalog. Moscow, 2002. http://readme.runme.org/1.2/teb2e.htm.

[36] Ibid.

[37] Mitchell Whitelaw. 'System Stories and Model Worlds: A Critical Approach to Generative Art', in *Readme 100: Temporary Software Art Factory*, edited by Olga Goriunova (pp. 135–54). Readme 100 Festival for Software Art and Cultures (Hartware MedienKunstVerein, 2005), p. 138.

[38] Ibid., p. 139.

[39] Ibid., p. 146.

[40] See Inke Arns, 'Read_Me, Run_Me, Execute_Me: Software and Its Discontents, or: It's The Performativity of Code, Stupid', in *Read_me: Software Art & Cultures*, edited by Alexei Shulgin and Olga Goriunova (pp. 176–93) (Aarhus Universitetsforlag, 2004).

not as a creative force that can bring new configurations, but as 'negation of intentionality'.[41]

In light of this debate, I adopt the term 'procedural' in order to re-instate the 'generative' dimension as an area of interest, while removing its instrumentalist, formalist connotations. In this sense, 'procedural' is much closer to 'software art' in the comparison that Arns provides, addressing this question. She articulates the following vectors: software art puts the focus on generative processes, as opposed to the focus on results in generative art; software is seen as a questioning of culture, as opposed to a tool; the balancing of randomness and control is more important than the negation of intentionality; and the interest lies in the performativity of code, as opposed to fascination with the generative quality itself.[42] Furthermore, in the individual artworks where the motivations of the artist become clear and where drawing the line becomes a question of balance rather than of divided academic camps, it is easier to find the resolution of this divide. Arns herself suggests that 'software art can… be the result of an autonomous and formal creative practice as well as… critically refer to existing software and the technological, cultural or social impact of software'.[43]

Procedural film reassembles the various fissures that have been created over time—aesthetics versus cultural politics, art versus science—into a complex entanglement of material, discursive, technical, cultural and historical forces. Seeing procedural films as techno-cultural artefacts, questioning their temporality, investigating the performativity of code means to embrace the tension between assumed binaries and make this tension productive and generative.

Why 'Procedural Films'?

Approaching procedural films as techno-cultural artefacts means investigating the affective technical entanglements that involve specific cultural contexts and configurations of algorithmic moving image apparatuses. Situated within this discussion, the term 'procedural' places the focus on algorithmic agency and its

[41] Whitelaw, 'System Stories and Model Worlds', p. 178.

[42] Arns, 'Read_Me, Run_Me, Execute_Me', pp. 183–184.

[43] Ibid., p.184.

role in the experience of the viewer. The affective space-time of procedural films, therefore, becomes an important nexus for investigating such entanglements.

In this section I outline the defining aspects of the idea of the 'procedural'. Procedural films, as I show, not only open up a space in which to consider filmic-algorithmic affect, but also allow for an investigation of the autonomy and liveness of such works. The affective process of watching a procedural film is the main area of investigation here, both as a conceptual focus of research, and as a reading of my practice. Seeing autonomy as a part of it, therefore, requires a disambiguation of the idea of autonomy in relation to automation and algorithmic procedures. The existence of a procedure highlights a certain rendering logic behind the moving image; procedurality both reflects the *process* of real-time filmic mediation and the logical stability of algorithmic argument.[44]

The autonomy of an algorithmic procedure assumes two meanings. Autonomy, in the most basic sense, means the capacity to operate independently, without intervention or direction. In the case of addressing the logical stability underpinning a procedural film, autonomy appears as a fixed measure of the limits within which the film can unfold. In that regard, autonomy can be understood as a structuring principle that defines the operation of the message. If one, however, approaches algorithmic procedure in its real-time mediation, autonomy emerges as a quality of the film's temporal unfolding, as an affective or experiential aspect. Then, autonomy also emerges as a generative quality, as production of the unexpected and the emergent.

Procedural films might employ different generative techniques, but the common point is the random occurrence. Here I draw on an interpretation of the term 'procedural' that comes from gaming communities, where a 'proc' (or that something 'procs') means the triggering of a random chance or effect (usually beneficial). One of the possible etymological interpretations of the term comes from early computer games' code, which would contain semantic elements such

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[44] The existence of the stable logical structure is also reflected in the use of the word 'procedural' in the film industry to describe television series that are dependent on a detailed, realistic treatment of professional procedures (especially police, legal or medical procedures) and where each episode is often dedicated to solving a particular case.

as 'spec_proc', or 'special process'.[45] Even if this randomness is restricted, it inevitably leads to the unpredictability of autonomous operation. As I explain in more detail in Chapter 2, procedural films create a particular affective space-time; the autonomous operation of algorithms leads to a continuous re-negotiation of the traditional roles of the spectator and a moving image work, played out in the affective space between the human faculties and the technical media. The feedback loop formed by the cognitive process of watching the film becomes the site of production of affect. At the same time, the algorithmic affect of procedural films is impacted by the technical and infrastructural operations that are necessarily involved in their making.

The emphasis on algorithmic autonomy and agency also reflects the current discussion around algorithmic culture, in which automation is an increasingly problematic issue. As mentioned in the introduction, the term 'procedural films' draws directly on the use of the word 'procedural' in game design, where 'procedural generation' means automating processes such as creating landscapes or game levels. In procedural films, therefore, the questioning of automation (and autonomy) becomes a distinct aspect of the term. In this, and in many other contexts, the processes of automation cannot be seen only as neutral operations aimed at increasing efficiency. Ultimately, because the use of algorithmic models of reasoning and decision-making are increasingly seen as a definitive technological solution, the naturalisation of such devices and their uncritical treatment makes automation problematic.[46] The consequences of producing rationalised models that automate the operations of prediction in policing, and in the financial and environmental spheres have already been widely explored in critical approaches to algorithmic cultures.[47] The automation of image processing makes an integral part of such data infrastructures, especially in the areas of computer vision and data visualisation. The images enter into a particular relationship with the regimes of prediction and decision-making that are technically dependent on the temporality and materiality of

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[45] The exact etymology of the term is still to be established. Other versions include 'percentage occurrence', 'process', or an acronym for 'potential rate of cast' and 'programmed random occurrence'.

[46] Matteo Pasquinelli, 'How a Machine Learns and Fails', *Spheres: Journal for Digital Cultures*, no. 5 (2019): 1–17.

[47] Frank Pasquale, *The Black Box Society: The Secret Algorithms That Control Money and Information* (Harvard University Press, 2015).

calculation. As Abelardo Gil-Fournier and Jussi Parikka note, 'these imaging devices are part and parcel of an infrastructure that does not merely "observe" microtemporal moments in a passive manner…rather, microtemporal moments are here an integral part of data mobilised to sustain a relation with a particular form of governance: data and projective temporalities governance'.[48] The processes of automation of the moving image, therefore, can be considered in the light of their potential to remake traditional understandings of filmic space-time and procedural films—as artefacts that participate in this remaking.

While not all procedural films participate in the data governance directly, they are implicated in software and data infrastructures of governance and control. Returning to Farocki's definition of operational images as images 'that do not represent an object, but rather are a part of operation',[49] the operations in the case of procedural films should be understood as generative algorithmic operations that define the parameters of the film's unfolding. However, this includes not only the algorithms that specifically define the parameters of the image, but also software and interfaces involved in its rendering and distribution. This produces an investigative space in which the process of watching a film needs to be considered in relation to the specific design and temporality of algorithms that drive it. Procedurality therefore addresses how filmic affect plugs into the systems of algorithmic control. Thus, the investigation of procedural films requires a scalable architecture that can move from localised filmic-algorithmic affect, and from the material aspect of seeing an algorithm unfold, to considerations of agency and control of algorithms within wider infrastructural networks.

In this regard, the 'procedures' behind procedural films cannot simply be regarded as autonomous processes, in the way that generative art debate proposed. The 'autonomy' of procedural films is an entanglement of various understandings of agencies, imagined and real, which require articulation. This also invokes a more normative understanding of the word 'procedure', which is often used to describe mechanisms of administration, law and political

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[48] Abelardo Gil-Fournier, Jussi Parikka, '"Visual Hallucination of Probable Events": On Environments of Images, Data, and Machine Learning', pre-print/forthcoming in *Big Data: A New Medium?* edited by Natasha Lushetisch (para 1) (Routledge, 2020/2021).

[49] Harun Farocki, 'Phantom Images', p. 17.

regulation. In this sense it echoes a longer history of computation whereby algorithmic logic followed in the footsteps of increasing bureaucratisation and control over the time and lives of workers.[50] I address this idea in detail in Chapter 3 by introducing the concept of 'algorithmic superstructuring', which was a result of my curatorial work and which I am continuing to develop. Discussion of algorithmic superstructuring involves the pursuit of layered modes and scales of algorithmic infrastructures that participate in the construction of affect. It opens up a space for discussions of the political aesthetics of procedural films, questioning how the naturalisation of algorithmic agency gets entangled with the real forms of governance.

To summarise, procedural films invoke two questions: the question of affective filmic-algorithmic entanglement and the question of algorithmic autonomy. These two issues, as I will show, require some further articulation, as well as a renegotiation of existing positions and theoretical coordinates. The idea of algorithmic autonomy, in particular, opens up a layered discussion of the different agencies at work within the film and the ones accorded to spectators. Different understandings of autonomy (and, therefore, of perceived and real agency) come into play. They can be distinguished in the material conditions of film-playing and film-watching, the perceived agency, or liveness of algorithmic agents and agency in the context of algorithmic governance. The next section will address the former, while the two latter issues are the focuses of Chapter 2 and 3 respectively.

Procedural Apparatus

If the autonomous operation of algorithms in procedural films leads to a re-negotiation of the traditional roles of spectator and moving image work, what comprises the apparatus of procedural films? How does algorithmic autonomy reconfigure the existing apparatuses of film and media theory? How does it reflect the entanglement of filmic affect and algorithmic agency? The current section addresses these questions, drawing on post-human and media theory.

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[50] Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society* (Harvard University Press, 1986).

Thomas Elsaesser argues that in order to consider the film-watching experience in the light of changes brought to it by digital technologies, it needs to be mapped according to its specificities:

> cinema's relation to other media-forms, such as television, video art and digital media, can be mapped by analysing their different and distinct diegetic worlds, comprising the technical apparatus and mental dispositifs, but also dependent on the temporal, spatial and enunciative locators/activators that together constitute their particular 'ontology'.[51]

Procedural films could similarly be seen as techno-cultural artefacts forming their own conditions of existence. In order to see how these conditions are formed and constructed, procedural films should be considered not only as sites of technologically shaped affect, but also as end points of longer infrastructural chains of software, algorithmic models and techniques. At the same time, the central difficulty remains that, while procedural film is undeniably a computational practice, it also owes a significant debt to the filmic apparatus and to theories of cinema. Often this needs to be articulated through specific moments of historical intersection, through marginal technologies and experimental practices.

In the first section of this chapter I showed that generative media art already has a complicated history. Cubitt and Thomas suggest that an interdisciplinary approach to media art, in order to reflect its fragmented histories, needs to a) be technologically (mathematically, computationally) rigorous without being reductivist in the sense of a modernist return to medium-specificity and its concerns; b) address the institutional and epistemic rift by including media arts in the broader history of art; and c) consider that it involves not only digital practices, but also film, video or other media.[52] In procedural films, the last of these points becomes particularly relevant, as the very idea of procedurality requires a negotiation of the oscillation between moving images and the computational. The capacity to approach media cultures through various technical artefacts, institutional and individual networks, materialities and genealogies becomes important. Elsaesser, Cubitt and Thomas refer to media

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[51] Thomas Elsaesser, 'The New Film History as Media Archaeology', *Cinémas: Revue D'études cinématographiques/Cinémas: Journal of Film Studies* 14, no. 2–3 (2004): 75–117, p. 110.

[52] Ibid., p. 29.

archaeology, which offers a robust critique of the narratives of linear technological progress, by addressing the materialist and epistemic conditions of technical artefacts.[53] Media archaeological investigations have undoubtedly influenced the current research, not least in the choice of the obsolete artefact of a screensaver as one of the two main case studies. However, the current investigation is not a media archaeological one. Rather, it adopts a materialist approach to procedural films in order to situate them as techno-cultural artefacts at the intersection of multiple fields. This method allows me to address the procedures at work in the technical artefact on multiple 'levels'. Looking at them as dynamic matter enables me to attend to the processes of labour and design behind the procedural films, and also investigate the affects, stories and imaginaries of technology, as well as the technical temporalities and specificities.

Traditionally, the discussion of agency in film studies has been bound up with the discussion of spectatorship, and to the space of cinematic theatre. The 1970s apparatus theory saw the spectator as a passive subject of ideology.[54] Jean-Louis Baudry argues for the optical centrality of the camera's 'eye' as the reason for cinema's ideological effect,[55] which is implicated in the institutional apparatus, including the architecture of the room, the technologies of capture and projection, and the narrative shape of the film. Michele Aaron underlines the importance of the interplay between the three elements: 'of the technical (projection), the physical (seated spectator in darkened auditorium) and the

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[53] Important sources for media archaeology include Michel Foucault's archaeologies of knowledge and power, Marshall McLuhan's work on media, Walter Benjamin's writings on media's effect on modernity, as well as the work of Friedrich Kittler and the theorists of New Film History of the 1990s. Within media archaeology itself there are a variety of approaches, and well-mapped introductions to the different strands of media archaeologies can be found in Wendy Hui Kyong Chun and Thomas Keenan (eds), *New Media, Old Media: A History and Theory Reader* (Psychology Press, 2006); Erkki Huhtamo and Jussi Parikka (eds), *Media Archaeology: Approaches, Applications, and Implications* (University of California Press, 2011); Jussi Parikka, *What Is Media Archaeology?* (Polity Press, 2012); and Wanda Strauven, 'Media Archaeology: Where Film History, Media Art and New Media (Can) Meet', in *Preserving and Exhibiting Media Art: Challenges and Perspectives,* edited by J. Noordegraaf, C. G. Saba, B. Le Maître and V. Hediger (pp. 59–79) (Amsterdam University Press, 2013).

[54] Jean-Louis Baudry, 'Ideological Effects of the Basic Cinematographic Apparatus', translated by Alan Williams, *Film Quarterly* 28, no. 2 (1974): 39–47; Jean-Luc Comolli and Paul Narboni, 'Cinema/Ideology/Criticism', *Screen* vol. 12, no. 1 (1971): 27–38.

[55] Baudry, 'Ideological Effects'.

psychic (the psychological effects of this configuration and of the film viewed)'.[56] The interplay, however, does not occur on equal terms. The ideological treatment of the film apparatus, while providing an important contextualisation of the concealed working of power relations, constructs a strictly hierarchical relation between the spectator and the apparatus. The former is denied an active role. The materialism in Baudry's approach refers to the processes of production and to the relatively stable model of the basic (technical) apparatus of film; thus, the embodied experience and the variations in the conditions of watching are not further questioned.

Later discussion of spectatorship called into question the passive and universalised conception of the spectator. Cultural studies and related ethnographic methods, as well as feminist approaches, pointed out that apparatus theory did not sufficiently address the specific experiences of the individual, and that the individual, while under ideological influence, can also be a resistant agent.[57] Teresa de Lauretis, for instance, appeals to the existence of a complex perceptual apparatus that involves both signifying processes and cognitive aspects:

> if, then, subjectivity is engaged in semiosis at all levels, not just in visual pleasure but in all cognitive processes, in turn semiosis (coded expectations, patterns of response, assumptions, inferences, predictions, and, I would add, fantasy) is at work in sensory perception, inscribed in the body—the human body and the film body.[58]

For her, this is a necessary part of displacing the traditionally male and white subject-spectator. At the same time, this is a different approach from strictly cognitivist claims that concentrate on the neuro-biological factors of film perception.[59] Instead, de Lauretis suggests that cultural and cognitive factors,

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[56] Michele Aaron, *Spectatorship: The Power of Looking on* (Wallflower Press, 2007), p. 9.

[57] See Judith Mayne, *Cinema and Spectatorship* (Routledge, 1993) for a detailed outline of this debate.

[58] Teresa de Lauretis, *Alice Doesn't: Feminism, Semiotics, Cinema* (Indiana University Press, 1984), p. 56.

[59] David Bordwell, 'A Case for Cognitivism', *Iris* 9 (1989): 11–40; Noël Carroll, *The Philosophy of Motion Pictures* (Malden, MA and Oxford: Blackwell, 2008).

as well as the 'film body', mutually implicate each other, resulting in a complex dynamics of perception rather than a one-sided relation.

The 'film body' in question—the one with a cinematic theatre and a passive spectator—changes in the case of procedural films. Depending on their categorisation as experimental films or as media art (or both), they take part in the fragmented and diverse distribution networks of these fields. Procedural films can be screened in a gallery, at a media art festival, or seen in a multitude of digital formats and presentation modes. They can be made with a custom code, using commercial software or open source software. The unique assemblages that can be seen as procedural films, therefore, do not follow what is traditionally understood as cinematic apparatus. Erika Balsom suggests that in order to reflect the variability and heterogeneity of contemporary filmic practices, the notion of the apparatus should be considered not in the sense described by Baudry—to signify the basic technical apparatus—but, rather, in Foucault's sense, as an ensemble of material and discursive practices.[60] Foucault describes dispositif as

> a thoroughly heterogeneous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions—in short, the said as much as the unsaid. Such are the elements of the dispositif. The apparatus itself is the system of relations that can be established between these elements.[61]

The view of procedural films as techno-cultural artefacts, therefore, refers not only to the institutions (or the lack thereof) that participate in their distribution, but also to the technological infrastructures that determine the processes of production and distribution, that limit or allow access and that implicate the spectator (or, rather, the user) in the range of interfaces. The conditions include the processes of labour and design, as well as the stories and imaginaries of these technological infrastructures.

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[60] Erika Balsom, *Exhibiting Cinema in Contemporary Art* (Amsterdam University Press, 2013).

[61] Michel Foucault, 'The Confession of the Flesh', in *Power/Knowledge: Selected Interviews and Other Writings, 1971-1977*, edited by Colin Gordon (pp. 194–229) (New York: Pantheon, 1980), p. 194; translation modified.

The apparatus of procedural films needs to account not only for its experimental networks, but also for the autonomous algorithmic procedure at the heart of its production and functioning. The spectatorship theory concentrated on renegotiating the agency of the viewer, and the 'agency' of the film itself in this debate was not considered. Baudry, constructing the hierarchy of ideological apparatus, drew on mainstream Hollywood cinema. Nonetheless, the apparatus of procedural films, fragmented as it is, still retains a model of immersive viewership even if it doesn't take place at the cinema. And while the viewer of procedural films cannot be seen simply as a 'user' who views a computer as a tool, or in the techno-determinist sense, as a powerless subject of algorithmic control, closer attention needs to be paid to the 'film body' itself and its technological temporalities and procedures. In order to do this, the traditional model of spectatorship that relied on binaries such as object/subject, ideology/subject, text/spectator, need to be addressed instead as a diverse multiplicity of entangled forces.

Feminist science studies scholar Karen Barad elaborates the idea of the apparatus through an analysis of a scientific apparatus and its capacity to have material effects on the results of observation. She extends this premise further to describe apparatuses as material-discursive practices that also make boundaries, including those between objects and subjects: 'it is not merely the case that human concepts are embodied in apparatuses, but rather that apparatuses are discursive practices, where the latter are understood as specific material reconfigurings through which "objects" and "subjects" are pro-duced'.[62] Barad goes on to define apparatuses as 'the material conditions of possibility and impossibility of mattering; they enact what matters and what are excluded from mattering'.[63] This reading of the apparatus reformulates all bodies, not just human or biological ones, as participants in a complex entanglement, wherein a posthumanist, rather than solely human-oriented, understanding of discursive practices becomes possible.

Barad further develops this approach as a 'specifically posthumanist notion of performativity' which 'calls into question the givenness of the differential

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[62] Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Duke University Press, 2007), p. 148.

[63] Ibid.

categories of "human" and "nonhuman", examining the practices through which these differential boundaries are stabilized and destabilized'.[64] As an alternative to the representationalist view (which relies on the interaction of independent entities that are often already predefined in dualisms such as subject/object, human/non-human), Barad suggests the idea of agential realism. In this framework, the primary epistemological units are phenomena, and not subjects and objects. The phenomena emerge from the specific intra-actions (as opposed to the *inter*-action of separate entities). Therefore, agential realism results in local, rather than transcendental, definitions of the epistemological boundaries:

> A specific intra-action (involving a specific material configuration of the 'apparatus of observation') enacts an *agential cut* (in contrast to the Cartesian cut—an inherent distinction—between subject and object) effecting a separation between 'subject' and 'object'. That is, the agential cut enacts a *local* resolution *within* the phenomenon of the inherent ontological indeterminacy.[65]

The posthumanist performative approach not only renegotiates the subject-object hierarchy, but also allows for a consideration of the role played by the materialist specificity of procedural films in constructing affect. The apparatus begins with the computational processes that enable the very existence of film and render it visible. Here Menotti-Gonring's proposition of *executable* cinema becomes pertinent, as it directly addresses the technical underpinnings of procedural film.[66] He argues that seeing digital moving images as primarily enabled by computational processes has a bearing on the cinematic dispositif, on participation in distribution and circulation networks. The notion of executable cinema that he proposes sees the digital moving image as a simultaneous co-running of computer operations that enable the process of visualisation of the digital film file. In this, Menotti-Gonring draws on Kittler's essay 'There Is No Software'. According to Kittler, the distinctions between

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[64] Karen Barad, 'Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter', *Signs: Journal of Women in Culture and Society* 28, no. 3 (1 March 2003): 801–31, p. 808.

[65] Ibid.

[66] Menotti-Gonring, 'Executable Cinema' and 'Executable Images'.

operating system, software, graphic interface and programming language are symbolic and ultimately come down to 'signifiers of voltage differences'.[67] All coding operations serve as systems of abstraction and representation, which facilitate the work of the user but, at the same time, obscure the complex machine operations from her. Based on this, Menotti-Gonring argues that a digital movie file itself can be considered software. The popular perception of a film file as a self-contained thing, not unlike a film strip that must be played 'on' the computer, does not hold up when one considers that the file does not simply 'contain' a film. For the movie to be displayed, instructions that are only partially contained in the movie file must interact with the operating system, with the media player software, with the video codecs and other protocols. In his take on the computer's point of view on playing a film, Menotti notes:

> as much as a digital movie, they [interfaces] are rational organizations of the machine, resulting from the way the computer processes information. From this perspective, a media player window is no more of a structure than the movie playing 'inside' of it is. […] All of these 'layers' are produced concomitantly while the computer is running; thus everything that is on the screen is of the same nature as a real-time abstraction of the machine.[68]

What this Kittlerian distinction highlights is the inextricability of the film from machine procedures, as well as its dependence on the smooth and simultaneous running of multiple processes. As in structuralist-materialist approaches, the apparatus of the film can then be reconstructed in order to show that neither element is more or less crucial than the other. Ultimately, it repositions the film as something that 'can only be displayed upon the real-time decodification by the machine…even the most static images, while they are being shown on a computer, are a consequence of procedural interactions—the effect of the system's unprecedented activity'.[69] As the foundation of this process is the material temporality of processor speed and other time-measuring processes used in order to display information (e.g. monitor refresh

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[67] Friedrich Kittler, 'There Is No Software', in *Literature, Media, Information Systems: Essays*, (pp. 147–55) (OPA, 1997), p. 150.

[68] Menotti-Gonring, 'Executable Images', p. 50.

[69] Ibid., p. 51.

rate or video frame rate), the temporal constitution of procedural film can similarly be seen as a series of layered procedures, each having to be consistent with existing standards in order to create images smoothly. This description directly speaks to Wolfgang Ernst's investigation of temporal regimes of media that do not simply refer to the traditional axis of time, but create their own 'tempor(e)alities', which are separate from the time of human culture and 'can only be understood according to their own operative dimensions through an analysis of technical (time) signals as opposed to cultural (semiotic) signs'.[70]

The layers of abstraction (code, software commands) and representation (graphic user interface, codecs) then become the primary space where the film itself is constructed. As I will argue throughout my research, this enables a particular aesthetic regime and artistic methodology, in which various operations of concealing or revealing of these layers take the primary place. Glitch art, for example, explores this tension by consciously using computational (or analogue) errors for aesthetic purposes. Procedural film is able to explore and exploit the same tension productively. In my practice work, discussion of which is included in the last two chapters, I consider two different operative spaces— of the screensaver and of the game engine—which allow me to explore the aesthetic, epistemic and affective configurations of the layers in them. While screensavers speak more towards early computation and its limited processing power, the procedural films made in game engines are often borrowing from the aesthetics of videogames and other high-powered environments (in terms of both processing power and of resources that they require). Each case study, therefore, is seen as a unique localised encounter where the focus lies in the challenge that the work brings to the emotional and intellectual faculties of the viewer.

In this chapter I have explored the potential to investigate procedural films as a distinct area of study, relying on a range of relevant literature. I have summarised the existing debate which provides an initial problematisation for the question of generative art. I have outlined what the term 'procedural' entails,

[70] Wolfgang Ernst, *Chronopoetics: The Temporal Being and Operativity of Technological Media* (Rowman & Littlefield International, 2016), p. xx.

and discussed its specific focuses on the filmic-algorithmic entanglement and on algorithmic autonomy. Finally, I have provided a potential model of a procedural apparatus and its computational underpinnings, drawing on the ideas of Karen Barad. The materialist approach to 'tempor(e)ality' of the technical artefact paves the way for approaching affect in a post-human light, and for a closer look at the affective space-time of procedural films, which form the focus of the next chapter.

Chapter 2

Procedural Films: Affect, Agency, Autonomy

As the investigations of the first chapter show, while the computational procedures behind procedural films condition the experience produced by the work, they cannot account for it entirely. Whereas the first chapter concentrated on the positioning of procedural film in relation to existing approaches and terms, the second chapter focuses on the affective space-time and one's experience of algorithmic autonomy in it. Following the non-hierarchical model of spectatorship, one can take a closer look at the ideas of autonomy and affect.

As Galanter underlines in his description of generative art, 'a system that moves an art practice into the realm of generative art must be well defined and self-contained enough to operate autonomously'.[71] Procedural films open up a renegotiation of agency between the artist and the work, and between the audience and the work. This shift in agency, even if it is restricted within the boundaries of the artwork, makes a crucial difference to the construction of affective space-time. I aim to show that the affect that generative and autonomous algorithmic works produce involves not only the technical workings of the apparatus, but the diverse experiences and imaginaries of machinic autonomy, unique for each apparatus.

In this posthumanist framework the interplay of perceived and real agencies becomes important: the processes of distinguishing, imagining, perceiving, assigning or interpreting autonomy as agency. David Tomas suggests that the posthumanist potential of moving image can manifest as 'a function of how film or video installation has eclipsed or processually rearticulated the human body, its identity, and subjectivity in terms of their machine-based visions (and models) of the world'.[72] The filmic artefact can be 'devoted to the exploration of its own spatiotemporal boundaries and characteristics as medium of mass communication', but also serve as 'a critical tool of analysis, hyper-reflexive

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[71] Galanter, 'What Is Generative Art?', online.

[72] David Tomas, *Vertov, Snow, Farocki: Machine Vision and the Posthuman* (Bloomsbury Publishing USA, 2013), p. 10.

artefact and archaeological site of a medium's contributions to society, its development and memory'.[73] Procedural film, in this paradigm, can address the specificities of technologically constructed affect and its spatiotemporal aspects.

However, affective space-time is not reducible to pre-cognitive understanding of affect, but also includes a process of agential renegotiation, following Barad's view of agential realism. In this regard, I see my own practice of procedural films as located within the tradition of the works of structural film-makers and in the field of experimental film and artists' moving image in general. Autonomy as understood within the structural films would often take on the task of severing the relations established by the traditional cinematic spectatorship model in order to re-assemble them in a new configuration—through the technical experimentation with the film apparatus. Structural films, through technical manipulation of the apparatus, re-articulate their affective space-time in a material encounter with the viewer. In this way, as I will show, the explicit relegation of control over the image creates an additional layer of experience of such works—a layer that reflects the tension between the viewer and the film, and that reconfigures an assemblage of pre-cognitive affects and cultural imaginaries.

This chapter thus serves as a more specific investigation of the *practices* of procedural film and its place within experimental media. In the first section, I outline the affective space-time of procedural films. In the following section I discuss the role of autonomy in film by drawing on the practices of structural film-makers. Further, I approach liveness as a specific aspect of procedural affect and suggest several underlying cultural logics that can be understood through the procedural films' specific technical apparatuses. Finally, in order to situate the argument, I include some notes on de-centering artistic methodology that follow from the topics discussed in this chapter.

The Affective Space-Time of Procedural Films

What constitutes the affective space-time of the moving image? As mentioned in the previous chapter, the models of distribution of procedural films are built into contemporary art, media art and experimental film circuits, festivals and

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[73] Ibid., p. 4.

networks. Unless the work has breached the walls of the art institution and can be seen fairly regularly in museum and gallery settings (such as Ian Cheng's work at the moment of writing) chances are that it is only available to see online: as a documentation, as a textual description, as a working or obsolete copy of software. Therefore, a singular spectator or viewer does not exist. Similarly, there is no singular institutional space of viewing, so each encounter takes place within its own unique apparatus.

Instead, I consider the site of moving image experience as a site under construction. As Thomas Elsaesser notes,

> key elements of cinematic perception have become internalised as our modes of cognition and embodied experience, such that the 'cinema effect' may be most present where its apparatus and technologies are least perceptible… The cinema is part of us, it seems, even when we are not at the movies.[74]

In the presence of multiple screens, devices and forms of moving image present in our daily life, cinema becomes a condition of contemporary life rather than a medium-specific art confined to the movie theatre.[75] Pasi Valiaho suggests that cinema can be seen as a 'specific formation of rationalities, bodies and machines'.[76] He calls this formation 'the moving image', putting the emphasis the techno-physiological design of the cinematic perception, denouncing the idea that human perception can be uncontaminated by technology. The moving image, therefore, leaves the space of cinema, but still retains some aspects of its former configuration.

A procedural work by Lawrence Lek provides an illustrative starting point for reflection. Lek works with both recorded and live simulations,[77] often making site-specific virtual worlds. In *Dalston, Mon Amour* (2015), later re-made as *Europa, Mon Amour* (2016 Brexit Edition), he reconstructs Rio Cinema, an independent film theatre with a more than century-long history in Dalston,

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[74] Elsaesser, 'The New Film History as Media Archaeology', p. 76.

[75] Ibid.

[76] Pasi Väliaho, *Mapping the Moving Image: Gesture, Thought and Cinema Circa 1900* (Amsterdam University Press, 2010), p. 10.

[77] For this reason, I feel it is possible to discuss his works in the investigation of procedural films.

London. The virtual camera, floating past the facade, and then inside of the deconstructed building, is accompanied by a voiceover on the nature of memory, extracted from Alain Resnais' *Hiroshima, Mon Amour* (1959). The cinematic space (and, perhaps, nostagia for it) becomes built into the apparatus of a game engine.

Miriam de Rosa suggests that to trace the contemporary cinematic experience in the threefold overlap of media, cultural and visual studies, moving images should be seen in their 'sensory and meaningful immediacy',[78] and *as much redefining and shaping their context as they are defined and shaped by it*. This view of moving images allows us to see the specificity of their situated and embedded condition, but also highlights the experience as a primary lens that allows one 'to seize their true nature and their full potential in the very moment in which they are *moving'*.[79] De Rosa underlines the pervasive nature of cinematic experience:

> …the proliferation of screens and the wide variety of occasions in which the filmic device finds its space in the contemporary scenario, does not simply cause a new collocation of cinematic experience. A *relocation* is definitely the first phenomenon to occur, but something else seems to characterize the situation as well: a real colonization of space takes place, and the moving image does not just enter new contexts but merges with them. It becomes part of it, forming its surface, allowing it to be practicable and dwelled in. The filmic experience becomes the rough material of space, which gives birth to a complex visual and experiential texture.[80]

This view shifts the emphasis towards the technical and material infrastructures and affect, where the way the moving image work is constructed overtakes the importance of the exhibition context.

An almost direct illustration of this view is *Pirate Cinema,* a procedural work by Nicolas Maigret, 'a cinematic collage generated by peer-to-peer network

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[78] Miriam de Rosa, 'Image, Space, and the Contemporary Filmic Experience', *Cinéma & Cie* 12, no. 2 (2012): 119–30, p. 125.

[79] Ibid.

[80] Ibid., pp. 125–126.

activity'[81] that investigates the pirate economy of file sharing networks. It is constructed as a monitoring room which shows audiovisual contents of current peer-to-peer transfers as a real-time montage.[82] The installation also displays technical information such as the IP address and location of the displayed fragment's source and destination. The work therefore literally remixes the traditional cinematic space-time into the new technological frameworks of sharing and distribution. The movement of affect and experience is shown as inscribed in the algorithmic infrastructures, spatially and temporally. As Geoff Cox notes, the work's

> networked real-time properties necessitate wider discussion of how the infrastructures of temporalization render our present the way it is, and how these structures inscribe a certain spatial logic of differences—such as those between servers and clients or indeed those between peers and other peers.[83]

He also underlines the materialist temporality in peer-to-peer networks, 'a micro-temporal dimension that is not simply discursive but one that is enhanced by the nondiscursive realm of technical objects and infrastructures'.[84] A procedural apparatus, therefore, is not a stable one, but rather presents as a set of moving parts—diverse artefacts, histories, interfaces and physical spaces —that feed into the affective space.

The technical inscription of affect reveals its externality to the observer. In procedural films, as I would like to emphasise, however, the externality of affect plays a specific role. I use the term 'affect' as describing the experience of the encounter with the moving image works, but also to underline the difference

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[81] See the project website, *The Pirate Cinema* https://thepiratecinema.com/.

[82] As opposed to a direct download, peer-to-peer protocols such as BitTorrent (which was also used in the installation) operate by fragmenting the original file. These fragments become available for simultaneous sharing, to and by all the users who are downloading the same file. Such a horizontal model allows for a fast downloading of large files such as movies. While, in line with the pirate economy of such networks, the files themselves are free, on some of the distribution websites (trackers) a so-called ratio system exists in order to compel users to leave the peer-to-peer software working, so that they share as much as they download. The value exchange therefore changes from a real currency to an exchange of online traffic and computational time.

[83] Geoff Cox, *Real-Time for Pirate Cinema* (Aksioma Institute for the Contemporary Art Ljubljana, 2015)*,* p. 9.

[84] Ibid.*,* p. 10.

between emotion and affect, where the former is seen as subjective and internal, and the latter as pre-individual and external. Following Barad's idea of apparatus, this continuous renegotiation does not assign new permanent agential positions, but allows the questioning of the effect of artefact's own autonomies. What I outlined in the previous chapter as computational procedures and temporality of computer processing constitutes the space of affect of procedural films as pre-individual and technical (algorithmic), and beyond the control of the human viewer/user. This autonomous aspect of affect is underlined by Brian Massumi, who notes that

> affect is autonomous to the degree to which it escapes confinement in the particular body whose vitality, or potential for interaction, it is. Formed, qualified, situated perceptions and cognitions fulfilling functions of actual connection or blockage are the capture and closure of affect.[85]

Carolyn Pedwell, following Massumi, describes affect as a 'form of intentional relationality' that 'signifies emergent interactions of human and non- or more-than human actors which are productive of different kinds of sensations and becoming'.[86] This agential shift in the new materialist and posthumanist approaches to media sees the technically mediated affect not as internal emotional states, but rather as a constant questioning of what used to be conceived as stable cause-and-effect relations between the human and the non-human.

The renegotiation could be seen as a process of agency attribution by the observer to the work, at the moment of witnessing and understanding that the continuous selection of what is rendered on the film's surface is controlled by the algorithm. How does autonomy renegotiate the borders between the film and the viewer? Gabriel Menotti-Gonring reflects on it with the following observation:

> As the user is excused and control leaves its reach, all that he can do is to observe: a fourth wall naturally appears…. That to which the system demands nothing tends to become audience. *A system produces*

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[85] Massumi, *Parables for the Virtual*, p. 35.

[86] Carolyn Pedwell, 'Mediated Habits: Images, Networked Affect and Social Change', *Subjectivity* 10, no. 2 (1 July 2017): 147–69, p. 150.

audiences precisely where it turns out to be autonomous (and therefore closes itself). In that situation, the system becomes an image, but does not reveal its operation. Most of the times, what happens is the contrary: the system appears transparent and the surface is pure facade; a simulation. That means the user becomes redundant, but not unnecessary. What is an image for, if not being watched?[87]

Even if autonomy is restricted to the programmed range of possibilities and emergence, it still creates a certain imaginary of the film's agency. This means that affective space-time also cannot be reduced to the space of pre-cognitive, technically induced affect, but also includes the process of rationalisation and perception of the film 'as film', insofar as it is identified as an inanimate cultural object. Seeing film as 'film' therefore becomes part of the affective space-time.

This imaginary and perceptual agency becomes the crucial part of algorithmic affect. In other words, where the moving image is imbued with autonomy, it tends to create resistance to being easily consumed, unlike in the traditional spectatorship models that presuppose immersion. The affective space-time of procedural film is characterised by mixing alienation and attraction. On the one hand, the very perception of the system as autonomous creates alienation, as the internal rules by which the film is generated are often unspoken. On the other hand, the liveness, the unexpected deviation and the *perception* of the film as autonomous make it stand in an agential position rather than that of an object made for consumption. This dialectic, while anchored in the affective space of moving image, also brings us back to the idea of machine art and to the associated metaphor of the machine perceived as 'other' to the human. Andreas Broeckmann characterised machine art as follows:

Works of machine art encourage us to not take the apparatuses for granted, but to problematize them by making the sibling ties between subjects and machines visible, or feelable—in the modes of comfort, pain, or humor. The artistic encounter with machines is therefore

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87 Menotti-Gonring, 'Executable Cinema', p. 111, emphasis mine.

characterized by strangeness (and familiarity), by distance (and proximity), by rejection (and love, or intimacy).[88]

The diverse cultural imaginaries of algorithmic affect, be they academic or artistic, coincide with the materialist affects of technological processes within the affective space-time of procedural films.[89] While initially this can seem a paradox, I argue that it is precisely within the space of that paradox that algorithmic (or technical) affect resides. The fact that something happens too quickly or too slowly to be perceived by human senses does not prevent it from being recognised or understood—whether through technical literacy, or through constructing imaginaries that attempt to visualise or map it, be they artistic or academic. Similarly, it is only in the interaction with human bodies that the distinctive technical modes of time-passing become clear. Where the temporality of machine processes confronts human ones, the primacy of the human position can be renegotiated. At the same time, the imaginaries, visualisations and mythologies that are constructed in the view of that difference and that gap, become part of the renegotiation.[90]

In the case studies investigated in this research—screen saver and game engine—the material temporalities of human bodies (the patterns of sleep and labour, attention span, leisure time) inevitably come into contact with their non-human counterparts (chemical and electric temporalities built into computation). The first case study, the screensaver, opens up a distinctly materialist, looped temporality of the film that plays on the screen while the worker is absent, as well as the dialectics of productive and idle time. The second case study, through the exploration of a game engine, looks at the programmed time: the algorithmic time of programmed processes, unfolding in the gamespace of simulation. These temporalities underpin the vast machine of algorithmic control that, more often than not, processes living time according to the protocols of standardisation and the logic of maximising profit. As Hansen and Mitchell suggest, this creates a sense of alienation on a larger scale:

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[88] Andreas Broeckmann, *Machine Art in the Twentieth Century* (MIT Press, 2016), p. 30.

[89] As Parikka notes in *What Is Media Archaeology?,* 'technical media are posthuman media in the sense of addressing a whole other sensorium than that of the human being' (p. 256).

[90] See also Taina Bucher, 'The Algorithmic Imaginary: Exploring the Ordinary Affects of Facebook Algorithms', *Information, Communication and Society* 20, no. 1 (2 January 2017): 30–44.

the time of the world—and specifically, of computational objects and processes—has become fundamentally disjoined from the time of experience, with the result that we find ourselves facing a new, structurally unprecedented form of alienation: alienation from the flow of information in the world around us.[91]

The reading of algorithmic affect that I would like to suggest here, therefore, draws on the two aspects described in this section: the sense of externality of affect that is channelled by the autonomy of algorithmic performance, and the imaginary 'inhumanity' of the material processes involved. Both construct the gap between the human and the technical (as 'inhuman'), a gap that can be sensed, imagined, theorised and described in various ways.

   The posthumanist intonation that colours my use of the term 'affect', therefore, does not signify a radical departure from human senses, but rather a refusal of certainty that has characterised the traditionally central placement of the human subject in relation to technology in Western thought. The posthumanist attitude towards the media environment calls for an investigation of the entanglement of the aesthetic and epistemic procedures as 'a particular mode of capture where resonances between bodies—both human and non-human alike—enter systems of value and value production'.[92] In procedural films, intimacy is created by the fact that it presents as *moving image*, and therefore includes the viewer in the process of watching; and at the same time, alienation is created by the fact that it is perceived as *autonomous*. The artwork uses its own methods of abstraction and representation to establish an affective space between itself and the viewer; at the same time, it re-calibrates the temporal and visual regimes from the agential position. This interesting dynamic will be addressed in greater detail in Chapter 5, where I discuss the position of non-human agents within procedural environments, and further draw on Karen Barad's posthumanist notion of performativity, which suggests that the borders

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[91] W. J. T. Mitchell and Mark B. N. Hansen, *Critical Terms for Media Studies* (University of Chicago Press, 2010), p. 110.

[92] Tero Karppi et al. 'Affective Capitalism: Investments and Investigations', *Ephemera: Theory & Politics in Organization* 16, no. 4 (4 November 2016): 1–13, p. 9.

between 'human' and 'non-human' are re-defined in each local material encounter, rather than seen as a given.[93]

Experiencing Autonomy:

From Experimental Film to Algorithmic Affect

The consideration of filmic autonomy invites an interesting recognition that procedural films—at least in the narrow understanding of my own artistic practice—owe a particular debt to the practices of structural film-makers. In this and the next section I sketch a tentative genealogy of autonomy in the moving image, extending from structural film practices and their unique capacity to create self-reflexivity in film experience, to the current algorithmic generative works and techniques.[94]

In experimental film, the disassembling of the film apparatus often becomes part and parcel of its experience. The film strip does not have to contain a chemically imprinted image in order to create a film—like in Stan Brakhage's *Mothlight* (1963); the film does not have to be two-dimensional or confined to the screen (Anthony McCall's *Line Describing a Cone* (1973)). Ultimately, the film does not even have to exist anywhere except on the soundtrack and in the imagination of the viewer (Derek Jarman's *Blue* (1993)). These, and many other films each have their own ways in which they disrupt the mainstream filmic procedures and the 'naturalised' film perception. In this sense, they induce a particular sense of meta-awareness of their own medium that affects the experience of the film.

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[93] Karen Barad, 'Posthumanist Performativity'.

[94] While beyond the scope of the current research, a larger and more detailed genealogy of procedural films would consider the productive moment of the 1970s, when the film-makers Hollis Frampton, Paul Sharits and Tony Conrad, video artists Steina and Woody Vasulka, and media artist Peter Weibel taught at the pioneering Center for Media Study at the State University of New York in Buffalo. The Center for Media Study was aimed at media and image-making technologies—film, video and computer. In one of his talks, the founder of the centre Gerald O'Grady describes media as 'the codes and modes of expression in human culture, and their creation and exploration as information carriers, art forms and structures of both individual and social consciousness'. See Gerald O'Grady, 'The Three Universes of Media', in *Buffalo Heads: Media Study, Media Practice, Media Pioneers, 1973-1990*, edited by Woody Vasulka and Peter Weibel (pp. 85–87) (ZKM Center for Art and MIT Press, 2008), p. 86.

Stan Brakhage defined such meta-awareness as ideological resistance to the naturalised experience of mainstream cinema, elegantly describing Hollywood film tropes as 'soothing syrup' and 'the depressant of imagistic repetition, a film akin to counting sheep to sleep'.[95] This is not, by any means, an overarching political stance, but clearly a point of a larger discussion of the 1960s, when art discourse grappled with the rapid changes in media technologies, new concepts of information and globalisation. Some of the results of this debate materialised as conceptual art, systems art, the very early beginnings of computer art and structural film. While the use of the term 'structural', introduced by P. Adams Sitney,[96] was criticised early on for imposing a reductive interpretation onto very diverse artistic practices,[97] I argue that it is possible to identify a point of commonality in the way the structural works, by addressing the technical conditions of the films' own making, activate the cognitive processes of seeing a film. This can be seen, in particular, in the practices and writings of Paul Sharits, Peter Gidal, Michael Snow and Hollis Frampton. By re-structuring the traditional systems of cinematic presentation and apparatuses, structural film engages in a kind of technical unmaking of the perceptual processes involved in watching a film.

How does this relate to procedural films? The attention to the technical medium in the practices of structural film-makers took on varying shapes. However, the crucial attitude was the exploration of film as *autonomous system*, as is particularly noticeable in the works of Hollis Frampton and Paul Sharits. Many of Frampton's films, including *States* (1967), *Zorns Lemma* (1970) and, to some extent, *(nostalgia)* (1971) or *Poetic Justice* (1972), utilise a certain procedure that defines the structural organisation of the film and is formulated symbolically, linguistically and/or mathematically. *Zorns Lemma*, for example,

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[95] Stan Brakhage, *Metaphors on Vision* (Film Culture, 1963).

[96] P. Adams Sitney, 'Structural Film', *Film Culture* No. 47, Summer 1969, and *Visionary Film: The American Avant-Garde* (Oxford University Press, 1974).

[97] While the definition elicited criticism from theorists and artists for its mis-representatively generalising view of very different artists and their motivations, it nevertheless provided a general description of the trend in which the technical nature of film was accorded a crucial place (Bruce Jenkins, 'A Case Against "Structural Film"'. *Journal of the University Film Association* 33, no. 2 (1981): 9–14; George Maciunas, 'Some Comments on Structural Film by P. Adams Sitney.' *Film Culture* no. 47 (1969); Peter Gidal, *Structural Film Anthology* (BFI, 1976), p.13–14; Hollis Frampton, 'Hollis Frampton in San Francisco'. *Cinemanews* 77–6 (1977): 8–9; Malcolm Le Grice, 'Thoughts on Recent "Underground" Film [1972]'. In *Experimental Cinema in the Digital Age* (pp. 13–26) (BFI, 2001).

reuses Frampton's earlier photographic project *Word Pictures* (1962–63) as a dataset, displaying in alphabetic order the photographs of words that he took in urban space. The procedure keeps repeating, but as some of the less common letters run out, they come to be substituted by abstract moving images.[98] With characteristic irony (and predating glitch art and debugging), Frampton notes that since 'a number of misfortunes' are bound to occur in a time-based work of art, he might as well incorporate them in a deliberate fashion, and provides a detailed description of errors in the film's system. Even more importantly, in a later discussion on *Zorns Lemma*, Frampton notes: 'That desire for internal self-consistency, or for self-provingness, suggests the possibility, at least, for outrageous hypotheses. There are language-like discourses that can carry with them a grand suggestion that they can be internally self-proving, that they can, among other things, get along without the artist'.[99]

A pertinent interpretation of Frampton's works can be found in the practice and writings of Barbara Lattanzi. Her website describes her works as *cinema software*, or *idiomorphic software*,[100] shared under copyleft licence. The work *HF Critical Mass* (2002)[101] is based on Hollis Frampton's 1971 film *Critical Mass,* adopting its structure as 'an interface for improvising digital video feedback'.[102] When the viewer downloads the software, they are able to apply it to local video files in *.mov* format, creating endless remediations of the original's rhythm. *HF Critical Mass* therefore codifies the essence of structural film, its internal logic, gestures and movement, into algorithmic form. In her notes on the film, Lattanzi remarks that she proposes 'Frampton's work… as a model for software construction because of the particular way that his work engages the intentionality and subjectivity of the viewer—the way his work stages viewers' acts of perception, or registration, as intentional achievements of the viewer'.[103]

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[98] See Hollis Frampton, 'Zorns Lemma: Scripts and Notations', in *On the Camera Arts and Consecutive Matters: The Writings of Hollis Frampton*, edited by Bruce Jenkins (pp. 192–202) (MIT Press, 2009).

[99] Hollis Frampton, 'Interview with Scott MacDonald: "Zorns Lemma"', In *Buffalo* Heads, p. 194.

[100] See website wildernessPuppets, http://wildernesspuppets.net/about.php.

[101] In 2015 Lattanzi also released *HF Critical Mass,* version 2.

[102] See website description *HF Critical Mass Software,* http://www.wildernesspuppets.net/yarns/hfcriticalmass/description.html.

[103] Barbara Lattanzi, 'Critical Mass, the Software', wildernessPuppets, 6 November 2004.

Her insistence that 'structures fundamentally perform something'[104] aligns structural film directly with performative understanding of code (and software) as 'speech acts',[105] and could be extended to procedural films as well. As Inke Arns writes, drawing on a series of lectures by John Langshaw Austin at Harvard University in 1955, *How to Do Things with Words*, 'linguistic utterances by no means only serve the purpose of describing a situation or stating a fact, but are used to commit acts'.[106] Speech is regarded as action in and of itself, and a performative process in its own right. Arns suggests that code can similarly be seen as a speech act, and its capacity or failure to be executable as the *performativity* of code.

Between procedural and structural films, the performativity of the technical system also becomes significant as it is perceived as autonomous from human being, or as an equal participant in the exchange. Paul Sharits addressed the technical apparatus of cinema as a communication system. Speaking in the context of how cinema measures up to the conceptual conquests of art in the 1970s, and implicitly drawing on the contemporaneous research in cybernetics, systems theory and communication, Sharits calls for seeing film practice as a form of 'research in contemporary communication and "meaning" systems'.[107] The task of the artist, according to him, is to approach films as informational systems, without imposing humanistic pre-suppositions such as 'capturing a likeness of the world in motion'.[108] In this definition Sharits likens the distinction between narrative-based filmic realism and between the film as a system to the distinction between 'human' and 'non-human'.[109]

Peter Gidal reframes structural film as materialist: 'In Structural/Materialist film, the in/film (not in/frame) and film/viewer material relations, and the relations

[104] Ibid.

[105] See Arns, 'Read_Me, Run_Me, Execute_Me', 'Code as Performative Speech Act', *Artnodes* 4 (2005); Geoff Cox and Christopher Alex McLean, *Speaking Code: Coding as Aesthetic and Political Expression* (MIT Press, 2013)*,* pp. 35–38.

[106] Arns, 'Code as Performative Speech Act', p. 6.

[107] Paul Sharits, 'Words per Page'. *Film Culture* 65–66 (1978): 29–43, p. 31.

[108] Ibid.

[109] Ibid.

of the film's structure, are primary to any representational content…'.[110] It is set in opposition to the dominant cinema of representation and narrative, which Gidal sees as a one-way system that 'categorically rules out any dialectic'[111] and relies on the passivity of the viewer and their identification with the characters. Unlike Sharits, Gidal includes the viewer in the system of the film. The structural/materialist film requires an active and involved viewer:

> The mental activation of the viewer is necessary for the procedure of the film's existence. Each film is not only structural but also structuring. This is extremely important as each moment of film reality is not an atomistic, separate entity but rather a moment in a relativistic generative system in which one can't simply break down the experience into elements. The viewer is forming an equal and possibly more or less opposite 'film' in her/his head, constantly anticipating, correcting, re-correcting— constantly intervening in the arena of confrontation with the given reality, i.e. the isolated chosen area of each film's work, of each film's production.[112]

On the one hand, as can be seen from this quote, the film experience is produced by the re-assembling of the technical elements of the cinematic machine; on the other hand, the mental process of viewing plays a crucial role. The viewer becomes an equal part of the cinematic machine. For Gidal, therefore, the film produces a kind of tension, a productive oscillation between expectation and experience, between perception and existing knowledge. Significantly, he uses the words 'filmic event' to underline the temporal process which becomes part and parcel of a film-induced self-reflection: 'filmic reflexiveness is the presentation of consciousness to the self, consciousness of the way one deals with the material operations; filmic reflexiveness is forced through cinema's materialist operations of filmic practice'.[113]

One of the best examples of such mental processing of experimental film is Michael Snow's film *La Région Centrale* (1971). The film was made using a

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[110] Gidal, *Structural Film Anthology*, p. 1.

[111] Ibid., p. 3.

[112] Ibid.

[113] Ibid., p. 10.

remotely controlled, programmable robotic arm that allowed the camera to move through 360 degrees in all directions. For the three hours of the film, a deserted, remote landscape in Northern Quebec remains its only subject. As the camera moves around its invisible point of anchor, all possible expectations are forfeited, turning the film into a meditation between the technical apparatus and the scarce elements of the landscape. As Michael Snow notes, 'I only looked in the camera once. The film was made by planning and by the machinery itself'.[114]

Not only the movement of the camera, but also the knowledge that the film is made by autonomous machinery, and that each screening is also a re-enactment of the process of production, gives it a strong sense of autonomy. The most powerful relationship in the film is the one of the camera to the centre around which it revolves. The viewer feels the way they are being displaced from the seemingly closed system of the film that *seems* to do very well on its own. There is an emphatic lack of the kind of merging of the camera's and the subject's points of view that is common in the narrative film. In this sense, the experience of the film described by Thierry de Duve offers a seminal reflection on *La Région Centrale*'s autonomy:

> The camera never reaches out into the landscape, it pulls the landscape towards the center. It is astonishing, especially in those sequences where the camera moves at high speed, because the body sensations that one would expect to see induced by such camera movements (as in I-Max entertainment movies) should be those of centrifugal forces. And there is no phenomenological accounting for that effect, save for this strangest hypothesis: I do not identify with the camera. I am here, no doubt, in the center, there where the eye of the camera is, but my body is not, and thus, that's not me, here. I don't feel it's me. The sensation I get is one of kinesthetic sensory deprivation.[115]

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[114] Michael Snow, 'Converging on La Région Centrale: Michael Snow in Conversation with Charlotte Townsend', in *The Michael Snow Project: The Collected Writings of Michael Snow*, edited by Michael Snow and Louise Dompierre (Wilfrid Laurier University Press, 2010 [1971]), p. 60.

[115] Thierry de Duve, 'Michael Snow: The Deictics of Experience, and Beyond', *Parachute* 78 (April–June 1995): 28–41, p. 32.

The sense of the film's autonomy accrues with sufficient strength to push the spectator out of her traditional place established by mainstream cinema, and to force her to renegotiate the experience of watching. But this kind of de-centering is also irreducible to indifference or complete exclusion of the viewer. Rather, it produces a feedback loop between the viewer and the film, a continuous de-centering and displacement of their positions.

Experimental film thus brings several important considerations to the discussion of procedural films. First, affect resides in 'space-time', rather just in 'space'; it unfolds temporally, as a self-reflective process, a feedback loop between the viewer's perception and the film's autonomy. Second, the technical procedure can be seen in light of its posthumanist performativity and production of affect. Finally, procedural films, like structural films, can become an engine for unmaking of the perceptual processes involved in watching a film, which opens a potential discussion of political aesthetics of procedural film.

Liveness

But while agency cannot be simply 'assigned' and stay with one party or another, there is still a matter of perceiving the performativity and autonomy of code as having agency, as one can while watching *La Région Centrale.* In this section I address liveness in procedural films as a specific effect of autonomy. Liveness is understood as the sensation that occurs when the film's autonomy is perceived, both subconsciously (simply as a reaction to animated movement) and rationally (as imagination of something as having agential qualities). These ideas of liveness are underwritten by existing apparatuses, cultural logics and imaginaries.[116] I will outline several techno-cultural logics—of database, of live mediation and simulation—and analyse how they affect the procedural space-time. This also introduces the way in which these topics will later be discussed as affective-epistemic encounter in the two case studies in my practice.

It is important to consider here, I argue, that even in the approaches to generative film where autonomy is seen as a given condition or is not articulated, the artists or programmers still operate under the *cultural*

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[116] For a similar investigation, see Dejan Grba, 'Avoid Setup: Insights and Implications of Generative Cinema', *Technoetic Arts* 15, no. 3 (2017): 247–60.

imaginaries of autonomous technology, machines and artificial intelligence that are at work within the ideological paradigms of techno-science. The positing of the machine as autonomous creates a sort of a darkened area in which various agencies, fictional or real, have to be identified. The imagination of the autonomous machine itself becomes one of the hidden conditions of knowledge in these models, along with the power relations built into the apparatus.[117] Ideas of autonomous moving image agents have themselves existed in very different paradigms, from military simulations to artificial life and contemporary entertainment, and they bring their own conceptions of autonomy along. While these debates fall well beyond the scope of the current project, the ways in which they create aesthetic paradigms that have influenced the practices of artists working with procedural and generative processes are important. In this regard, the renegotiation of agency happens not only for the viewer, but also for the artist in the very process of production. While in the most basic sense the real-world agency still lies with the human operator (and to the degree that they choose to establish it in regards to the autonomy of the programme), the sense of perceiving entities in a film as autonomous, remains to be investigated.

The first case I would like to consider is the cultural logic of the database. Database cinema refers to the works which establish a dataset, a library of singular units (for example, video clips) and recombine them under a particular rule-set. It can be seen as a generative montage that treats the film as an actionable database rather than a stable sequence of images. For the early cinematic expressions of this, one could refer to the cut-up method, which was originally formulated by Tristan Tzara in 1920,[118] and which Brion Gysin later re-

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[117] For further elaboration, see Broeckmann, *Machine Art in the Twentieth Century*.

[118] TO MAKE A DADAIST POEM

Take a newspaper.
Take some scissors.
Choose from this paper an article of the length you want to make your poem.
Cut out the article.
Next carefully cut out each of the words that makes up this article and put them all in a bag.
Shake gently.
Next take out each cutting one after the other.
Copy conscientiously in the order in which they left the bag.
The poem will resemble you.
And there you are—an infinitely original author of charming sensibility, even though unappreciated by the vulgar herd.
—   Tzara, *Seven Dada Manifestos and Lampisteries,* p. 39.

discovered and applied to film-making with William Burroughs and Anthony Balch. This resulted in *The Cut-Ups* (1966)—a film made by dividing edited footage in four rolls of equal length, and then re-assembling one-foot-long sections of each roll consecutively one after another.[119] Contemporary examples include manually assembled supercut films such as Christian Marclay's *Telephones* (1995) and *The Clock* (2010). Procedural projects based on the database principle vary in approach. Here one could refer to the interactive hypermedia system *Aspen Movie Map* (1978) developed at MIT; Lev Manovich's *Soft Cinema* and its three instalments, *Texas* (2002)*, Mission to Earth* (2003–4) and *Absences* (2004), which, I would argue, exemplify the approach to database cinema, as well as Sam Lavigne's algorithmic *Videogrep* (2014), a Python script that assembles supercut films based on a keyword. What these works have in common is a certain montage sensibility, where recombination of existing materials amounts to the production of new experiences. Manovich outlines in the description of *Absences* that this work ensued from the assumption that 'meaning and narrative coherence can be created through associative chains', and that these chains respond to 'visual properties of images'.[120] The action of assembling activates the database as procedural, as meaning-making.

Another logic of liveness could be located in live mediation. Works treating computer graphics as live materialist artefacts can be identified from as early as in the 1950, when Ben Laposki started to create the oscilloscope works (even though they exist as photographs). Woody Vasulka and Brian O'Reilly's *Scan Processor Studies* (1978) and other works using analogue video feedback offer interpretations of generative aspect as mediation, or a translation of one kind of process into another. The procedural aspect in case of their practice is primarily

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[119] *The Cut-Ups* was made out of footage for an unrealised documentary on Burroughs, *Guerilla Conditions,* that Balch shot between 1961 and 1963. The footage was conventionally edited, and then cut up in four equal-length rolls, which were given to an editor to re-assemble, using foot-long sections from each of the four rolls consecutively. As Balch puts it, 'the actual chopping was done by a lady who was employed to take a foot from each roll and join them up. A purely mechanical thing, nobody was exercising any artistic judgement at all' (See Balch, 'Interview with Anthony Balch'. *Cinema Rising* 1 (April 1972): 12). The soundtrack of the film equally consists of several phrases (the most repeated ones include 'Yes', 'Hello', 'Look at that picture', 'Does it seem to be persisting?'), which were repeated in different intonations during the initially twenty-minute long film, which was later cut to twelve minutes, as the staff at the Cinephone Academy Moviehouse, where it was showing five times a day, could not bear it.

[120] Lev Manovich and Andreas Kratky, *Soft Cinema: Navigating the Database* (MIT Press, 2005).

materialist, relying on the immediacy of electromagnetic response. Live coding artists such as Joanne Armitage, Alex McLean and Adrian Ward are known for the audiovisual performative events in which they also often project the process of their working on the screen, opening the black box to the viewer, supporting the visual with the self-reflective process. However, the live works face the same representational dilemma as any performance work, essentially bound to existence as only *live* processes or as documentation that cannot reproduce the original experience. As any generative method can be used in the production of the work and then recorded, it is not necessarily a part of the live rendering of the work if it is not distributed as an actionable software. This is particularly important for the considerations of the 'liveness' of the work. In this case, machinima films that are made in game engines or simply recorded in-game become an interesting reference for the procedural process. Essentially, one could argue that the generative aspect of the in-game world is employed as a kind of performance which is recorded, not dissimilar to a theatrical staging.

Finally, the logic of the simulation process owes to the scientific domains from which the instruments and models are borrowed. Artificial life simulators and evolutionary algorithms were appropriated by artists such as Jane Prophet, Karl Sims and William Latham in the late 1980s and 1990s in order to create biologically-inspired environments. As liveness in the simulation apparatus will be explored in detail in Chapter 5, I will limit its discussion here to a brief mention. Among the current artists, the practices of Lawrence Lek and Ian Cheng (whose work I will address in the final chapter) offer an interesting interpretation of simulation through game engines. While Ian Cheng calls his works 'live simulations' and programs them in order to achieve a fully simulated environment that develops by its own rules, Lawrence Lek utilises the game engine in order to create site-specific simulations of locations, which are then often recorded and shown as non-procedural films.

Notes on De-centering Artistic Methodology

The renegotiation of the role of technology also influences my artistic research methods and ways of working. In the process of developing and questioning procedural films I have been inspired by the posthumanist idea of de-centering

the role of the researcher, in the sense of critical posthumanism represented by work of Rosi Braidotti. In her book *The Posthuman,* Braidotti shows that traditionally the humanities operated with the Vitruvian ideal of Man at its centre, and thus were organised in an unfairly anthropocentric manner that resulted in exclusion of 'others'—starting from non-Europeans and women to non-human animals. She also points out that where the traditional nature-culture divide has collapsed, replaced by the 'complex systems of data-feedback, interaction and communication transfer',[121] a new renegotiation of relations between nature and culture becomes necessary. She suggests that

> technologically mediated post-anthropocentrism can enlist the resources of bio-genetic codes, as well as telecommunication, new media and information technologies, to the task of renewing Humanities. Posthuman subjectivity reshapes the identity of humanistic practices, by stressing heteronomy and multi-faceted relationality, instead of autonomy and self-referential disciplinary purity.[122]

The posthumanist approach to theory, therefore, also introduces a reconfiguration of the traditional apparatus of research. The necessary guidelines for thinking posthuman theory are then 'cartographic accuracy, with the corollary of ethical accountability; trans-disciplinarity; the importance of combining critique with creative configurations; the principle of non-linearity; the powers of memory and the imagination and the strategy of defamiliarization'.[123] Following these parameters, I suggest posthumanist de-centering as a multi-scalar process that operates in different ways in my practice.

First of all, it is de-centering of the dominant position of the human and the artist in relation to technology, as I hope is clear from the discussion of affect throughout the chapter. Secondly, it is also de-centering of the affective kind as a viewer of other procedural films. And of course, it is de-centering of other kinds—a situated knowledge of being a foreigner in the UK and being a woman, both of which can contribute to keenly felt cultural and discursive displacement. In this section I will articulate how technical and affective de-centering works in

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[121] Rosi Braidotti, *The Posthuman* (John Wiley & Sons, 2013)*,* p. 145.

[122] Ibid.*,* p. 145.

[123] Ibid., p. 163.

terms of practical aspects of making art, and what it means in the ethical sense, for my position as an artist-researcher.

In my practice I see art primarily as a method of knowledge construction. That means questioning the technical mediation, the language, the epistemological framework in which the experience of the work takes place, the new epistemologies that it creates, and the affective space. In other words, art practice is not only tasked with the creation of knowledge systems, but also with unpacking what kind of other systems the experience of the work activates in its turn, and what the conditions of producing these systems are. Both affect and the aesthetic space are plugged into this goal, suggesting the ways of experiencing, living, sensing or comprehending these epistemological questions. Because of that, the production of a local encounter for each viewer, and the production of knowledge, as in structural-materialist approaches, becomes a priority, as well as the autonomous existence of the work.

Another aspect of de-centering that I would like to address is multi-modality as a method in my practice. Both of the two sets of works that are included in the project, *Chronic Film* and *Non-Player Character*, exist in multiple formats. *Chronic Film* exists as an algorithm, as a four-channel installation and as a lecture-performance. *Non-Player Character* exists, thus far, in two modes. The first one is a gallery work: a generative film that is meant to be contemplated. The second is a performative part in an ongoing series of lecture-performances.

In this project, I chose to take on the ideas of screensaver and game engine as two main case studies. While this research could have been done with only one of the case studies in mind, I argue that juxtaposing them in a kind of multi-modality similar to that which my works exploit produces de-centering on a larger level, one that allows the work to be perceived in the way intended and in the context of development of my practice. The investigations of both case studies offer entry points into the two sets of layered apparatuses. However, it was only by following these two sets through one after another that I could explore the processes of labour, design and human experience in the larger critical posthumanist framework, and only through having them next to each other that one can see that the processes of both control and emergence are at play in the algorithmic processing. Where screensaver is seen as a more marginal case of procedural film, game engine represents a leading paradigm,

as more and more artists adopt it as a method for making simulated audiovisual environments. In a sense, the sequence of the two case studies also documents a transition, from the purely filmic practice that I pursued at the beginning of my research, towards more collaborative media art practices that include advanced algorithmic techniques into the context of film. For this reason, the procedural film practices presented in the two artistic bodies of work in this project are not *purely* or *solely* generative; rather, they combine, juxtapose and situate the procedural elements through other practices.

Collaboration in my practice is seen as part of de-centering. While in film, collaboration of a film-maker with the sound artist or composer is often seen as a given, a collaboration of artists with programmers is a more contested subject. While complete technical mastery of the apparatus is a big advantage, hybrid practices such as mine present a certain difficulty. In my practice, working in collaboration with programmers on the code was a part of a learning and discovering process in this project. When I started working on *Chronic Film*, for example, it quickly became clear that the task imposed mathematical and conceptual difficulties that went far beyond my skillset. The collaboration process then was not only a necessary part of the work, but also a valuable experience, in which the necessity to bring into the theoretical discussions such aspects as media literacy and approaches to media art became evident.

In this chapter I have addressed the construction of affect in procedural films through the lenses of autonomy and agency. I have outlined the considerations on the affective space-time of procedural films. Referring to practices of media art and experimental film, I have drawn a tentative genealogy of autonomy in moving image, and addressed how technical apparatuses might carry different logics of liveness. Finally, I have considered de-centering as an artistic method in my own practice.

The posthumanist consideration of algorithmic affect shows that autonomy becomes an important aspect of the film experience. However, concentrating solely on autonomy as a part of the viewer's experience risks a return to the anthropomorphic or mythological view of the technical artefact. In order to consider the questions of power relations and algorithmic control, the

algorithmic construction of affect cannot be seen as separate from infrastructural networks. Therefore, a transversal discussion of the sociopolitical construction of algorithmic autonomy and affect becomes necessary. This will be the focus of the next chapter.

Chapter 3

Political Aesthetics of Algorithmic Superstructuring

If procedural films can be seen as part of a vast economy of images and affects, it is important to acknowledge the proprietary nature of the procedures that constitute it, built into the regimes of standardisation and control. The 'materiality of networks and equipment is part and parcel of the media art history movement',[124] and economic and political structures constitute an important part of the affective space-time of procedural films. Therefore, the apparatus of procedural film is viewed as intrinsically enmeshed with questions of political economy and algorithmic governance. The difficulty of connecting information technology infrastructures and their modes of performance, and their networked and distributed affect, requires a transversal approach, which I will investigate in this chapter through the concept of 'algorithmic superstructuring', developed as a part of my curatorial project for a media art festival.

Media art has traditionally responded to questions of algorithmic governance by opening the 'black box' of technology, by revealing the power structures inside the machine, be it explicitly or implicitly, through hacking, commentary, speculative narratives, glitching and other methods. In the current moment it seems that such blackboxing takes on more menacing forms, as algorithms are increasingly used for decision-making and analytic in a variety of fields, while remaining proprietary and, therefore, opaque. This is reflected in the investigations of algorithmic governance, or even 'algocracy',[125] characterised by the unprecedented consolidation of access to big data and to proprietary algorithmic solutions in the hands of various state and corporate bodies.[126] Zeynep Tufekci identifies the main dangers of algorithmic governance as 'lack

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[124] Cubitt and Thomas, 'Introduction: The New Materialism in Media Art History', p. 62.

[125] See A. Aneesh, *Virtual Migration: The Programming of Globalization* (Duke University Press, 2006); A. Aneesh, 'Global Labor: Algocratic Modes of Organization', *Sociological Theory* 27.4 (2009): 347–370; John Danaher, 'The Threat of Algocracy: Reality, Resistance and Accommodation', *Philosophy & Technology* 29. 3 (2016): 245–268.

[126] See John Danaher, et al., 'Algorithmic Governance: Developing a Research Agenda through the Power of Collective Intelligence', *Big Data & Society* 2 (2017) for comprehensive outlines of the stakes and challenges of algorithmic governance.

of transparency, information asymmetry and hidden influence.'[127] The shift to focus on the 'algorithmic' from 'software' has been also reflected in media studies.[128]

Drawing on contemporary media art practices and on studies of visual and algorithmic cultures, I would like to develop the idea of algorithmic superstructuring as a reading of aesthetic regimes of algorithmic governance, their procedural affect, conditions of labour and design. First, drawing on the work of Jacques Rancière, I will consider the political aesthetics of algorithmic autonomy and suggest how algorithmic superstructuring can be seen as distribution of the sensible. Second, I will draw on media art works in order to situate the processes of algorithmic superstructuring as localised in media art, labour, in blackboxing and imaginaries of technology. Finally, I will consider how interfaces and 'persistence of vision' affect algorithmic superstructuring as a larger condition and as an aesthetic regime of algorithmic governance.

Distribution of the Sensible

In this chapter I will be drawing on my curatorial practice. While the previous chapter focused on the affective space-time between the film and its viewer, as well as between the artist and the work, the current chapter addresses wider networks and infrastructures of algorithmic affect. I will articulate the socio-political field of procedural films and other media art practices. Furthermore, I will further elaborate the position of spectator, the political space and public narratives of media art, drawing on the experience and knowledge produced by curating a festival.

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[127] Zeynep Tufekci, 'Algorithmic Harms beyond Facebook and Google: Emergent Challenges of Computational Agency', *Journal on Telecommunications and High Technology Law* 13 (2015), p. 207.

[128] In the last two decades, theories of media have adapted to the emergence and proliferation of algorithmic processing. Some of the pivotal discussions in this sense are represented by software and new media analysis by Lev Manovich, and the critical studies of software by Matthew Fuller and Alexander Galloway (see Manovich, *The Language of New Media*; Fuller, *Behind the Blip*; Galloway, *Gaming: Essays on Algorithmic Culture*). Due to the challenges that have been brought on by advanced data processing techniques such as machine learning, data mining and predictive analysis, the algorithmic itself, seen as a concatenation of design, economic, cultural and political concerns, has become the focus. Further mapping of the term can be found in Tarleton Gillespie, 'The Relevance of Algorithms', in *Media Technologies: Essays on Communication, Materiality, and Society*, edited by Tarleton Gillespie, Pablo Boczkowski and Kirsten Foot (pp. 167–194) (MIT Press, 2014) and Ted Striphas, 'Algorithmic Culture', *European Journal of Cultural Studies* 18, no. 4-5 (2015): 395–412.

I see curatorial work as a form of *practice research.* This means that a curatorial project is not simply a presentation for completed research, but rather, in the words of Simon Sheikh, a space for enacting research. As he notes, 'research is here not only that which comes before realisation but also that which is realised throughout actualisation'—a statement that is also true for artistic research.[129] The festival format, which includes exhibitions, screenings, public discussions, workshops and other modes of engagement, is especially suitable for creating spaces of productive questioning. The curatorial concept, *Algorithmic Superstructures,* was developed as a theme for IMPAKT media art festival by Yasemin Keskintepe, Luba Elliott and I. It took place in Utrecht, Netherlands, in October 2018. *Algorithmic Superstructures* in its initial iteration was aimed at investigating widely, through artistic, theoretical and design approaches, the epistemic and affective shifts brought on by algorithmic processing, as well as disrupting the techno-positivist narratives of progress. The idea of algorithmic superstructures appeared as an attempt to question the ways in which the traditional systems of politics, media, labour and art are being overlaid and displaced by new algorithmic frameworks, interfaces and protocols, installed under the techno-capitalist drive for quantifying, consolidating and regulating human experience. Referring specifically to these processes of displacement, we imagined algorithmic superstructures as pervasive, expansive, open vectors of algorithmic processing and logic that flourish under the auspices of the attention economy, where codes, images, software and protocols serve as primary mediators in the networks of the commercialisation, capture and circulation of affect. The spaces of knowledge and affect production that are created within algorithmic culture were the primary focus of our festival concept.

In line with this thinking, we likened the space of the festival to an interface, where human participants could engage with algorithmic frameworks through encounters with techno-cultural artefacts, artworks, games and public discussion. Considering the festival space as a critical interface, it could be seen in the light of descriptions of critical software suggested by Matthew Fuller —as speculative software 'that creates transversal connections between data,

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[129] Simon Sheikh, 'Curating and Research: An Uneasy Alliance', in *Curatorial Challenges: Interdisciplinary Perspectives on Contemporary Curating*, edited by Malene Vest Hansen, Anne Folke Henningsen, Anne Gregersen (Routledge, 2019), p. 102.

machines, and networks'.[130] The 'enormous spread of economies, systems of representation, of distribution, hiding, showing, and influence as they mesh with other systems of circulation, of life, ecology, resources'[131] can be mapped with the help of the statistical abstractions of the lived processes, 'blips', behind which the real politics are located. Following the transversal computational logics built around (and continuously building) such blips means exploring the superstructuring qualities of algorithms—processes that cannot be regarded as solely computational or solely human precisely because of the enmeshing of lived experience and technical artefacts in them. For this reason, for the festival we also commissioned projects that explored that 'enmeshing' in different ways. These included the all-female collective Keiken's lecture-performance, which, by mixing various modes of speech, from millennial social media slang to academic diction, bypassed the interpretative structures of these modes; a live-action role play (LARP) commissioned from the Omsk Social Club that created virtual alliances among the visitors of the festival; and a geolocation-based resource-trading game by the Patternist collective that was adapted for the urban space of Utrecht and created further possibilities for the visitors to explore the infrastructural space.

The reason for engaging the festival concept here is, therefore, that it presents the possibility of looking at the processes of algorithmic superstructur*ing* (now used exclusively as a verb) as transversal lines connecting procedurality to the ideas of labour, design, political aesthetics of media art, visibility and algorithmic autonomy within infrastructures—all of which extend and question the previous investigations of procedurality. The question of how algorithmic autonomy operates within structures of control, and if it can be seen as a tactic of resistance, or artistic appropriation, becomes central. In the course of the festival and its many public discussions and conversations with artists, it seemed that there was a particular ambiguity where artistic fascination with the inhuman nature of algorithmic reasoning intermingled with the inhumanity of rationality (and autonomy) clearly seen in the proprietary structures of algorithmic governance. These two kinds of inhumanity seemed to

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[130] Matthew Fuller, *Behind the Blip,* p. 30.

[131] Ibid.

be at times confused, equated, or intentionally interchanged. In this section I discuss autonomy and inhumanity as connected but different concepts.

The *superstructuring* in algorithmic superstructuring takes on a different meaning from that in the original Marxist debate about determining base and determined superstructure. In the transition, as Raymond Williams puts it, 'from Marx to Marxism', the economic base has been often interpreted as determining the political and legal (later also ideological and cultural) superstructure.[132] The strict economically reductionist approach was already criticised by Engels in a letter to Joseph Bloch in 1890,[133] and many theorists argued for a more nuanced reading of the interrelation of base and superstructure. Williams in his insightful analysis suggests that instead of a rigid, static understanding of base and superstructure, there needs to be a 'more active idea of a field of mutually if also unevenly determining forces'.[134] Alex Callinicos suggests that the forces and relations of production merely set limits to the "superstructure" rather than determine it.[135]

Similarly, the use of superstructuring in this chapter is not aimed at representing algorithms as a rigid superstructure, but rather at investigating them as enmeshed and dynamic processes, and discovering their potential affective and cognitive agency in governing structures, as well as the resulting aesthetic configurations. This needs to be seen in the light of a set of amendments to base and superstructure, suggested by Raymonds:

> We have to revalue 'determination' towards the setting of limits and the exertion of pressure, and away from a predicted, prefigured and controlled content. We have to revalue 'superstructure' towards a related range of cultural practices, and away from a reflected, reproduced or specifically dependent content. And, crucially, we have to revalue 'the base' away from the notion of a fixed economic or technological

[132] Raymond Williams, 'Base and Superstructure in Marxist Cultural Theory', *New Left Review*, I/82, November-December 1973: 3–16.

[133] Karl Marx and Frederick Engels, *Selected Correspondence* (Moscow: Foreign Languages Publishing House, 1956), p. 498.

[134] Raymond Williams, *Problems in Materialism and Culture: Selected Essays* (London: Verso Editions and NLB, 1980), pp. 36–37.

[135] Alex Callinicos, *The Revolutionary Ideas of Karl Marx* (London and Sydney: Bookmarks Publications, 1983), p. 97.

abstraction, and towards the specific activities of men in real social and economic relationships, containing fundamental contradictions and variations and therefore always in a state of dynamic process.[136]

In the current context, therefore, 'base' can be described as economic motivations of those who produce algorithmic models, services and scripts, and 'algorithmic superstructuring' - as a complex techno-cultural process of procedural remediation[137] of lived practices and experiences through algorithms, in which the differences, relations, borders and limits of the human and non-human participants are renegotiated. Remediation here is meant in the light of Sarah Kember and Joanna Zylinska's critique of Jay David Bolter and Richard Grusin's treatment of remediation as human-centric. Instead, they suggest looking at it, in line with new materialist suggestions, as a space of renegotiating the ideas of singular human agency: 'It is not simply the case that "we"—that is, autonomously existing humans—live in a complex technological environment that we can manage, control, and use. Rather, we are—physically and hence ontologically—part of that technological environment, and it makes no more sense to talk of us using it, than it does of it using us'.[138]

Theorists of digital culture have often had recourse to Rancière's formulation of the distribution of the sensible to describe the regulatory function of computational processes in the acts of concealing and revealing.[139] In this sense algorithms, software, protocols and interfaces can be seen as politico-aesthetic regulators, in Rancière's sense of such phenomena serving the function of 'delimitation of spaces and times, of the visible and the invisible, of speech and noise, that simultaneously determines the place and the stakes of politics as a form of experience'.[140] Where the distribution of the sensible 'reveals who can have a share in what is common to the community based on

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[136] Raymond Williams, 'Base and Superstructure', p. 6.

[137] See Sarah Kember and Joanna Zylinska, *Life After New Media: Mediation as a Vital Process* (MIT Press, 2012); David Bolter and Richard Grusin, *Remediation: Understanding New Media* (MIT Press, 2000).

[138] Kember and Zylinska, *Life After New Media,* p. 13.

[139] Hito Steyerl, 'Proxy Politics: Signal and Noise', *E-Flux* 60 December (2014)*;* Michael Dieter, 'The Virtues of Critical Technical Practice', *Differences* 25.1 (2014), p. 222.

[140] Jacques Rancière, *The Politics of Aesthetics* (Bloomsbury Academic, 2018 [2003]), p. 8.

what they do and on the time and space in which this activity is performed',[141] algorithmic superstructuring also establishes modes of being, sensing and acting.

In Rancière's account, the scope of the 'aesthetic' is not confined to questions such as the status of the art object, but rather pertains to the general field of life and its sensible forms and practices. Seen in this light, aesthetics under algorithmic governance refers to the visible and sensible aspects of cognitive production and movement of affect. As Michael Dieter notes, 'the alteration of sense and perception in CTP [critical technical practice] speaks to the classic meaning of *aisthesis*, but now explicitly defined by sociotechnical events',[142] where *aisthesis* is meant as perception through the senses. In this sense Rancière's argument for the distribution of the sensible directly aligns with the vectoral character of algorithmic governance. Algorithms produce meaningful and affective aspects of life, often guided by the vectors of algorithmic governance. As algorithmic infrastructures underlie the conditions for working, learning, consuming and creating, algorithmic *superstructuring* re-distributes the sensible aspects through its interfaces, analytical modes and choices.

Furthermore, it also suggests a different role for the critical function of art. Traditionally, Rancière notes, it aimed 'to build awareness of the mechanisms of domination to turn the spectator into a conscious agent of world transformation'.[143] Instead, he proposes an aesthetic regime of art. As Suhail Malik and Andrea Phillips summarise, Rancière's aesthetics-art

> shifts the focus of an analysis of art's politics away from its internal or socially-driven claims towards its structural capacity to *instantiate* a politics, effecting a different relation with the spectator of art than historical models of critical art. The free play between *poiesis* and *aisthesis* in aesthetics-art sustains a 'tension' between, on the one hand, a logic that maintains the separation of art from other kinds of sensory experience—all the more to have political effectivity through its autonomy from the domination of life by capitalism and so on—and, on

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[141] Jacques Rancière, *The Politics of Aesthetics*, p. 8.

[142] Michael Dieter, 'The Virtues of Critical Technical Practice', p. 220.

[143] Jacques Rancière, *Aesthetics and Its Discontents* (Polity, 2009), p.45.

the other hand, a logic that pushes art towards 'life' in which it becomes fully integrated as an effective and direct form of activity.[144]

If one applies Rancière's call for aesthetics to serve 'the invention of the sensible forms of the life to come',[145] the ethical task of the media artist seems to be located precisely in uncovering and re-inventing forms of experience produced by technical media. Procedural film in this sense is just one of such forms.

The key capacity of algorithmic superstructuring to circumvent modern modes of organisation and install its own logic can be seen as an ability to affect the very conditions of knowledge production. Where the value chain and information distribution are controlled, the communication space is also reorganised accordingly. Tarleton Gillespie argues that the algorithm has become 'a key logic governing the flows of information'.[146] Algorithmic superstructuring has to be seen as a materialist reorganisation of economic or other structures that also affects meaning itself. While interfaces participate in the distribution of the sensible in the most direct way by offering and limiting choices of action of the user, it is the invisible algorithmic processes and power formations that affect the conditions of meaning-making. It is in this sense that Ganaele Langlois argues for the shift towards understanding meaning not only as a human process, but as 'one that is increasingly dependent on media technologies'.[147] In her investigation of social media algorithms, she finds that software contributes to meaning-making as 'a semiotechnology in charge of producing both meaning and the conditions for the experience of meaningfulness'.[148]

By aligning the investigation of procedural films with 'algorithmic superstructuring, new understandings of algorithmic autonomy come to light. While previously the temporality of algorithms was considered within the

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[144] Suhail Malik and Andrea Phillips, 'The Wrong of Contemporary Art: Aesthetics and Political Indeterminacy' in Reading Ranciere: Critical Dissensus, edited by Paul Bowman and Richard Stamp (pp. 111–129) (Continuum Books, 2011), p. 113. Also see Jacques Rancière, *Aesthetics and Its Discontents*, p. 46.

[145] Jacques Rancière, *The Politics of Aesthetics*, p. 24.

[146] Gillespie, 'The Relevance of Algorithms', p. 167.

[147] Ganaele Langlois, *Meaning in the Age of Social Media* (Palgrave Macmillan, 2014), p. 5.

[148] Ibid., p. 19.

localised encounter of a viewer with an artwork, in algorithmic superstructuring temporality presents itself as a necessary part of enacting control through algorithms. The distribution of the sensible involves an active algorithmic renegotiation of pre-cognitive aspects of 'sensible', meaning those that occur either outside the scale of human cognition and senses (such as high-frequency trading), or pass below the threshold of user's media literacy (such as interface elements). Parisi suggests, in the essay 'Reprogramming Decisionism', that with the incursion of algorithmic automation into decision-making processes, it becomes possible to speak of a kind of 'technological decisionism, which values making a clear decision quickly more than it does making the correct one'.[149] She posits algorithmic processing, following N. Katherine Hayles, as a 'nonconscious form of cognition, solving complex problems without using formal languages or deductive inference',[150] as well as working at scales and speeds inaccessible to human perception.

The 'autonomy' within algorithmic superstructuring, therefore, can be attributed to the technical impossibility of tracing the entirety of micro-decisions that went into building a specific algorithmic model—similar to the discussion of autonomy in the discussion of affective space-time in procedural films. However, and more importantly, it must be considered from the point of virtual opacity of such models as they enter the areas of decision-making, often staying within the proprietary copyright of their owners. While there has been a noticeable increase in recent initiatives for ethical guidelines and legislation surrounding the use of datasets,[151] in the current moment such models are freely built into the processes of analysing experience and channelling affect.

The participation of 'proprietary' inhumanity in the algorithmic distribution of the sensible can be clearly seen in how it is organised around the axis of the commodification of experience. The process of data commodification runs

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[149] Luciana Parisi, 'Reprogramming Decisionism', *E-Flux*, no. 85 (October 2017), para. 2.

[150] Ibid., section 'Learning to Think', para. 5.

[151] For example, the Institute for Ethical AI & Machine Learning in UK (opened in 2018), the Ethics and Governance of Artificial Intelligence Initiative launched by MIT Media Lab and the Harvard Berkman-Klein Center in 2018, and the European AI Alliance (2019). This is not to exclude earlier work accomplished in this direction, or a wide range of open systems that are community-run (such as Women in AI or Platform Cooperativism Consortium), but to underline a recent surge in the wider acknowledgement of necessity for ethical regulation of algorithmic processing.

parallel to the commodification of affect and the design of user experience. Following the vector of algorithmic superstructuring from the initial economic motivation to the design and implementation of algorithms, it becomes possible to see how the design of user experience perpetuates the automation of various cultural operations through software abstraction. This can be seen in platforms such as Netflix, as well as other services using recommendation algorithms. In this sense, the dangerous aspect of algorithmic superstructuring lies not only in its pervasiveness, but in the loop of commodification of experience and affect that it enables; a procedural automation of cultural choices. Where data collection participates in infinitely updating feedback loops, it guarantees continuous commodification: as data analysis turns human choices, experience and attention into rationalised models, these models, in their turn, create more and more refined and precise definitions of what kind of experience is marketable. As Brian Massumi notes, 'the ability of affect to produce an economic effect more swiftly and surely than economics itself means that affect is a real condition, an intrinsic variable of the late capitalist system, as infrastructural as a factory.[152] The affective capacities of algorithmic procedures are therefore embedded in the software regime of abstractions.

The potential for algorithmic inhumanity remains, however, that it can also become an exit towards other models of distribution of the sensible. In 'The Incomputable and Instrumental Possibility', Antonia Majaca and Parisi draw on Judith Butler's writing to suggest a possibility of feminist re-claiming of machinic instrumentality.[153] They suggest that machine logic, primarily seen as a part of a 'paranoid techno-industrial apparatus' relying on collecting and flattening data as predictive models, could be also reclaimed on its own terms, as an alien logic that embraces its own instrumentality and repurposes it for its own ends, potentially disrupting the white-male concept of humanness as a whole.[154] While this suggestion is speculative in nature, it offers a way to acknowledge that the 'proprietary' inhumanity of algorithmic superstructuring does not exclude the possibilities for other kinds of inhumanity, built in different ways and

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[152] Brian Massumi, *Parables for the Virtual*, p. 45.

[153] Antonia Majaca and Luciana Parisi, 'The Incomputable and Instrumental Possibility', *E-Flux* 77, Nov. (2016).

[154] Ibid., para. 7.

experienced in different ways. The inhuman scales of technical infrastructures introduce affective and cognitive renegotiation of human experience.

Alternative Superstructuring

Could the artistic appropriation and remaking of the proprietary algorithmic models constitute alternative forms of algorithmic superstructuring? In order to look at algorithmic superstructuring through the inquiry of artistic practice, I will draw on several projects from the festival, selected for exhibition by Yasemin Keskintepe. These projects, in particular, engage with the question of procedural algorithmic techniques, deployed in order to question existing techno-cultural configurations. The work of Constant Dullaart, *The European Classes, Euronet* (2017), developed in collaboration with Adam Harvey, uses convolutional neural networks that recognise objects within images in order to create an image dataset. The artists retrained the networks on 'European artefacts' in order to investigate how European cultural output can be presented in a dataset, and how the network can classify something as European.[155] The 152 classes for image recognition ranged from common – 'guitar', 'beret' – to more specific: 'Hagelslag', 'Chancellor Angela Merkel'. The neural networks, essentially tasked with the question of European identity, are solving the technical question of semantic segmentation – what parts of the images are recognised as a particular descriptor, and what images can be reconstructed from these correlational links. Highlighting how algorithmic automation can enter the areas that have been considered a cultural domain, this work also reconstructs the capacity of machine learning to produce meaning, referring to the cases in which machine learning techniques, when applied to existing datasets, produced sample bias, in that they uncovered pre-existing bias in the set itself.

Anna Ridler's video *Mosaic Virus* (2018) was developed during the EMAP residency at the festival. It draws a parallel between 'Tulip Mania', the economic bubble that witnessed an extraordinary inflation of prices for tulip bulbs in the Netherlands and Europe in the 1630s, and the current moment of crypto-currencies. The video continuously generates, through a neural network, an

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[155] See description and documentation on the work's website, ImageNet.xyz.

image of a tulip, mimicking the prototypical Dutch still life. The number of stripes on the tulip, which in the seventeenth century would have signified its value, is in Ridler's work linked to the fluctuation of the value of bitcoin. One could suggest that *Mosaic Virus* does not so much provide commentary on crypto-currencies as ironically re-position media art within the discussion of value formation of the more traditional forms of art.

Both of these works can be interpreted in the tradition of 'blackboxing' as revealing of the algorithmic thinking behind the machine and 'highlighting' its inhumanity. They also, however, have the capacity to underline processes of labour and alienation hidden behind the procedures of machine learning. While the common perception of neural networks is still largely perceived as 'computers doing all the work', there is a significant amount of human labour involved in the annotation of images. In the case of Ridler it was made especially visible since the ten thousand photographs in the dataset were taken by the artist herself, categorised manually and exhibited as additional work, *Myriad (Tulips)*. In Dullaart's work, some of the classes could be defined using semi-automatic image scrapers, and for some of the classes the bounding boxes that define objects had to be manually drawn, using outsourced and in-house labour. The question of making this labour visible becomes an artistic choice alongside others.

Artist Sebastian Schmieg, whose work *Segmentation.Network* (2016–2018) highlights exactly this kind of manual labour, speaks of 'humans as software extensions' in his discussion of the outsourcing platforms such as Fiverr or Amazon's Mechanical Turk.[156] In the quick-gig economy it is still possible to see how 'bodies and minds that are algorithmically managed [are] under the permanent pressure of constant availability, efficiency and perpetual self-optimization'.[157] However, as Schmieg points out, citing a 2015 court case in which Gabriela Rojas-Lozano sued Google for alleged exploitation of users by micro-tasking them with Google reCAPTCHA, the labour can be fragmented to the point where its very definition as labour becomes contestable.[158] In the work

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[156] Sebastian Schmieg, 'Humans as Software Extensions', *Sebastian Schmieg*, 31 January 2018.

[157] Ibid.

[158] Ibid.

of Anna Ridler, where the labour process is shown as an artwork in its own right, the alienation of labour that machine learning facilitates runs parallel to alienation of the subject, seemingly excluded from the imaginary financial loop that the tulips constitute. Media artworks that seem to operate on their own, not needing any human input beyond the initial set-up, create a perception of agency by default. Here, chance and autonomous operation emerge as a more familiar reading of independency of algorithms. The potential for accidents is created and determined at the moment of the invention of a particular technology, as Virilio reminds us.[159] But as accidents, according to glitch artist Rosa Menkman, can create 'a new protocol after shattering an earlier one',[160] they inevitably return even such limited agency back to the realm of instrumentality.

Artistic approaches to destroying the opacity of algorithmic superstructuring need to navigate both the economic relations and technical conditions behind automated processes, and the way in which instrumentality translates into images. As Ian Bogost suggests, by making processes visible, procedures open up a way to act on them, acting as enabling rather than limiting forces.[161] Procedural mediation in the works discussed in this section operates within datasets, which represent a particularly interesting entanglement of visibility and concealment. On the one hand, if the 'poor' image, in Hito Steyerl's insightful suggestion, becomes about 'its own real conditions of existence',[162] the images used for datasets in machine learning seem to be the poorest of all, losing its status as an image in the process of technical abstraction. On the other hand, the images that are contained in the datasets needed to train the neural networks result in the creation of 'image-models',[163] sets of operational relations that lead to the creation of figurative, representational images. And these images can become 'rich' in other ways, when impossible sofas, non-existing

[159] Paul Virilio, *The Original Accident* (Cambridge: Polity Press, 2007).

[160] Rosa Menkman, 'Glitch Studies Manifesto', in *Video Vortex Reader II: Moving Images beyond YouTube*, edited by Geert Lovink and Rachel Somers Miles (pp. 336–47) (Institute of Network Cultures, 2011), p. 341.

[161] Bogost, *Persuasive Games: The Expressive Power of Videogames* (MIT Press, 2007)*,* pp. 3–11.

[162] Hito Steyerl, 'In Defense of the Poor Image', *E-Flux Journal* 10, no. 11 (2009).

[163] Luciana Parisi, 'Xeno-Patterning: Predictive Intuition and Automated Imagination', *Angelaki* 24, no. 1 (2 January 2019): 81–97.

people and paintings generated by neural networks are put in the context of art market and auctions.[164]

The technical processes are therefore entangled in the problem of intelligibility, of the dialectic of signal and noise. In Shannon and Weaver's theory of information a signal or a message is always seen as 'one *selected from a set* of possible messages'.[165] In other words, the message is seen in its materialist capacity to be intelligible, as a message distinguished from the surrounding noice. While technical procedures can introduce randomness, they can also serve to structure 'noise' into signals. It does not only make something intelligible, but also selects what exactly is made intelligible and what is omitted, making the process of 'figuration' out of data a political gesture.

As Rancière underlines, art by definition designates itself as 'art', meant for human senses. The discussion of political aesthetics therefore should include not only the motivation of the artist to make something visible, but to the viewer's capacity to discern the technical operations of visibility and concealment. In other words, if we see self-reflection as a part of procedural mediation, it also becomes necessary to consider the idea of procedures in the light of the critical capacity of the subject to recognise the very presence and operation of procedures.

Persistence of Vision

Negotiation of the visibility and opacity, as well as the concealment, of labour behind the algorithmic practices also returns us to the idea of spectatorship that was previously discussed in relation to the traditional models of film viewing. In an encounter with a technical work of art, technical literacy becomes another parameter of intelligibility of artwork. Rancière's critique of the passive spectator becomes pertinent here. Rather than seeing the 'performance' of art as an act of instructing the viewer, of imparting knowledge, and therefore constructing

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[164] As evidenced by some of the auction sales of the portraits and landscapes generated by generative adversarial networks. See Vincent, 'A Never-Ending Stream of AI Art Goes up for Auction', *The Verge*, 5 March 2019; Christie's, 'Is Artificial Intelligence Set to Become Art's Next Medium?' Christie's website, 12 December 2018.

[165] Claude E. Shannon, 'A Mathematical Theory of Communication', reprinted with corrections from *The Bell System Technical Journal,* 27 (1948): 379–423, 623–656, p. 379.

spectatorship as a hierarchical situation, he suggests the idea of 'emancipated spectator'.[166] He outlines,

> Emancipation begins when we challenge the opposition between viewing and acting; when we understand that the self-evident facts that structure the relations between saying, seeing and doing themselves belong to the structure of domination and subjection. It begins when we understand that viewing is also an action that confirms or transforms this distribution of positions. The spectator also acts, like the pupil or scholar. She observes, selects, compares, interprets.[167]

Viewing the act of spectatorship as an active engagement with the work, and not simply a passive process, opens up the political agency of the spectators. As Rancière underlines, it also opens up the capacity for the artwork to be perceived freely: 'there is the distance between artist and spectator, but there is also the distance inherent in the performance itself, insofar as it subsists, as a spectacle, an autonomous thing'.[168] Therefore, even within the distribution of the sensible, the spectator still acts as a participant and not as a passive receiver. Furthermore, it leaves it to the artist to 'produce a form of consciousness, an intensity of feeling, an energy for action', instead of performing critique straightforwardly.[169]

However, where one speaks of critical media art, the question of perceiving the work immediately opens a question of technical literacy. *The Critical Engineering Manifesto* by Julian Oliver, Gordan Savičić and Danja Vasiliev articulates the triangulation between the technical function of the work, the user experience (as potentially obscuring the entirety of the function), and its critical perception by the engineer. The Critical Engineer 'considers any technology depended upon to be both a challenge and a threat', and also 'recognises that each work of engineering engineers its user, proportional to that user's dependency upon it'; at the same time, the Critical Engineer 'raises awareness that with each technological advance our techno-political literacy is challenged',

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[166] Jacques Rancière, *The Emancipated Spectator* (Verso, 2009).

[167] Ibid., p. 13.

[168] Ibid., p. 14.

[169] Ibid., p. 14.

and 'deconstructs and incites suspicion of rich user experiences'.[170] Following Rancière, we can still see the operations of raising awareness and of deconstructing black box configurations a part of a possible suspicion towards the processes of algorithmic superstructuring.

However, addressing the complex space of algorithmic superstructuring still requires particular attention to what role various visuals, mythologies, fictions and imaginaries play in the construction of technology. For example, James Bridle's *New Aesthetic*, which comprises a diverse collection of images, blog posts, lectures and artworks, addresses various kinds of images that arise from the incursion of the digital into the span of human perception—from 3D models and glitched Google Maps to documentation of machine vision techniques.[171] This view incurred critique for its umbrella-like character and the conflation of many different technologies and contexts under what seemed like an obsession with surface-level aesthetics.[172] Bridle's response of keeping the *New Aesthetic* as a diverse collection of items, as 'an attempt to "write" critically about the network in the vernacular of the network itself: in a tumblr, in blog posts, in YouTube videos of lectures',[173] only highlights the problem of separating the audience into those who possess technical literacy and those who do not.

I would like to see the spectator's emancipation and the technical opacity of media art as an entanglement of forces. Algorithmic superstructuring relies on vision as perpetuating engine. The aesthetic regime of algorithmic governance and its participation in the distribution of the sensible is actualised by the interfaces. With their help, the inhumanity of algorithmic superstructuring can instantly scale down back towards instrumentality in order to become invisible—or, more precisely, to hide behind the visibility of the interface. It is also the 'persistence of visual knowledge'[174] that Wendy Chun suggests is the main

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[170] Julian Oliver, Gordan Savičić and Danja Vasiliev, 'The Critical Engineering Manifesto', *Critical Engineering*, 2011.

[171] See Tumblr page, *The New Aesthetic*, https://new-aesthetic.tumblr.com/.

[172] Bruce Sterling, 'An Essay on the New Aesthetic', *Wired*, 2 April 2012.

[173] James Bridle, 'The New Aesthetic and Its Politics', *The Blog of James Bridle: Art, Literature, and the Network, since 2006* (blog), 12 June 2013.

[174] Wendy Hui Kyong Chun, *Control and Freedom: Power and Paranoia in the Age of Fiber Optics* (MIT Press, 2005), p. 19; also see 'On Software, or the Persistence of Visual Knowledge', *Grey Room* 18 (January 2005): 26–51.

engine enabling power dynamics in software, and which she later analyses as 'invisibly visible' logic of naturalisation of interfaces.[175] While she compares software to ideology, she also underlines that it allows critical thinking, therefore putting emphasis on the encounter itself, rather than on the subject as completely constructed. As she puts it, 'software and ideology fit each other perfectly because both try to map the material effects of the immaterial and to posit the immaterial through visible cues'.[176] She remarks on the formal similarity between software and various definitions of ideology, from the 'false consciousness' such as that represented in the film *Matrix*, to the Althusserian idea of ideology as a *representation* of the lived social relation. Chun also highlights the fetishistic logic of the graphic interface: 'users know very well that their folders and desktops are not really folders and desktops, but they treat them as if they were—by referring to them as folders and as desktops'.[177] As there is a process of making visible, 'through this process the immaterial emerges as a commodity, as something in its own right'.[178] At the same time, Chun points out that precisely because of the dual relation of concealing and making visible, software cannot be seen as completely analogous to ideology. As software reveals as much as it conceals, given a critical eye, it acts both as ideology and critique of ideology. The interplay of figurative and operational images makes software 'algorithmically affective in ways that ideology never was'.[179] Alexander Galloway similarly highlights the central paradox of the ideological reading of software as 'technical transcoding without figuration that nevertheless coexists with an exceedingly high level of ideological fetishism and misrecognition'.[180]

Scaling between the human and the algorithmic, deciding what stays visible and what does not lies at the heart of algorithmic superstructuring and its re-distribution of the sensible. Infrastructural affect works pre-cognitively, at the

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[175] Wendy Hui Kyong Chun, *Programmed Visions: Software and Memory* (MIT Press, 2011), p. 10.

[176] Chun, 'On Software', p. 44.

[177] Ibid., p. 43.

[178] Ibid., p. 44.

[179] Alexander R. Galloway, 'Language Wants to Be Overlooked: On Software and Ideology', *Journal of Visual Culture* 5, no. 3 (2006): 315–331, p. 325.

[180] Ibid., p. 319.

level of computational temporalities, but also consolidates at the visible level of interfaces as various kinds of images. These images include symbolic navigation and other interface elements that simultaneously *make possible* and *limit* the user's interaction, that guide, prompt, attract and distract. Algorithmic superstructuring presupposes that different kinds of images co-exist in the same operation, both as figurations subject to commodity fetishism and as participants in software and algorithmic abstractions. At the interface level, the vectors of axiomatisation are always actualised both as data structures, and as aesthetic operations interweaved with code. As Benjamin Bratton underlines in his theoretisation of algorithmic governance as *The Stack*, the platforms evolve in relation to their aesthetic formalisation:

> Platforms are infrastructural but rely heavily on aesthetic expression and calibration. […] Even as the majority of the information they mediate may be machine-to-machine communication (as, for example, today's Internet), the specific evolution of any one platform, in the ecological niche between the human and inhuman, depends on how it frames the world for those who use it.[181]

The key focus of the aesthetic regime of algorithmic superstructuring therefore lies in the interpenetration of algorithmic abstractions and aesthetic codes used to represent these relations to the human.

Capturing and understanding instrumentality in order to open the technological black box remains a difficult task when one is confronted with persistence of vision. Algorithmic superstructuring is characterised by its scalability, by its ability to cut across contexts; it is stimulated towards constant expansion by capitalist logic, has to rely on ever-changing data and is unable to stabilise. Along with the algorithmic superstructuring entering individuals' lives, the representations and abstractions that lie at the core of software operations enter their very bodies and become internalised as modes of perception and habits, furthering the opacity of the processes that actually take place (e.g. data collection). This becomes particularly important when we consider the transnational and extra-legal character of capitalist relations, and the globalised cultural economies that automate logic of consumption. While a recent development such as EU General Data Protection Regulation (GDPR)

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[181] Benjamin Bratton, *The Stack: On Software and Sovereignty* (MIT Press, 2016), p. 46.

implements the 'right to explanation' of the algorithmic blackbox, it does not legally compel the companies to disclose the technical details fully.[182] Even more important is the capacity of algorithmic superstructuring to set new protocols and logics, altering the *conditions* of knowledge production. Algorithmic superstructuring operates in a grey zone in terms of both distribution of power relations and human experience.

Locating and addressing the specific spaces where the entanglement of design, labour and aesthetic is visible, and where it becomes possible to reclaim the instrumentality for other ends, is the task that in the field of media practices has often been delegated to artists, hackers, activists and engineers. In this regard, a model of planetary computation such as Bratton's *The Stack* that envisages the algorithmic abstractions as a 'design brief' of computational sovereignty, can be productive for artistic approaches in that it identifies the layers where such operations become more defined.[183] Where algorithmically mediated processes of distribution of the sensible take place, they also produce an aesthetic renegotiation of agency, alienness and humanness. In this regard the proprietary orientation of algorithmic superstructuring is always already present, but can be reappropriated as alternative superstructuring.

The possibility for alternative superstructuring is precisely the reason to bring the discussion of the distribution of the sensible, of political aesthetics, into the discussion of procedural films. Algorithmic superstructuring becomes apparent in the aesthetic and epistemic effects of algorithmic media. The affective space-time of procedural films is also conditioned by the ways in which the logic of design built in the platforms, software and algorithms aids or disrupts the pervasive processes of commodification and capture of attention and affect. Procedural films can also become levers for disrupting this logic. Capitalist algorithmic systems of circulating, analysing and commodifying affect still exist within a gravitational pull towards the centrality of human vision. The call for posthumanist models of perception, therefore, can constitute an artistic practice

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[182] See Cynthia Rudin, 'Stop explaining black box machine learning models for high stakes decisions and use interpretable models instead', *Nature Machine Intelligence* 1 (2019): 206–215; Brian Casey, Ashkan Farhangi and Roland Vogl, 'Rethinking Explainable Machines: The GDPR's Right to Explanation Debate and the Rise of Algorithmic Audits in Enterprise', *Berkeley Technology Law Journal* 34.1 (2019): 145-189.

[183] Bratton, *The Stack*, p. 65.

that aims to disengage with the existing modes, and to construct alternative ethical and political realities. In the two following chapters I will investigate the spaces of screensaver and game engine as case studies that open up the complex entanglements of filmic space-time, labour and design.

In this chapter I have addressed the idea of algorithmic superstructuring and questions of political aesthetics, labour, design and critical research practice. As I will show in the following chapters, procedural films in my practice operate less in the sense of the critical intervention through code and more as spaces of investigation. In the two case studies—screensaver and game engine—the liveness and procedurality are explored through the two distinct affective space-times that are defined by their apparatuses. The fourth chapter, dedicated to screensavers, takes on the materialist temporalities of idle and productive time in regards to the screensaver and situates my work *Chronic Film* and its two iterations as procedural film and as a lecture-performance. The fifth chapter explores the idea of topological gamespace, emergence and liveness of non-human agents such as bots and non-player character in order to conceptualise procedural films made with game engine, drawing on my work *Non-Player Character*. In the following chapters I will specifically concentrate on how the apparatus of each case study contributes to the affective space-times in my artistic works, and what kind of questions such works open up for film and media studies.

Chapter 4

Screensaver
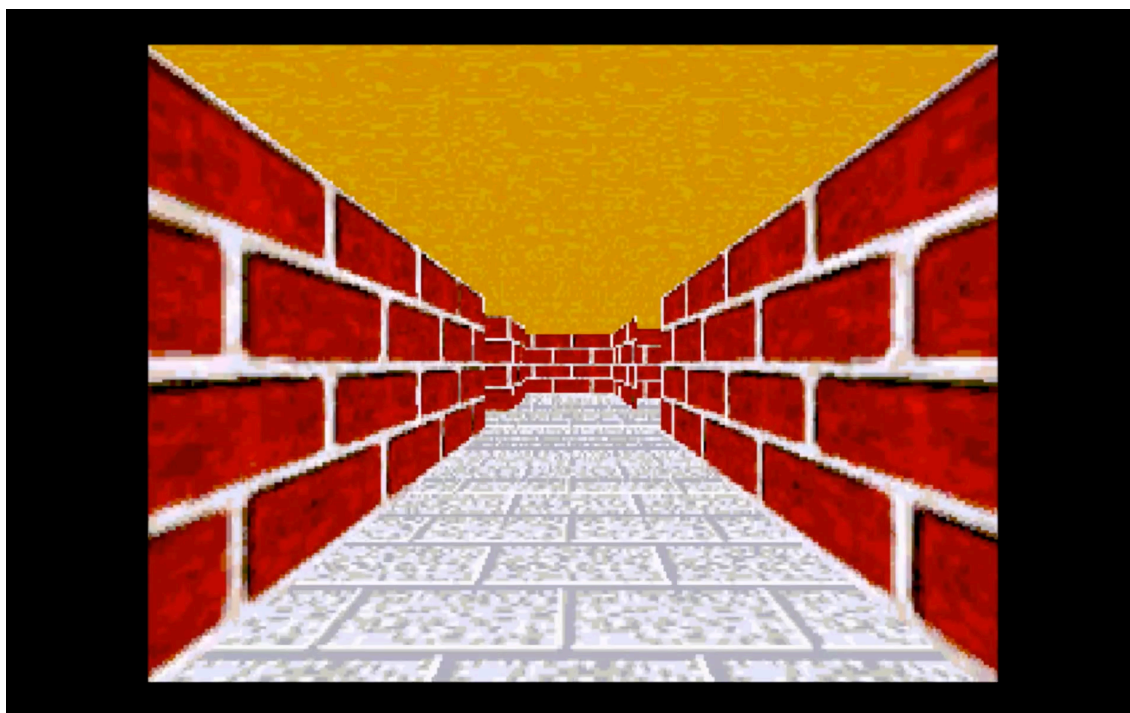
Image 1. Still from lecture-performance *Chronic Film* (2018).

This chapter introduces my investigation of screensavers as original procedural films. It explores their aesthetico-political operation, following the discussion from the previous chapter and adopting Rancière's approach to technical media artefacts as participants in the 'distribution of the sensible'. At the first glance the screensaver is a digital anachronism, a strangely persisting feature that still comes included with the current versions of the two most popular operating systems, Apple's OS X and Microsoft Windows, even though it has been technically redundant for more than two decades.[184] Its relevance to the study of moving image does not seem to amount to much, as for the majority of its existence the screensaver has been a mundane object, something like the photograph that comes with a frame. The screensaver is generally perceived as a decorative feature, aimed at *personalisation* of the personal computer. However, I argue that, seen beyond their decorative function, screensavers can

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[184] One could also add here that the screensaver's secondary function as a security remains relevant, but belongs to a different discussion.

be regarded as as accidental artworks, generative moving images that run as a seamless loop in the gaps of the computer's inactivity. In this sense, as I show later, the patterns of looped filmic space-time that they create have to be seen in the context of the patterns of labour and leisure and affective space-times of personal computing.

The screensaver was also the first thing that pushed me towards making the body of work grouped under *Chronic Film.*[185] Born in the country that was still called the USSR just before its dissolution, I encountered computers (and screensavers) relatively early. In informatics class at school, having successfully programmed the day's task in QBASIC, I would spend the rest of the class modifying Windows' screensaver, 3D Maze (Image 1), which, with its incessant movement and sharp camera turns, was a source of endless fascination—at least until *Prince of Persia* was installed. When my research on generative moving image prompted me to re-explore screensavers at a much later stage, the idea was already infected with a kind of anachronistic displacement that came from remembering my eight-year-old self, sitting in the living room of a different apartment, looking at a monitor much bulkier than my current one.

Watching a screensaver, back then and now, is never separated from the anthropomorphic significations. That the computer is *waiting,* or in *sleep mode,* is clear from the scarce and unimaginative looped dreams on the screen, akin to little sounds of snoring or breathing: showing that the machine is still operative*,* just asleep. The screensaver does not have the same kind of immersion that Walter Benjamin saw in the cinema, but it does have a kind of immersive intimacy that could only be encountered in a dark room, alone, facing the computer screen. The idea of a viewer as someone who does not just plug her perception into the machine of film consumption, but has to face the machine and face her own time passing in front of it, was appealing.

Chronic Film, the work underlying this chapter's argument, started as an attempt to re-create the outside-of-time feeling that screensavers exhibit. Technically, *Chronic Film* is an algorithm that plays out all possible images on a screen of a given resolution. Mathematically, it ends up as a continuous playing out of indecipherable noise. The first iteration of work was something like a

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[185] See Practice Overview and Documentation section of the current thesis, p. 158–163.

structural filmic monument to time; not infinite, but an immensely long universal screensaver that it is not possible to consume as a film. In the process of making it, as versions proliferated and various questions entered the work, *Chronic Film* also became a lecture-performance. For this, I took the noise function as a starting point for a new relationship between the viewer and the screen, and as a promise of meditation, and made the algorithm into a lecture-performance that laid out the human-noise relationship at the sites of nostalgia and divination. I will return to the discussion of this in the final section.

In the current chapter I aim to look at the screensaver as a software moving image artefact that opens up the questions of labour and the techno-materialist design of time. First of all, the affective space-time of the screensaver is very different from the traditional temple of cinema theatre. It is found at the office, the space of efficiency and timed breaks. Unimaginable outside of the shifting of paradigms from shared to personal computing in the late 1980s and early 1990s, the screensaver also accompanies the shifting of the space of labour into employees' own homes. With the screen that conveniently goes 'to sleep' when one goes for a break, the cognitive labour does not have to stop. At home, the computer will greet the owner with the same fractal images that can be seen in the office. The screensaver's audience is not a traditional film spectator, but a cognitive worker whose time and attention span is constantly assaulted and regulated by various interfaces.

Second, seen as a marginal form of moving image, the screensaver challenges not only the traditional notion of the viewer, but also the fundamental notions of film: linear temporality, footage and narrative. Instead, terms such as *generative*, *repetition* and *loop* come into the picture. Much like in the works of experimental film and media art, these capacities contribute to the creation of the particular affective space-time, inextricable from the critical discussion of patterns of labour, rest and attention. These lines of inquiry in the chapter are informed by the field of experimental film and artists' moving image, as well as by the analyses of computer culture in the period from 1970s to 2010s.

From Obsolete Materialism to Affective Loops

To anyone who owned a personal computer between the 1980s and 2010s, some of the following tableaux might be familiar: flying toasters; an infinite red brick maze; black space with stars flying past; colourful growing and interlocking pipes; a bright flurry of light travelling the screen; pixelated aquarium fish. In a well-known anecdote from the early 1990s, computer writer Andy Ihnatko joked about turning the older model of the Apple Macintosh into an aquarium as a last upgrade (it was fast becoming obsolete), only to start a trend of creating real 'macquariums' (Image 2). The main goal of making one was to make the waterline invisible, so it would look like 'a really good screensaver'.[186] Like an aquarium, the screensaver creates a window into a space where digital (animal) images move in seamless operation.

Image 2. A planted Macquarium by Ben Wells. Photo by Ben Wells. 2004. CC BY 2.0 License.

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[186] Andy Ihnatko, 'Interview with Tommy Thomas: Andy Ihnatko on Macs, Writing, Innovation, and the Macquarium', *Low End Mac Since 1997*, 22 May 2007.

The screensaver, however, came into existence more as a hardware function of the screen than a decorative animation. In the early 1980s the phosphor coating in computer screens was prone to burn-in when graphics on the screen remained static for a prolonged period of time. Even though it would require hours and days for the image to be etched on the screen, in the case of a static interface (such as a news logo, for example) the burn-in could be produced by slow accumulation over time. The screensaver was created to prevent this condition. The first popular mention of a screensaver dates back to 1983. It was published as a Basic program in the article by John Socha, 'Socha's Toolbox: Save Your Monitor Screen', in *Softalk Magazine* for the IBM Personal Computer.[187] Socha simply called the program *scrnsave.* The original IBM Personal Computer's hardware clock ran at the frequency 18.2 Hz, or at 18.2 ticks per second; the programme instructed the screen to turn off after 3276 ticks, or after three minutes. In a sense, if the screensaver could be considered an image at this point, it was more operational than figurative—part of a procedure, completely free from any demands for representation.

The 1990s witnessed the growing acceptance of the personal computer as a necessary home appliance.[188] The easy installation from a a floppy disk or CD-ROM contributed to establishing technology as a black box and to alienation of the user from the source code. In the 1990s the screensaver was marketed as a ready-to-use, boxed product that offered a playful personalisation for the user's computer. And as the new liquid-crystal display (LCD) screens proved to be less prone to pixel degradation, in the late 1990s and early 2000s the screensaver eventually came to serve a purely decorative function. This, in its turn, conditioned the format: looped, abstract, without clear beginning or end, and largely void of considerations of narrative.

Who is the early computer user, and in what context does the shift from hardware to decorative function take place? The image of a male 'computer geek' takes its roots exactly in the 1980s' adoption of personal computing. According to a 1985 study on computer use and shifts in time allocation

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[187] John Socha, 'Socha's Toolbox: Save Your Monitor Screen', *Softalk Magazine for the IBM Personal Computer*, December 1983, 81–84.

[188] See Capers Jones, 'Chapter 7: 1980 to 1989: The Rise of Personal Computers and Personal Software', in *The Technical and Social History of Software Engineering* (Addison-Wesley, 2014).

patterns, 'the fact that 63 percent of the adopters are engaged in technical professions, are well-educated, and have above average incomes is noteworthy. At present, the home computer is a rather complex product requiring special skills and, possibly, some training'.[189] Unsurprisingly, the study bypassed the question of gender altogether, acknowledging that it only addressed 'the principal user'[190] in the household, not specifying who it was. While early computation had been considered 'women's work' and, as a result, was built by female data scientists and programmers,[191] from the mid-1980s their participation drops.[192] Frink argues that the drop is linked to the emergence of personal computers at the same time, and to the fact that they were marketed as machines for games, toys predominantly for boys.[193] From that point on, the gender imbalance in computation remained consistently skewed towards male coders, scientists and designers. This context is important for the current study in order to clarify the circumstances in which the screensavers were designed and marketed.[194]

As screensavers in the mid-1980s and early 1990s were published in computer magazines, like many other programs, the users of different operating systems could type them out on their own home computers. A do-it-yourself, engineer-like feeling was a part of dealing with the computer at that time, as not only typing errors but also programming errors from the potentially

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[189] Nicholas P. Vitalari, Alladi Venkatesh and Kjell Gronhaug, 'Computing in the Home: Shifts in the Time Allocation Patterns of Households'. *Communications of the ACM* 28, no. 5 (1985): 512–22, p. 520.

[190] Ibid.

[191] Jennifer S. Light, 'When Computers Were Women', *Technology and Culture* 40, no. 3 (1999): 455–83; Brenda Frink, *How Computer Geeks Replaced Computer Girls,* The Clayman Institute for Gender Research at Stanford University report, 2011; Marie Hicks, *Programmed Inequality: How Britain Discarded Women Technologists and Lost Its Edge in Computing* (MIT Press, 2017).

[192] See Steven Henn, 'When Women Stopped Coding', *NPR*, 21 October 2014.

[193] Frink, 'How Computer Geeks Replaced Computer Girls'.

[194] An aspect of the screensaver culture that does not fit in the current investigation but would be of interest to pursue elsewhere is the screensaver's connection to malware. Computer viruses, especially the ones for Windows OS, have been often spread through freeware—software available for free download. Screensavers were popular programs to download because of their small size. At the same time, it made them a convenient method for attacking the computer of the user, who, after downloading a software, would be trapped with a screensaver without any capacity to remove it. Often such screensavers would feature pornographic images and sounds, forcing the use to re-install the operating system completely or update their antivirus.

unpredictable interactions with other programs were frequent. Computers were still a new technology that did not offer a smooth operation straight out of the box. In this spirit, the articles usually contained recommendations for users who wanted to tweak the screensaver, encouraging them to deepen their knowledge of code and their machine.

The September 1989 issue of *ST-Log: The Atari ST Monthly Magazine* offered its readers 'The Ultimate Screensaver', written by Richard Leinecker. It starts with a story somewhat indicative of the enthusiasm of that time:

> As I pose the mouse to run ST Writer, I hear a voice from the kitchen. 'Hey, can you help with the groceries?' Eager to dispel my current computer-addict image, I proceed to the car and bring in the groceries. One thing (submarine sandwich) leads to another (Miller Lite), and it is eight hours later that I return to my ST.
>
> I scream. A dim trash can has appeared in the upper right-hand corner of the ST Writer menu screen as well as the edit screen. I know that some of my prose is lacking, but what is ST Writer trying to tell me? Just this: 'Your monitor now has a trash can permanently burned into it because you left it on for eight hours'.[195]

At the margins of this anecdote one can already notice the early user-programmer in question: his engagement with code, the gender imbalance present in computer culture then (and still persisting now), as well as the time deficiency already affecting their lives. In evocative detail, the illustration to the article features the author on the run, with clock-faces on his shirt (Image 3).

The curious refusal of the screensaver to disappear completely after its functional redundancy shows that it does contribute to a certain kind of affect. Notwithstanding brief mentions in the histories of screens and interfaces, the screensaver as a cultural object is absent from academic discussions, including critical considerations of software or moving image. When it does appear, it is mostly in the industrial discussions on product design, shared computing, or entertainment articles on desktop psychology and personalisation of the interface. However, an undeniable fascination with the screensaver can be seen

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[195] Richard Leinecker, 'The Ultimate Screensaver', *ST-Log: The Atari ST Monthly Magazine*, September 1989, 18-30, p. 18.

BY RICHARD LEINECKER

THE *U*LTI

*a*s I poise the mouse to run *ST Writer*, I hear a voice from the kitchen. "Hey, can you help with the groceries?" Eager to dispel my current computer-addict image, I proceed to the car and bring in the groceries. One thing (submarine sandwich) leads to another (Miller Lite), and it is eight hours later that I return to my ST.

i scream. A dim trash can has appeared in the upper right-hand corner of the *ST Writer* menu screen as well as the edit screen. I know that some of my prose is lacking, but what is *ST Writer* trying to tell me? Just this: "Your monitor now has a trash can permanently burned into it because you left it on for eight hours."

Two precautionary measures would have avoided this disaster. The most obvious, of course, would have been to turn the computer off. The other alternative would have been to install a screen-saver program so that if there was no keyboard or mouse input for a period of time, it would take evasive action, shutting off the screen.

Image 3. 'The Ultimate Screensaver' by Richard Leinecker. *ST-Log: The Atari ST Monthly Magazine.*

in web repositories, emulators and freely circulating video recordings. Like many other obsolete software artefacts, and as a part of early net culture, screensavers were preserved and updated by enthusiasts.

Even among obsolete software paraphernalia, screensavers possess something of a cult status. A tacit acknowledgement of that is seen in online repositories such as YouTube, where one can find clips such as *281 After Dark*

screensavers.[196] The clip presents a colourful array of screensaver modules: cars, numerous clocks, interface glitches, dominoes, animals, lines of code, blobs of paint, landscapes, aliens, geometrical abstractions, random flying objects, labyrinths, fractals, Disney characters, sea life, ghosts, self-playing 'tennis' and other games, *Simpsons*, *Star Trek*, and others. The decorative status of screensavers makes them collectable objects. As artist Matthew Plumez-Fernandez notes:

> Screensavers were fairly simple software, and were not designed to run on super computers. You could see it as a kind of folk art. The screensaver became a cultural artifact that was overlooked because it was so common.[197]

Ironically, seeing screensavers as a decorative commodity, a form of 'folk art', also brings up an interesting consideration of how their affective space-times relates to their modes of presentation. As the discussions of net art and user culture in 1990s suggest, software and interface artefacts offer an insight into the vernacular culture of personal computer and its specific modes of human-technology relations.[198] The value of addressing the affective-space time created by the personal computer becomes especially clear when the screensaver is displaced from it. A 2017 installation at Het Nieuwe Instituut, *Sleep Mode: The Art of the Screensaver*, curated by artist Rafaël Rozendaal, presented the early screensavers for Apple and Microsoft operation systems as large projections on gallery walls. This decision was explained as a desire to 'submerge the visitor in a spatial experience',[199] to make them really pay attention to an overlooked, but fascinating software. As the description states:

> Due to the format in which they are displayed in the exhibition, the images take on a degree of autonomy and become museum objects. Because they have also been stripped of their original function, here the screensavers can be judged on their inherent visual qualities. Visitors find themselves immersed in an animated landscape of abstract vistas

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[196] David Donarumo, *281 After Dark Screensavers*, Youtube.com, 2011. https://www.youtube.com/watch?v=M1w1SQ3ezh8.

[197] 'Sleep Mode: The Art of the Screensaver', Exhibition essay, Het Nieuwe Instituut.

[198] Olia Lialina and Dragan Espenschied (eds), *Digital Folklore* (merz&solitude, 2009).

[199] Ibid.

dominated by colour, structure and the laws of nature and in which no movement is entirely predictable.[200]

This view clearly resonates with the modernist idea of a work of art as autonomous, and subject to an art market review of abstract art's 'inherent' expressive qualities. However, even from documentation showing large projections of the flying windows and floating fish, it is clear that, by aiming for immersion, the exhibition seems to take away the precarious intimacy that the screensaver evokes when displayed on the home screen. Where screensavers are seen as media artefacts, they also evoke a space of reflection and affect that is markedly different from the assumed 'neutrality' of a white cube space. It also opens up a question of how they participate in distribution of the sensible— under what sociopolitical circumstances and how they are being viewed. This brings me to the next section, in which I will address the affective space-time of screensavers and their position in relation to the temporalities of techno-capitalist framework.

Screensaver and Techno-Capitalist Space-Time

As I argue in the previous chapters, the affective space-time of procedural films can be understood in its relation to material processes, including those of labour. Therefore, instead of the holder of the gaze of traditional film studies, the screensaver conjures up the image of a cognitive worker: one who is connected to the computer screen, leaves to have a break, and returns to see the fractals, flying toasters or some other looped images on her computer screen. The title of the screensaver pack *After Dark* is indicative of this imagination. In the late capitalist society, the subject that gazes at the moving image is likely to be sleep-deprived, tired and looking for respite; and it is *after dark* that the computer screen marks as the time when labour is not being done, but the subject is still at her working place.

After Dark was sold as modular software, consisting of a number of different screensavers and encouraging users to develop and contribute their own modules. Created in the late 1980s by Jack Eastman and Patrick Beard, it was introduced first in 1989 to Apple Macintosh and in 1991 to Microsoft Windows.

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[200] Ibid.

In 1992 it became one of the top-selling software products in the world. In the thin history of screensavers it is probably the most noticeable: widely reviewed in computer magazines, mentioned in the histories of software and computation, and even referenced in popular culture (Image 4).

In one of the most famous *After Dark* modules, *Flying Toasters,* the user sees on the screen a fairly surrealist image: shiny toasters with little white wings, flying diagonally at different speeds across the screen. The toasters are accompanied by slices of toast of various shades. This imagery, as Jack Eastman explains in an interview, emerged in a feat of late-night inspiration when he wandered into a kitchen, saw a toaster, and his 'sleep-deprived brain put wings on it'.[201] This story, of course, could have been intended as a myth of a genius encountering the invention in their sleep, like Dmitri Mendeleev and his table of elements. But, more forcefully, it draws attention to the tired automatism of the late-night brain, consciousness ceding place to idleness and uncertainty. As commodity object, the screensaver becomes a part of a repository of mundane images, designed for everyday entertainment and functionality; but at the same time, it contributes to the mythology of early digital images, and to the mythology of the interaction between users and computers.
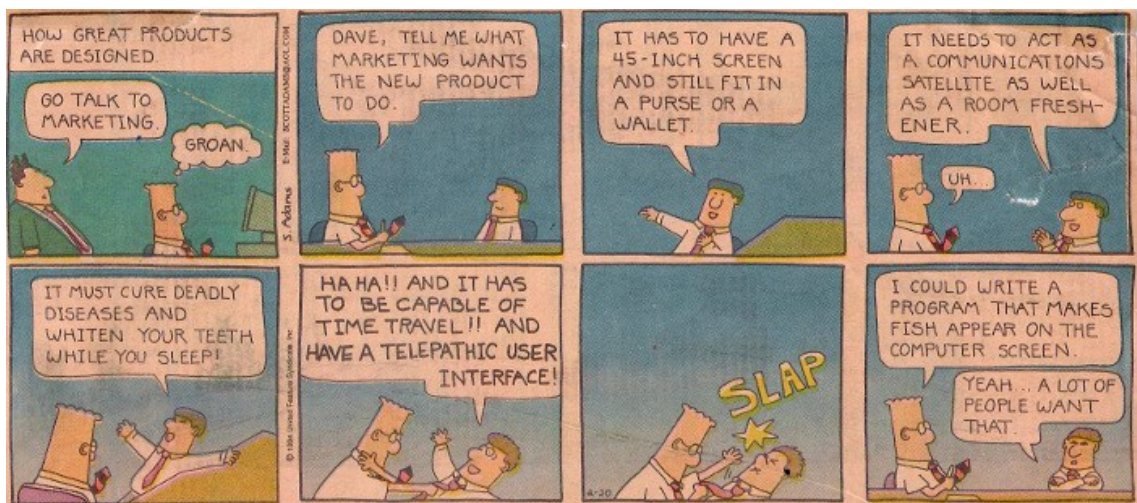

Image 4. Dilbert comic strip. Sunday February 20, 1994. © Andrews McMeel Syndication.

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[201] Tommy Thomas, 'Aggressively Stupid: The Story behind After Dark', *Low End Mac Since 1997*, 9 February 2007.

As mentioned before, the screensaver is a product of the shift that occurred in the 1980s towards personal computing.[202] Before this, time-sharing was a crucial practice in early computation, introduced in the 1960s and a major paradigm by the 1970s. Time-sharing was initially a solution to the problem of 'idle time' during a computer's use. For example, the time that one user would spend only typing in the code would be idle in terms of processing, and this was too expensive to allow. Computer scientist Bob Bemer, who was one of the first to introduce the idea of time-sharing, sternly notes in the article 'How to Consider a Computer': 'It is axiomatic that a computer should never stop, run useless problems or be subjected to manual operation and dial-twiddling. To do so deprives your fellow engineers of its benefit'.[203] Put differently, time-sharing put direct value on computational time and power, to the extent that the value of the human operator's time became secondary.

In later years, the screensaver could be found at the centre of relations forming the material network of immaterial labour. By the 1980s the rise of personal computing brought new meaning to the disintegration of the border between home and office. The computer became part of the household and, in doing so it brought the processes of cognitive labour home. While in the office the screensaver simply marks the minutes when the worker is idle, at home it embodies the continuous encroachment of *productive* time on *leisure* time. In the Autonomist Marxist tradition, immaterial labour is approached as 'the labor that produces the informational and cultural content of the commodity',[204] referring both to the increasing need for computer-enabled skills in production processes and to the increasing commodification of activities that were not previously recognised as work. Thus, the screensaver also arises in the period of transition towards a society in which various algorithmic operations, software, interfaces and data analysis become the main tools for perpetuating biopolitical control. The ultimate cognitive worker is the computer user, who, as Michael

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[202] See Jones, *The Technical and Social History of Software Engineering*, Chapter 7.

[203] Bob Bemer, 'How to Consider a Computer', *Automatic Control Magazine*, March 1957: 66-69., p. 66–67.

[204] Lazzarato, Maurizio. 'Immaterial Labor', in *Radical Thought in Italy: A Potential Politics,* edited by Paolo Virno and Michael Hardt (pp. 133–47 (University of Minnesota Press, 1996).

Hardt and Antonio Negri argue, engages in immaterial labour of analytical and symbolic tasks, and is involved in the production of manipulation of affect.[205]

While screensavers themselves appeared at a time when governance was not yet armed with big data and algorithmic analytics, the outlines of what I described as algorithmic superstructuring were already clearly visible. The screensaver exists as a part of the particular space-time characterised by invasive commodification and oppressive temporality—a machinic order of time that comes from the urge to maximise efficiency. Crary vividly describes the pressure that capitalism puts on time: unrelenting pace, the constant pressure of productivity, and subsumption of every activity as yet another point on the list of cognitive production.[206] All time, apart from the time spent sleeping, is reinforced with value. The *pastimes* that are not easily marketable as embodying actual, social, cultural or some other form of capital become de-valued and forgotten. As Crary points out, 'a 24/7 environment has the semblance of a social world, but it is actually a non-social model of machinic performance and a suspension of living that does not disclose the human cost required to sustain its effectiveness'.[207] Human bodies become inscribed in the self-perpetuating system of technologically sustained habits, and the temporality that we inhabit is increasingly shaped as machinic. As Crary describes it:

> In spite of its insubstantiality and abstraction as a slogan, the implacability of 24/7 is its impossible temporality. It is always a reprimand and a deprecation of the weakness and inadequacy of human time, with its blurred, meandering textures. … the effectiveness of 24/7 lies in the incompatibility it lays bare, in the discrepancy between a human life-world and the evocation of a switched on universe for which no off-switch exists.[208]

In this regime, time itself confirms itself as inseparable from productivity, and the aesthetic markers that separate idle from productive time come vividly into view.

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[205] See Section 3.4 'Postmodernization, or the Informatization of Production', in Michael Hardt and Antonio Negri, *Empire* (Harvard University Press, 2000), pp. 281—303.

[206] Jonathan Crary, *24/7: Late Capitalism and the Ends of Sleep* (Verso Books, 2013).

[207] Ibid., p. 8.

[208] Ibid., pp. 29–30.

The procedural time of the screensaver therefore directly connects to patterns and configurations of labour and leisure. If, following Rancière's idea, the screensaver still participates in the distribution of the sensible, then the temporality of the screensaver is inextricable from the affective space-time of personal computing. In the urban environment where 'computer-generated virtual spaces coexist with the vernacular daily virtual spaces that we inhabit… as viewers and users',[209] the screensaver becomes just one of the many virtual windows, a part of our daily interface. Where it appears on the screen, one feels reminded of productive time, be it at home where one labours long past one's capacity to do so, or at the office where a co-worker had already left, leaving the monitor on.

At the same time, since the screensaver can only come to existence during *idle* time, it brings interruption to the structured temporality of 24/7. Even the screensaver, seemingly a carrier of idle time, can be made to serve efficiency. Driven by the demands of the 'switched-on universe' and in a paradoxical nod to time-sharing of the 1970s, the screensaver software had also acquired a new functional purpose: distributed computation. That means that the 'idle time' of the user is donated to scientific or other initiatives that use spare processing power to shorten calculation time. One of the most well-known is IBM's World Community Grid, working with global risks projects in science, health and climate change. The time efficiency is underlined by the last page of the introduction, which suggests: 'While you were learning about World Community Grid…your device could have analyzed 465 potential cancer signatures for the Mapping Cancer Markers project'. The screensaver in this case emerges as another node that strives to maximally include the human in the productive temporality.

Some media artists use screensavers as a means to engage with and reverse the existing configurations of office space-time. When re-appropriated for artistic use, the screensaver can also make the hidden connotations of productive and idle time visible, and act as a critique of the existing temporal order. For example, the screensaver made by anti-consumerist activist collective RTmark, *Information Kiosk* (1999), was intended for distribution among corporate intranets in order to 'encourage workers to consider the

[209] Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (MIT Press, 2006), p. 3.

agendas of corporate uses of power'.[210] Another of their screensaver works made use of idle computer power to automatically send thousands of e-mails to Microsoft-owned mail servers, effectively trying to overload the system (a hacker tactic that has been used since 1997 and which is known as a 'denial of service' (DoS) attack). In both cases, the screensaver's position—literally at the site of labour and at the centre of data processing regulation—allows it to be used for subversive gestures, be it in the form of an anti-corporate corporate newsletter or a DoS attack. The interruption of the office work here echoes Mario Tronti's idea of refusal to work as a tactic. Tronti argues that 'the effective development of the political power of labour really begins from the moment that labourers are transformed into workers'.[211] Therefore blocking the work-process as an intentional strategy, exemplifies the idea that productive power is always already a political power. In the context of screensavers it opens up a space of resistance to the oppressive productivity of 24/7 regime.

How does the procedural design of the screensaver feed into its affective space-time? Having imagined the screensaver within the set of labour relations, within the external dialectic of *productive* and *idle* time, I would like to call on the technical side of the screensaver's own internal temporality. From the first example mentioned in this chapter, Socha's *scrnsave*, to the more advanced screensavers of the late 1990s, the makers of screensavers were relying on the logical structure of the algorithm rather than on the expectations that a film-maker might have about her future work: considerations of pacing, narrative, emotional affect, and others.

The operational logic of the screensaver—the loop—is also one of the most basic functions in computing. The loop is a fundamental idea in programming languages: it is one of the main structures that can underpin the execution of the code (after this action is finished, repeat it endlessly, or until a certain condition is met). It allows one to automate the algorithmic action by repeating the instruction a desired number of times. For example, the first instruction in the sequence of an algorithm may be to select an item of data and change it. Then, the next action checks if this item has reached a prescribed condition. If

[210] Patrick Lichty, 'RTMark Information Kiosk Screensaver', Rockefeller Foundation New Media Fellowships, 2003.

[211] Mario Tronti, 'The strategy of refusal', *Semiotext(e)* 3, no. 3 (1980): 28–34, p. 28.

not, the next instruction in the sequence would be to come back to the first instruction and repeat the whole sequence. When the condition is reached, the program moves on to the next action. A loop that does not have an exit function is called an endless loop and typically operates until the system detects it as an error and terminates the program, or unless there is another condition, such as terminating the program after a certain amount of time.

One could draw a quick parallel between the screensaver and experimental film, especially in the context of a museum or gallery space, where the struggle of art technicians to put the work 'on the loop' has seemingly gone on since the beginning of time. However, the nature of repetition that the computational loop invokes is different. To appreciate this difference between the moving image sequence on repeat and the algorithmic logic, one could turn to Peter Gidal's *Room Film 1973.* Throughout the 55 minutes of the film, the camera, put at the centre of a darkened room, swerves around its own axis, filming the contents of the room, seen in a spot of light that rotates along with the camera. The overall effect of the film, which Michael Snow describes as being as 'if it was made by a blind man',[212] is one of incompleteness and the impossibility of representation (of the whole room but also of the viewing subject). The camera's movement possesses a kind of searching automaticity that excludes the human viewer. In the end, what is much more visible than the content of the film is the rule that underlies it, the algorithm of the circular movement.

The loop, therefore, is not an imposed quality but a part of the screensaver's operation. And similarly to experimental film, it is also in contrast to mainstream cinema that one can see the screensaver's resistance to linear time. When mainstream cinema introduces flashbacks, 'plot-within-the-plot' or other non-linear methods, what Elsaesser calls mind-game or puzzle films,[213] the loss of consequential narrative already leaves the spectator in confusion. Where in traditional narratives cinema has always strived to express itself from A to B, from cause to effect, in the case of the screensaver the loop becomes the starting point, and also the point of non-time, of generative suspension that can be started or ended at any point. This suggests an experience that is even

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[212] Gidal, 'Artists' Statement'.

[213] Thomas Elsaesser, 'Puzzle Films: Complex Storytelling', in *Contemporary Cinema,* edited by Warren Buckland (Blackwell Publishing, 2009)*.*

harder to place in the traditional expectations, and the space-time enabled by the screensaver is starkly different from narrative-based progression.

This is also reflected in the notion of database cinema, which attempted to assimilate computational innovations such as 'interactive film' or non-linear film artworks in line with the existing context of film studies. In Manovich's concept of new media the loop is featured as a new driving force for cinematic temporality and narrative:

> Can the loop be a new narrative form appropriate for the computer age? It is relevant to recall that the loop gave birth not only to cinema but also to computer programming. Programming involves altering the linear flow of data through control structures such as 'if/then' and 'repeat/while'; the loop is the most elementary of these control structures.[214]

While Manovich poses this question in terms of narrative form, his overview of the various iterations of the loop (the early cinematic toys, the repeated cycles in animation, the 'repeat' function in Quicktime, the interactive feedback loops in games and film) seems to ultimately present the loop more as a widely applied device. In screensavers, however, database cinema can be exemplified by one literal example: the *Matinee* screensaver developed by Softek in 1993. *Matinee* was the first screensaver that used full-motion video clips: altogether 38 excerpts, of two to five seconds each, taken from public domain movies and cartoons. Users were offered the chance to edit the film themselves in the interface, which was designed as a film strip. The assembled 'film' was played not full-screen, but on a background representing one of the older media: a film theatre, a TV set or a newspaper.

However, as a functional product, the looped screensaver also needs to be *efficient*. Even if the problem of the lack of processing power in the early computers was eventually solved, the screensaver as a product is still intended to be a program that runs in the background, and therefore needs to be one that does not impose heavy costs in terms of processing power. The screensaver needs to be seamless. For the most immediate translation of still graphics into moving image, this means turning to visualised geometrical formulas, which also means that the source code will be shorter and more efficiently written.

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[214] Manovich, *The Language of New Media*, p. 266.

Due to these considerations, the screensaver became an ideal outlet for generative abstract geometry. In combination with the fact that it needed to run for an infinite amount of time, this created a loop that was not repetitive but open-ended. This is exemplified by the iconic Windows screensaver *Flying Through Space*, where bright dots create an illusion of depth and stars rapidly passing by, as well as *3D Pipes* and *3D Maze*, which are probably the most recognisable examples of infinite generative 3-dimensional space.

Such images describe the screensaver first of all as a technical image, driven by considerations of system requirements rather than by demands of representation. Procedural design of the screensaver also becomes built into the late-capitalist temporalities of machinic performance, in which system requirements also expand to include human workers. A screensaver becomes a placeholder, a suspension of productive time. However, much like experimental film, the affective space of the screensaver is not, for all its banality, abolished. The experience of seeing a screensaver is always accompanied by a certain degree of inaccessibility, be it because of the screensaver's temporality or the banality of its images. Through this inaccessibility, the screensaver triggers the possibilities of boredom and introspection.

Idleness, Productivity and the Labour of Watching

In an episode of the US version of the mockumentary TV show *The Office,* the screensaver makes a brief but relevant cameo. In a meeting room, Michael, the manager, is giving a presentation on the ways one can make the quarterly report more exciting by printing it on coloured paper. When his subordinates display, in sequence, alert attentiveness, intense disappointment, shouts of encouragement and hope, he takes these to be reactions to his words. Even though he is still speaking, the listeners suddenly cheer, give a round of applause and exit the room, leaving him in complete certainty that he delivered an amazing speech. Needless to say, Michael is unaware that all this time the office workers were actually cheering for the bouncing DVD logo in the screensaver showing behind his back to finally land in a corner. While this episode informs that even watching a screensaver is more productive than office meetings, it also responds to the question of what kinds of time are

considered productive (and, therefore, *spent* well, valuable) and unproductive (just *spent,* or *wasted*). But what if one explores the possibilities of unproductive time further?

Agamben described the two great conditions of montage as repetition and stoppage. For him, these two conditions enable the ethics and the politics of cinema by opening up a space of 'imagelessness', a space beyond representation. The repetition reveals a paradoxical capacity of cinema to restore the possibility of what was and to render it possible anew. The work of images is important 'because they are a way of projecting power and possibility toward that which is impossible by definition, toward the past'.[215] Relying on the logic of the loop, the screensaver creates a state of suspension, a continuous conjuring of idle time. As Nicky Hamlyn notes in his studies of experimental film, repetition does not mean that the experience stays the same: seeing exactly the same thing might be 'different from the first time around, and seeing it three times would produce further new experiences and knowledge'.[216] If one chooses to engage with the screensaver, rather than ignore it as mere decoration, the continuous reproduction of computer code offers little variation but a very palpable sense of the passing of time. Most screensavers are 'slow', as they are designed only as placeholders for other events, and their design is meant to be functional. The amount of variation provides little respite to the curiosity of the accidental viewer; paradoxically, it is exactly this quality that can also make the screensaver entrancing in its own right.

The contemplatability of the screensavers partly owes to technical restrictions, as not only were screensavers mostly made to be low-cost (in terms of power) software, but computers were also not yet powerful enough to play full-screen video. This was the case with *Seize the Day*, a popular 1994 planner application by Ian Gilman that included twelve animated background landscapes made by artist Mark Ferrari. The landscapes changed as the day progressed and had different weather states. 'A calendar picture of a magical

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[215] Giorgio Agamben, 'Difference and Repetition: On Guy Debord's Films', in *Guy Debord and the Situationist International: Texts and Documents,* edited by Tom McDonough (pp. 313–320) (MIT Press, 2004), p. 316.

[216] Nicky Hamlyn, *Film Art Phenomena* (British Film Institute, 2003)*,* p. 93.

far-off land that lived and breathed in real time',[217] the program proved sufficiently emotionally engaging to amass a number of mentions in online discussions. One of the feedback quotes on the website states: 'It is rare to find a piece of software that is soothing to even think about, especially when it's something as potentially stressful as a calendar',[218] ironically pointing towards the same aesthetic space between idle and productive time that screensavers occupy. Not surprisingly, the affective function of the program has not lost its relevance, and in 2019 *Seize the Day* was re-issued as a mobile phone application, where on Android phones it can be used as a screensaver.

A similarly palpable experience of passing time is offered by slow cinema, such as instantiated in the works of figures such as Chantal Akerman, Andrey Tarkovsky, Lav Diaz, Apitchapong Weerasethakul, Tsai Ming-liang and others. It is characterised by minimalist aesthetics: long takes, slow pacing and contemplative rather than action-led plot. These devices contribute to slow cinema's insistence on fully experiencing the passing of time, and to its resistance to the easy flow of narrative on which most mainstream films rely. Rather than an immersive escape from reality, slow cinema offers an introspective living-through, informed by the conscious intensity of the watching process. As Flanagan formulates it, it is 'a cinema which compels us to retreat from a culture of speed, modify our expectations of filmic narration and physically attune to a more deliberate rhythm'.[219] Slow cinema can be seen as a reaction to the accelerated tempos of late capitalism and its effects on the mainstream film industry, where easy consumption, most clearly seen in the Hollywood model, has been aided by a noticeable intensification of immersive narratives, fast pacing and special effects.[220]

In the conditions of late capitalism where the environment is oversaturated with information, attention itself turns into a precious resource, leading to such

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[217] Ian Gilman, 'Ian Gilman – Seize The Day'. Personal website. https://iangilman.comsoftware/seizetheday.php.

[218] Ibid.

[219] Matthew Flanagan, 'Towards an Aesthetic of Slow in Contemporary Cinema', *16:9 in English* 29 (November 2008).

[220] See David Bordwell, 'Intensified Continuity Visual Style in Contemporary American Film', *Film Quarterly* 55, no. 3 (2002): 16–28.

articulations of consumption as the attention economy.[221] As Terranova notes, 'in a strange reversal of early information theory's take on entropy, attention here becomes the scarce quantity which is "consumed" by that which is abundant, that is, information'.[222] Crary describes the economic aspect of paying attention as the 'ongoing crisis of attentiveness', where

> the changing configurations of capitalism continually push attention and distraction to new limits and thresholds, with an endless sequence of new products, sources of stimulation, and streams of information, and then respond with new methods for managing and regulating perception.[223]

In this framework, watching slow cinema can be also seen as an activity that requires a particular way of and attitude towards *paying* attention.

One of the discussions of slow cinema becomes particularly pertinent in the context of redefining attention as a resource. In an article that sparked a well-known debate on the methods and politics of slow cinema, James critiques slow cinema as an indulgent and easy method, one that is perpetuated by the festival circuit and the film critics.[224] Ultimately James wonders if watching slow films is 'worth it'.[225] While the resulting debate is not within the scope of this research, it brings to light a pertinent issue of the practice of film-watching as economic activity, or as labour. As Schoonover points out, if the time of viewing *is* labour, what is it worth?[226] Schoonover notes that 'slow art film anticipates a spectator not only eager to clarify the value of wasted time and uneconomical temporalities but also curious about the impact of broadening what counts as productive human labour'.[227] Ultimately, for him, the question of slow cinema's worth does not end in the juxtaposition of slow practices to speedy ones, but

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[221] Michael H. Goldhaber, 'The Attention Economy and the Net', *First Monday* 2, no. 4 (7 April 1997); 'The Value of Openness in an Attention Economy'. *First Monday* 11, no. 6 (5 June 2006).

[222] Tiziana Terranova, 'Attention, Economy and the Brain', *Culture Machine* 13 (2012), p. 4.

[223] Crary, *24/7: Late Capitalism and the Ends of Sleep,* p. 13.

[224] Nick James, 'Passive Aggressive', *Sight and Sound 2,* n.4 (April 2010), p. 5.

[225] Ibid., p. 5.

[226] Karl Schoonover, 'Wastrels of Time: Slow Cinema's Laboring Body, the Political Spectator, and the Queer', *Framework: The Journal of Cinema and Media* 53, no. 1 (2012): 65–78.

[227] Ibid., p. 65.

rather 'speaks to a larger system of tethering value to time, labor to bodies, and productivity to particular modes and forms of cultural reproduction'.[228]

Extrapolating the experience of watching slow cinema to the experience of watching a screensaver helps to make visible their socioeconomic scaffolding. Where slow cinema exists in a more or less established canon of spectatorship, supported by dedicated agents such as festivals, independent film distributors and cinephiles, the screensaver can only be regarded as a commonplace software with fragmented viewership, preserved and shared by enthusiasts and largely excluded from considerations of film and art. In this regard, and in relation to my artistic practice, I seek to position the screensaver also as an artistic artefact that creates a space of reflection. The reason for this is simple: where a screensaver is re-imagined as an artistic artefact, it encourages the existence of emancipated spectators. The space-time that the screensaver activates is similar to that which Peter Gidal describes as characteristic of the machinic apparatus that connects the human spectator with the 'non-human', or simply 'non-naturalised' aspects of her own perception, through a structural-materialist experiment on film.

Thus, the idle time of the screensaver relates both to the temporal drag of slow cinema and to the indifference of the technical automation. The minutes when both the computer and the human operator are not working are ultimately unproductive. What is created, then, during this time? Warhol would refuse the boredom of easy consumption of the mainstream genres that repeat 'the same plots and the same shots and the same cuts over and over again',[229] but welcome the real boredom of seeing something that is truly unchanging —'because the more you look at the same exact thing, the more the meaning goes away, and the better and emptier you feel'.[230] The continuous algorithmic loop in the screensaver offers the same scarce variation as Warhol's *Sleep* (1963) or *Empire* (1964).

The continuous loop and the banal images lead to boredom, and boredom leads to reflection, as suggested by Benjamin and Kracauer. For both of them,

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[228] Ibid., p. 68.

[229] Andy Warhol and Pat Hackett, *POPism: The Warhol '60s* (Harcourt Brace Jovanovich, 1980)*, p. 50.

[230] Ibid.

boredom was a necessary condition for creating an experience outside the daily commodified gratification. As Moore points out, they connected the loss of the capacity to be bored with 'the new labour and media environment of their 1920s modernity'.[231] The screensaver's peak existence in the 1990s is similarly situated on the brink of a turn towards the attention economy, where the ability to experience boredom would be pushed even further away from the consideration of daily life.

Inspired by these suggestions, I would argue that the screensaver is able to construct its affective space precisely because it is situated at the margins of the labour process, yet presents a completely unproductive time in itself. Much like slow cinema, the idle time of watching the screensaver cannot be commodified. The attention dedicated to it is mostly accidental, and can hardly be appropriated as a resource. Moreover, the experience itself is not accommodating. If anything, it is fragile: the viewer cannot influence their watching experience, or multi-task, as the screensaver occupies the screen completely, and as soon as the user moves a mouse, or presses the key, it is gone. In a rare essay dedicated to screensavers and their particular allure, the journalist Zack Hatfield points out:

> You can't consume a screen saver in an instant. You can't fast-forward or rewind one. The genre, its own kind of endurance art, shuns immediacy. Fugitives from time, screen savers possess no real beginning or end. Their ouroboric nature is perhaps why preservations on YouTube, whether ten minutes or twelve hours long, tend to evoke disenchantment. Decades ago, stumbling upon a screen saver in a shared living room—or perhaps finding an entire office full of them at lunchtime, cubicles lambent with workers' judiciously chosen modules—likely signaled your own solitude. When you're watching one intentionally, that feeling never arrives.[232]

The allure of the screensaver is best seen on the *home* screen, in the late-night 'after dark'. The assigned computer at the office can also be a *home* screen,

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[231] Rachel Moore, 'In Transit: Between Labor and Leisure in London's St. Pancras International'. In *Public Space, Media Space*, edited by Chris Berry, Janet Harbord, and Rachel Moore (pp. 162–77) (Palgrave Macmillan UK, 2013), p. 172.

[232] Zack Hatfield, 'Salvation Mode', *The Paris Review*, 23 May 2017.

insofar as the careful personalisation of the screensaver by the office worker counts. Children and tired adults will watch it out of curiosity, or because its trance-like repetitiveness is weirdly comforting. The human viewer is not supposed to be there: after all, the screensaver is only on because they have left. Yet, the sleepless subject is still there, contemplating the graphics on the screen. The 'sleep mode'[233] of the screensaver is not the unassailable time of bodily rest, which Crary positions as the last resistance to capitalism. Instead, the *idle* time of the screensaver is manifold: it is both a consequence of and a defiance of productive time, and also a trance-like meditation of generative time driven by an endless repetition of the loop.

Chronic Film (2018)

The final section of this chapter is dedicated to the discussion of my moving image work *Chronic Film*. Having started as a deadpan take on the idea of a screensaver containing *all* possible images, during the course of the project it evolved to encompass several versions and formats that investigated the questions of temporality, digital materialism, commodification of images and the mythologisation of media. In this section I will outline two main iterations of *Chronic Film*—the algorithm, or procedural film, and the lecture-performance— linking them to the preceding discussions of the screensaver in this chapter. The viewing links and documentation of the multiple iterations of Chronic Film can be found on pages 158–163.

Chronic Film as Procedural Film

In the first and the most important iteration, *Chronic Film* is a software-based work, a procedural film. I often think of it, following the line of thought of structural-materialist film-makers, as a digital structural film, or as a cognitive-

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[233] The 'sleep mode' is one of the casual anthropomorphisms that we accord to algorithmic operation on the daily basis (e.g. artificial *intelligence* or machine *learning*). Running the computer reduces the lifespans of its hardware: thus, the sleep of the machine is only a power-saving compromise, a half-life where the hardware lifespans of the screen is sacrificed in favour of that of the CPU. On Windows operating systems, different power-saving configurations are still possible—sleep, hibernation, hybrid sleep, some of which are better suited for desktop computers, and some for laptops. In contemporary personal computers, the screensaver has almost completely ceded to simply turning off the screen, as they mostly rely on battery power, and the moving graphics consume it.
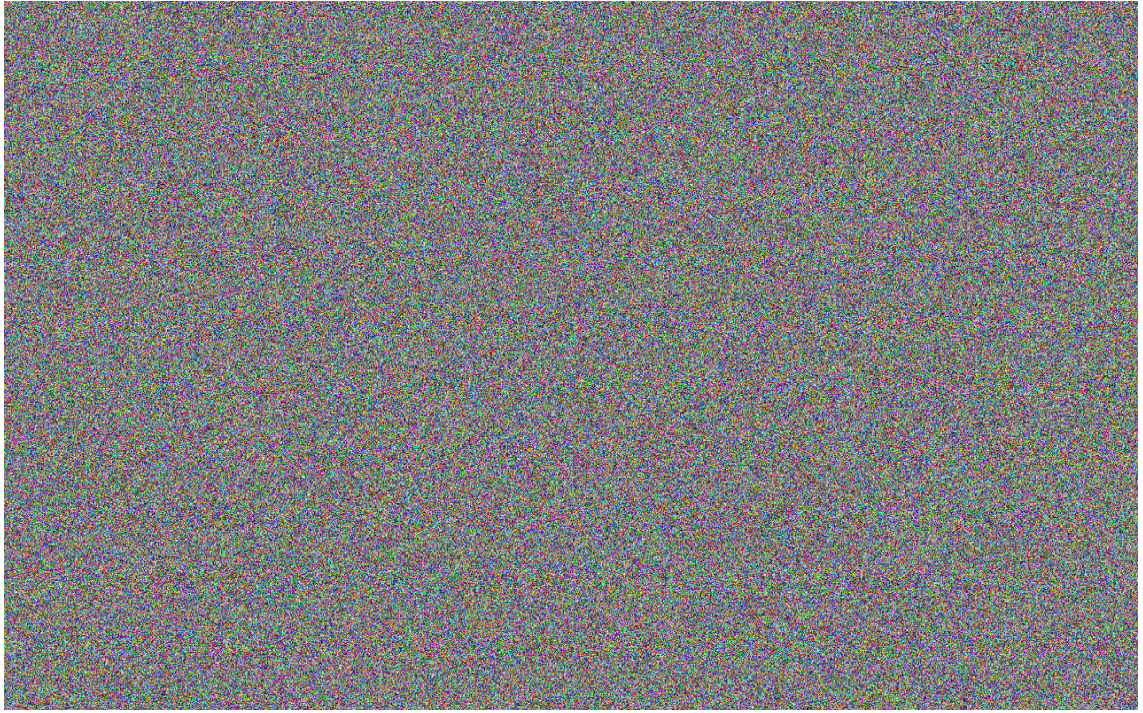
Image 5. Screen capture, *Chronic Film* (2018) (algorithm).

materialist work in which the process of its live algorithmic performance is primary. *Chronic Film* is an algorithm that generates and plays out every possible combination of pixels—or, in other words, every possible image—that can be generated on a screen of a certain resolution (See Image 5). What results is a film of the duration longer than the possible life of human civilisation that is not really made for traditional filmic perception. Essentially, what the film addresses is an idea of materialising algorithmic time by taking the idea of cinema to be a sort of *chronic* condition.

A screen of a given resolution contains a finite amount of pixels; they, in turn, are defined by a limited number of colours. Potentially, these combinations can become all forms and kinds of images. Mathematically, because the number of combinations is finite, they are not all-encompassing. The idea of the film, therefore, speaks less to ideas of omnipotence and more to the idea of Shannon and Weaver's theory of information that was briefly discussed in Chapter 1, where a signal or a message is always seen as 'one *selected from a set* of possible messages'.[234] Given that the number of messages in the set is

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[234] Claude E. Shannon, 'A Mathematical Theory of Communication', reprinted with corrections from *The Bell System Technical Journal,* 27 (1948): 379–423, 623–656, p. 379.

finite, 'this number can be regarded as a measure of the information produced when one message is chosen from the set, all choices being equally likely'.[235]

One of the main inspirations for *Chronic Film* was Borges' short story on the library of Babel, with the books containing all possible combinations of one language—the finite set of 24 letters, a comma and a full stop. When a similar logic is applied to a certain screen resolution, for example, 1280 x 720, a certain number of channels in each pixel (3 in RGB space), and a certain number of values for each channel, one can conceive of a finite, even if large, number of frames that can be generated with it; and so, a finite, even if inhumanly long, sequence of all these frames. Playing them out would conceivably contain all the images ever made, or yet to be made. While the actual length of the film is calculable, playing the film out completely would take more time than is left until our sun burns out. A similar work made in 1996 by artist John F. Simon, Jr, *Every Icon,* generates every possible icon on a grid of 32 by 32 squares in black and white, going through the pixel combinations in order, starting from the top left one in the square. Even with that restrictive resolution, the time required to see the work through would amount to several hundred trillion years.

The film is inaccessible to a human viewer, not only in terms of its lifespan, but also in terms of economic sustainability, as it is hard to imagine an institution that would exist for that long and support this artwork's continuous running. The silly incongruity of the work with the currently dominant mode of consuming images makes it unsustainable. Potentially, exhibiting such an artwork to its logical end would mean handling the costs of supporting the server on which the work is based, the electricity cost, and the cost of updating hardware. As the duration of the work would preclude the possibility of any contractual obligation actually guaranteeing the work's support and existence, *Chronic Film* cannot be properly assimilated by the art market.

Furthermore, the noise function becomes significant. As can easily be seen from a comparison with the example of *Every Icon*; the better the resolution of the image, the more easily it translates, quite literally, to noise. The digital 'figuration' of the algorithm can be expressed in different ways. During the work's development, several versions of the algorithm were produced, in which

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[235] Ibid.

different mathematical formulas were used to determine the order in which the pixels change. For the exhibition in the Sanatorium Gallery in December 2017, a four-channel video recording of various algorithms, was produced.[236] The first version changed the pixels one at a time, going through all the possible combinations for the pixel in the left upper corner of the screen, then for its neighbour to the right of it, and so on—similarly to *Every Icon*. The second 'seeded' four starting pixels on the screen, and worked with their respective neighbours, changing four pixels on the screen at a time. The third version divided the screen into 'blocks' of pixels and analysed them, generating the possible combinations of pixels for each of them. The final one generated random combinations on the whole screen, resulting in the rendering, of noise, which, however, did not retain the previously generated combinations. In all four versions, the probability of seeing a non-abstract image was mathematically infinitesimal.

The current version of the algorithm was made in collaboration with programmers Thomas Bailey, Ian Edwards and Jeff Porter. The main difference in approaches between *Every Icon* and *Chronic Film* is that the algorithm in *Chronic Film* updates the pixels not in sequential order, but all simultaneously. As the software runs, it is given a resolution and a percentage for which update should happen—for example, 100% of the pixels on the screen are updated when the frame changes or 25%, which means that all the pixels on the screen are updated over four frame changes. The default web application runs at the resolution 800 by 450 pixels (16:9), and updates 50% of the pixels per frame change. As all the calculations occur prior to the visualisation, the initial loading process might take some time.

The algorithm is written in Javascript and works in the following way. The amount of all possible combinations of pixels is large, but not infinite. Assuming that the initial resolution is 800 by 450, and that for each of the three colour channels (Red, Green, Blue) of every pixel, there are 256 possible values, from 0 to 255, the amount of all possible combinations would equal 256 ^ (800 x 450 x 3). First, the algorithm 'stacks' the three colours channels on top of each other. An index (ironically called 'Camera' in the program) is able to grab values from the 'stack', choosing which items in the three channels to plug in the pixel.

[236] See documentation on p. 160.

The key point of the algorithm is that, before grabbing the values, it shuffles their sequence using a pseudo-random number generator. This ensures that the pixels are not just going through all possible combinations sequentially. In regard to the web application, seeding the pseudo-random number generator allows it to randomise a sequence, but memorise the order, so that the algorithm can run from the same step it previously stopped at. This makes the application incredibly lightweight, as all the calculation are done before the visualisation, and it only has to store a single integer in order not to repeat previous steps.

In a way, *Chronic Film* takes the idea of a screensaver to a very extreme point. How many times have we seen a 'screensaver' of noisy interference on a TV screen when the channel doesn't have a signal or when the antenna is broken? Noise comes from a materialist understanding of information, from the point where the signal itself is considered not yet a message, but as one of the options that can be made out from illegibility. The hardware function of the screensaver has become redundant as new monitors appeared, better equipped against physical degradation; similarly, with only the resolution as a reference, the screen simultaneously is and is not present in *Chronic Film*. What is left is its ghostly rectangular outline, a reminder of its material shape. By generating all possible images as noise, the virtual screen is at the same time a container for future contingency, and a reminder of the entropic state of information before it is organised into a message. From there, what becomes the starting point for the lecture-performance is exactly the dichotomy between signal and noise, and the stubborn refusal of the images to figurate, to become recognisable, and to be organised into patterns and shapes.

Chronic Film: Lecture-Performance

The initial idea of Chronic Film was to exhibit it as a kind of filmic monolith, a monument to film-making that is not made for a human viewer. As the concept developed, and as I recognised that there was more than one way to construct such an algorithm mathematically, the four-channel version was developed and installed at the Sanatorium Gallery. Finally, I started to recognise the potential for a shared intellectual/emotional space, for the making of which the gallery

Image 6. Still from lecture-performance *Chronic Film* (2018).

modes of presentation were insufficient. Because of this I came up with the idea of making the algorithm of *Chronic Film* a part of a lecture-performance. (See Practice Overview and Documentation section of the current thesis, pp. 161—163.)

A lecture-performance is a format that is usually linked to the 'educational turn' in contemporary art. I see it, primarily, as a method that has its roots in institutional critique, and which has developed as a reaction to the 'professionalisation' of art through the protocols of academia and to the authority figure of the artist-educator. Therefore, for me, the lecture-performance has two important aspects: its capacity for a real-time performance of two counterparts (myself, and the algorithm); and its potential to disrupt the illusion of authority of the screen and of myself, in Mashinka Firunts' words, to 'evacuate a position of sovereignty and circulate knowledge as a non-sovereign subject'.[237] It also reflects the diverse spaces where lecture-performances take place—from biennales to conferences.

For *Chronic Film*, a format of lecture-performance became crucial. First of all, the real-time aspect of a lecture-performance acquires a particular significance

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[237] Mashinka Firunts, 'Staging Professionalization: Lecture-Performances and Para-Institutional Pedagogies, from the Postwar to the Present', *Performance Research* 21, no. 6 (2016): 19–25, p. 22.

when the lecture involves the time-critical media of procedural film. The two processes of parallel mediation, of me speaking and of the film unfolding, enter in a performative dynamic that affects how the viewers see the moving image. For this reason, the lecture consists of several parts. In the beginning I speak to the backdrop of pre-recorded moving images, and the narrative is fictional, imaginative. In the later part, in contrast, I step back, removing myself from the picture, launch the *Chronic Film* application or the online version (depending on the conditions), and the algorithm on the screen takes over. The way I am able to operate within the format of a lecture-performance, and the representational turn that the moving image itself makes when switched from pre-recorded to generative format, allows me to deconstruct the traditional hierarchical experience of image consumption. The traditional position of authority accorded to a lecturer is also questioned: the narrative is fictional, the images do not seem to connect immediately to the text, and the artist on the stage—myself—is able to remove herself from it. With all these considerations, I see the space of the lecture, compared to that of an art object, as conversational, not necessarily in dialogical sense, but in the sense of a space where knowledge can be shared, both in speech and through bodily and technical clues.

Overall, the lecture passes through three space-times: the virtual space of the screensaver, the footage that I shot on the Greek island of Delos and the algorithm of *Chronic Film.* The lecture continues to address the Shannon-Weaver model of communication. In order to demonstrate how the fetishistic dimension of the figurative image works within with the processes of commodification and cultural appropriation, the lecture considers the figurative image as a signal and the technical processes surrounding it as part of the noise.

The first space-time is the screensaver: a homely, intimate space where the endless procedural film on the screen causes reflection, boredom or even mystical trance, in the tradition of slow cinema. Starting from there, it draws on the experience that I outlined at the beginning of this chapter: seeing my younger self and considering her relationship to the screen and seemingly autonomous computer dreams. Through the labyrinth of Windows' *3D Maze,* the lecture departs to ancient/contemporary Greece or, more precisely, the island of Delos, which appears in the forms of both its popular game representation in

the *Assassin's Creed* franchise and as documentary footage produced by me. Delos is considered to be the birthplace of Apollo, one of the most complex figures in the ancient Greek pantheon, who is known as an oracular deity and the patron of divination. Through Delos, the lecture engages in the parallel thinking of artefacts such as those that this island houses and of artefacts as digital images, subject to compression and glitching. Two re-imaginings become important here. The first is a figure of a female oracle who deciphers the visions that come to her in a smoke; the sybil is re-imagined as a computer (drawing on the times when computers were still human and predominantly women[238]). The second re-imagining concerns the statues of the white lions of Delos (as originals) and their replicas as poor images. In this sense, the lecture-performance takes on ancient Greek mythology as a poignant point in the history of Western thought, and as a contemporary participant in the commodification of images and cultural artefacts. The lecture draws a line from archaeological work, the mosaics and statues of the island of Delos, to the current moment of the reproducible and ubiquitous digital image.

The final part of the lecture returns the artist and the viewers to the intimate feedback loop of the *Chronic Film*. The digital noise of the algorithm, by forcing the viewer's brain to form mental images, is acted out as a divination and/or meditation, as a hallucinatory escape from the economies of efficiency and monetisation. Using the algorithm, this part of the lecture suggests how the spectator-screen 'ownership' model of image consumption can be broken, instead entering a state of image-word sensing. It juxtaposes the process of figuration, inevitably connected with the desire to objectify and contain, to the digital noise that is seen as a hallucinatory escape from the economies of efficiency and monetisation. *Chronic Film* introduces a quite radically alternative model of viewership (but also by inverting the gaze in quite a straightforward, deadpan way), by combining the act of speech with the visual noise. As the brain engages in pattern-seeking, shapes appear in the noise. Although it is impossible to see the actual shapes (if they are generated), the brain still creates them in the trick of optical perception. The searching gaze is met with the refusal of images to figurate on the screen and is forced to turn inwards—to the mental imagery that is being conjured within the brain as I speak.

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[238] Light, 'When Computers Were Women'.

Inspired by Melvin Moti's *Prisoner's Cinema*, Hollis Frampton's *Poetic Justice* and *(nostalgia),* as well as Derek Jarman's *Blue*, the work plugs into the working memory to reconstruct it in a process of a self-reflective live viewing—what can be more live than something happening directly in the brain? The film in this reading can be seen as not just procedural film, but also, at least in the artist's conception, as a cognitive-structuralist film, as it verbally unpacks the processes of human perception at the same moment as it is connected to them. In this sense, it constructs a cybernetic feedback loop directly between the observer's brain and the algorithm. Ideally the last part of the lecture works as a collective meditation with the algorithmically generated noise. Where the conditions of performance allow, the last part of the lecture essentially consists of viewing the noise accompanied by a soundtrack in a dark, sonically insulated, cinema-like space. I see such practices as a sort of human circuit-bending, of creating a space for continuous reflection and co-existence with the technical image, but also for trusting the brain to produce visions and thoughts, to daydream and hallucinate. In this regard, it continues my idea of the screensaver's capacity to create spaces of reflection and generative mediation, and directly addresses its procedural space-time.

In this chapter I have considered the screensaver as a possible case of procedural film. Between its obsolete materialism and its later decorative function, the screensaver occupies a unique place in the studies of software and moving image. As I argue, the temporality of screensavers is conditioned by the patterns of idle and productive temporalities, and its affective space by the specific socioeconomic design of personal computers. Engaging with the screensaver as a marginal form of moving image, instead of a decorative commodity, allows me to consider the potential of exiting the pressure of productivity that Crary describes as 24/7, and instead enter a space of boredom, reflection and *un*-productivity. My artistic work in this regard can be seen both as a tool for accessing this space, and a further investigation into the dialectic of signal and noise in the screensaver's visual space insofar as the lecture-performance delves into the ideas of figuration and commodification.

Chapter 5

Game Engine

Image 7. Still from *Non-Player Character* (2019).

This chapter investigates procedural films created using game engines, essentially intentionally non-interactive games where the observation becomes the main mode of experience instead of interaction. As Galloway points out, many games also account for periods of player inactivity by reverting to an ambient state, presenting a 'perpetual happening, a living tableau',[239] one in which the machine performs even when the operator is not there. In this sense procedural filmic space, I would argue, can be found in most games where the player has an option of 'doing nothing'.

The game engine is, historically, as much a product of military and scientific research as it is the heir to the Hollywood production pipeline and the narrative

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[239] Galloway, *Gaming: Essays on Algorithmic Culture*, p. 10–11.

tradition of film-making.[240] It has been particularly noted and explored in relation to mainstream and competitive games, where the trajectory from the military funding of early computer technologies towards warfare entertainment can be clearly seen. As such, it already supports the 'persistence of vision'. The gaespace exists in a particular relation to the idea of the depiction of life and bodies on screen, human or other: anthropocentric (organised around the experience of the human viewer/player), objectified and involving a naturalised cinematic perception, dependent on the existence of narrative, characters and traditional filmic structures.[241]

Continuing with the discussion of apparatuses of procedural films, I explore the game engine as a complex techno-cultural artefact with its own power relations and imaginaries of autonomy, a site where socioeconomic agencies of the game corporations engage in the quantified regulation of human and non-human participants. I will also show that the gamespace presents as a pervasive and expanding space of encounters between multiple and diverse participants (human players, third-party software, NPCs, bots) spanning both in-game and external worlds.

This chapter follows the research conducted while working on the procedural film *Non-Player Character*, a re-make of a mechanical automaton in a gamespace, exploring it as a case study for a procedural approach to moving image and generative mediation. In the following sections I will pay particular attention to the figure of non-player characters (NPCs), virtual characters controlled by the game. In the commercial paradigm, the smoothness of the user experience often becomes the key motivation for the designers, and the NPCs are principally seen as a design feature that greatly helps to enhance the overall believability of the in-game world.[242] The design of NPCs in mainstream games, especially in popular genres such as first-person shooters, rarely

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[240] See McKenzie Wark, *Gamer Theory* (Harvard University Press, 2007)*;* Tim Lenoir, 'All but War Is Simulation: The Military-Entertainment Complex'. *Configurations* 8, no. 3 (2000): 289–335; Nick Dyer-Witheford and Greig De Peuter, *Games of Empire: Global Capitalism and Video Games* (University of Minnesota Press, 2009); Patrick Crogan, *Gameplay Mode: War, Simulation, and Technoculture* (University of Minnesota Press, 2011); Matthew Thomas Payne, *Playing War: Military Video Games After 9/11* (NYU Press, 2016).

[241] Wark, *Gamer Theory.*

[242] By 'commercial paradigm' I here refer to games that are built primarily with market-driven goals in mind.

disrupts the fulfilment of their functional goals—providing targets, loot and narrative direction. However, as the range of videogames constantly expands, and as more games introduce successful abstract gameplays with goals that are atypical (or even lacking entirely), it becomes less and less productive to draw distinctions based on the instrumentality of NPCs.[243] I will address this by re-positioning NPCs as part of cultural imaginaries of autonomous agents and participants in processes of algorithmic superstructuring, rather than from the more instrumental point of view of commercial game design. The sensory and experiential aspects of virtual characters, the figurations, imaginaries and affects, are seen in this chapter as transversal rather than confined to the in-game world. The mechanics of the game-world are guided by specific economic and design decisions, but they are never confined solely to the virtual world. Rather, the in-game experience inevitably spills into the economic, cultural and social fabric of the player's life, producing other cultural encounters—lore,[244] videos, walkthroughs, memes and images.

I argue, therefore, that NPCs are not only symptomatic of the hidden power relations in commercially produced games, but that they also bring new implications for such encounters in contemporary algorithmic culture, especially for media artists and game designers. It is therefore important, for the purposes of the argument, to tease out the commercial paradigm that traditionally creates reward-orientated, competitive, hierarchical, target-based game environments. Following that, I will return to Karen Barad's idea of posthumanist performativity[245] to analyse how the gamespace can be re-imagined as a non-hierarchical local encounter between the player and the NPC. I will outline alternative constructions of the gamespace that borrow from the tradition of artificial life simulators on the example of Ian Cheng's 'live simulations'. I will finally survey the constructions of agency and figurations of non-human subjectivity that exist in independent games, showing how the NPCs evoke the

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[243] See Brendan Keogh, *A Play of Bodies: How We Perceive Videogames* (MIT Press, 2018), for an approach that offers an expanded understanding of videogames that includes the more atypical works alongside the more traditional ones.

[244] In games, 'lore' refers to the entirety of knowledge available about the game universe (usually fantasy or sci-fi), including its history, politics, mythology, art, etc. As this information is rarely available in an organised, unitary fashion in the game itself, it is often collected, systematised and shared by the players.

[245] Barad, 'Posthumanist Performativity'.

questions of alienation and uncanniness, as well as developing further the idea of liveness, and proceed to the discussion of my procedural film *Non-Player Character* (2018–2019)*.*

Gamespace Topology

In the discussion of the intersections of computational and filmic cultures, the game engine presents a particularly productive case study because it explores the predominantly anthropomorphic, realistic space of moving and interacting bodies and objects on screen—the way we usually perceive popular cinema. The game engine is therefore a cinematic agent within computational culture: it facilitates the entry of cinematic technologies into game design by providing tools aimed at perceptual realism—sustaining believable motion, physics, textures, lighting and characters. The game engine is open to modifications, and is highly adapted for cross-platform manipulations, such as importing of models and animations from secondary software, as well as exporting to different hardware. In this sense, within the game engine strategies of 'cinematic' understandings of photorealism as indexical relation to the real come to be substituted and complemented by technical strategies offered by the game engine. As Gurevitch notes, 'automated algorithms provide the spaces, objects and even "camera" with a set of behaviours consistent with the physics of the real world at the same time as they allow for a plasticity in such rules only possible in animation'.[246] In other words, the game engine not only reorganises the traditional space of cinematic montage as quantified objects that can be easily moved and manipulated, for instance in digital animation software such as Maya 3D, but it also automates its functions. It also opens up the process to artists, independent film-makers and game enthusiasts, which can be clearly seen from the widely existing practice of 'machinima', video works recorded 'from within' games or in engines.

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[246] Leon Gurevitch, 'Computer Generated Animation as Product Design Engineered Culture, or Buzz Lightyear to the Sales Floor, to the Checkout and Beyond!' *Animation* 7, no. 2 (1 July 2012): 131–49, p. 134.

The hierarchical construction of the gamespace, as well explored in game and media studies,[247] originally comes from technologies of simulation that were initially developed and funded as military research. For commercial games (and, consequently, for game engines), this has traditionally resulted in a particular aesthetic space, where everything is re-orientated towards a singular perspective of the player. In a warfare-orientated gamespace each object is assigned numerical value and is treated either as a target or a part of environment that can be used to tactical advantage. The user experience becomes the guiding vector, around which the pipeline and the subsequent updating of the game are organised. User experience has traditionally been approached as a two-part endeavour, consisting of gameflow (dramatic structure, pacing and building of reward and motivation) and usability (more practically, initial in-game learning, interface and difficulty levels). Both of these approaches have been largely heuristic until recently, when the data collection, or game telemetry, became a more standard practice.[248] Game telemetry allows one to follow the player's actions on any levels, from movement and decision-making to the smallest behavioural details. Playtime and levelling speed become major indicators that allow one to quickly evaluate the difficulty of the game.[249] The smoothness of the user experience is therefore secured by the game balance, a complex internal rule-set that dictates how the objects, strategies and tactics of the game relate to mathematical coefficients, ensuring that the game is not too easy or too difficult. Thus, in a gamespace, a player exists in a unique, calculable relationship to the NPCs (and/or other players), and within a complex visual economy/ecology that regulates non-human and human game agents alike.

McKenzie Wark's notion of the gamespace (as encompassing both in-game and real worlds) shows how gaming itself can be seen as a metaphor for life within the capitalist media ecology, in which processes of labour and affect are enmeshed in virtual worlds and images. In particular, she underlines the hierarchical character of the gamespace:

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[247] See Lenoir, 'All but War Is Simulation'; Dyer-Witheford and de Peuter, *Games of Empire*; Crogan, *Gameplay Mode*.

[248] See Magy Seif El-Nasr, Anders Drachen and Alessandro Canossa (eds), *Game Analytics: Maximising the Value of Player Data* (Springer-Verlag, 2013).

[249] Ibid.

What topology yields is not a cyberspace but a gamespace. The idea of cyberspace is still too linked to images from the world of radio and television, of flow and 'seamless' movement, of access and excess, of lines running anywhere and everywhere. Topology is experienced more as a gamespace than a cyberspace: full of restrictions and hierarchies, firewalls and passwords.[250]

In an interesting comparison with cinema (which, for her, only exists in the topographical space, one of representation), Wark describes the spatial dimension of the gamespace as topological, conflating the space of movement itself with the space of communication, and becoming instantaneous and homogenising, as well as 'statistical, digital, simulated—algorithmic'.[251] The gamespace consumes the representational—topographical,[252] and turns it into an actionable database accompanied by navigation tools—topological. The storyline is replaced by an algorithm, and the objects and bodies on screen become items in a database.

Unity 3D, the software considered in this research and used for creating *Non-Player Character,* is explicitly marketed as an accessible, 'entry-point' engine. The engine connects to a large network that consists of an online community of game developers and players with accompanying official and unofficial tutorials, an asset store, videos of gameplay, forums and other data. A significant aspect of this access is data collection: Unity's user agreement explicitly states that inbuilt analytics tools will collect both technical data from players and the information on how game developers use Unity software. With among the widest cross-platform compatibilies of all engines (covering over twenty platforms, including mobile), Unity has unprecedented access to user data: in 2016 it counted 770 million gamers.[253] Using this data, Unity 3D improves not only the gameplay, but also the engine itself. The interface and settings that it offers to the developer are already supplied with options that have proven

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[250] Wark, *Gamer Theory*, para. 66.

[251] Ibid.*,* para. 65.

[252] In Wark's example (para. 69), Sid Meyer's *Civilisation*, history and geography (the topographical) are subsumed by the topological (the databases which the game activates). This offers a different situation from simply remediation of old forms—novel, cinema or television. *Civilisation* replaces narrative by recalling appropriate data from the database.

[253] See https://unity3d.com/public-relations, accessed on 16.03.2017

marketable, and the game experience is predefined by the larger infrastructure of military entertainment. Benjamin Nicoll and Brendan Keogh describe this feedback loop as the 'circuits of cultural software' that engage the creativity of the developer in a kind of soft self-governance.[254] The sensible aspects of playing experience become crystallised, made reproducible in the game engine, and distributed as the new games. As Aylish Wood notes in her description of digital animation software Maya, it is not only

> a means for creating computer-generated images, but also a discursive and material site in which the discourses become enmeshed… As such, software ceased to be an abstraction, and is instead an active element with the capacity to persuade and engage users in a particular discourse. In this way, the UI [user interface] operates through a form of governance.[255]

In this sense, if we consider the commercial gamespace as a socioeconomic network, everything within the game is hierarchically tied to the user experience, and the user experience itself is quantified, collected and analysed in order to generate profit in line with the algorithmic superstructuring behind the game. By engaging with the gamespace, the user enters the network of images in which her time, data and attention become subject to capitalist capture. The gamespace acts as a kind of 'self-administered reality'[256] that is enabled by the labour/play of the users. Moreover, the gamespace provides the users with instruments to perpetuate the processes of their own commodification and militarisation: the player contributes to it as both a spectator and a co-creator.[257]

Cultural Imaginaries of Autonomous Agents in the Gamespace

What becomes interesting then are the socio-aesthetic relations that the players create with the game-world and the entities that they perceive as the other participants. The algorithmic superstructuring through the game engine then

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[254] Benjamin Nicoll and Brendan Keogh, *The Unity Game Engine and the Circuits of Cultural Software* (Palgrave, 2019).

[255] Aylish Wood, *Software, Animation and the Moving Image* (Palgrave Macmillan, 2015), p. 32.

[256] Retort, *Afflicted Powers: Capital and Spectacle in the New Age of War* (Verso, 2005), p. 187.

[257] Dyer-Witheford and de Peuter, *Games of Empire*, p. 190; Wark, *Gamer Theory*, para. 111.

needs to be considered in the light of the idea of posthumanist performativity, as a renegotiation of agential borders. Whereas I have previously discussed procedural films in terms of liveness, the gamespace involves an active participation of NPC that are designed to seem like independently acting, lively agents. This also invites an inherently hierarchical reading of the gamespace and its participants. In single-player games, this means engaging, in the first place, with the NPCs that constitute the game-world. In multi-player online games, the competition for virtual resources and rewards often results in the construction of hierarchies (official and unofficial), where success translates into social capital, both in-game and outside of it.

Pointing out the power nodes in the gamespace, therefore, also requires looking not only at the completely autonomous entities such as NPCs, but also bots—player-made or third-party software that automates the game processes by controlling a player avatar. Bots could also be regarded as computer-controlled characters made not to support but to circumvent the socioeconomic network of the gamespace. In multi-player games, bots are often used to collect resources. The internal game economy might require a certain amount of 'grinding' from the players,[258] which openly puts the idea of play-as-labour back in the in-game world in the form of truly tedious work required to achieve game rewards. As the bot's script is often recorded directly from the human player's movement, or uses predefined positions on the map, it can result in monotonous, easily identifiable patterns of behaviour and movement. In such a hierarchical construction, the bots can accrue not just functional, but distinctly dehumanised connotations. The distinction between 'grinding' by players (which is considered 'honest' labour) and cheating this process by using bots becomes particularly problematic in light of the phenomenon of 'gold-farming', the gathering of in-game valuables specifically to sell them for real currency. In the mid-2000s, media coverage of cases of gold-farming by low-paid Chinese workers (and even inmates) in the massive multi-player online role-playing game (MMORPG) *World of Warcraft* revealed how they were subjected to abuse and harassment from Western players, who also represented the main market for the sale of the virtual goods. Nick Yee demonstrates similarities

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[258] 'Grinding' is game slang for repetitive tasks that have to be performed for a certain amount of time in order to unlock game content—for example, killing a particular type of monster over and over for resources or experience points.

between the Western players' prejudice against the Chinese gold-farmers and the real-life historical incidents of Western racism against foreign labour.[259] In the hierarchy of the gamespace, this also means that the Asian gold-farmers were relegated to the status of farmbots, or NPCs who are disruptive to the gameplay and are therefore as disposable as any virtual monster. In her excellent analysis of the racialised depictions of gold-farming in *World of Warcraft* machinimas,[260] Lisa Nakamura notes that the farmers are shown owning exactly the same avatar, 'a male human wearing a red and gold outfit',[261] evoking the idea of cheap and replaceable workers who ultimately present as 'undesirable underclassed social bodies'[262] among other players. I would also suggest that in this relation the metaphor of NPC itself, or a bot, accrues dehumanising connotations in the sense that it marks the actual live humans as 'non-people', as sources of mechanised, automated agency that present a threat to the 'real human' labour Western players understand themselves to be engaged in.

In a different cultural imaginary, this metaphorical move can also be seen in the recent appropriation of 'NPC' as a derogatory term in alt-right and conservative rhetoric in social media, to refer to a caricature of liberals as brainwashed, unable to think for themselves or to think critically. This use of the term was coined on 4chan imageboards in 2016, a popular anonymous image board. In October 2018 the resulting meme went viral, causing Twitter to ban 1,500 newly-made NPC caricature accounts that were portrayed as easily triggered by provocations and only able to provide scripted, unimaginative answers. While NPC as a meme does not specifically pertain to gaming, it is of interest to the present discussion not simply as a meme that equates 'automated' with 'unthinking', but as a metaphor in which a *displacement* of agency takes place, as political expression is eliminated by being pictured as a

[259] Nick Yee, 'Yi-Shan-Guan', http://www.nickyee.com/daedalus/archives/001493.php, accessed online on 04.02.2019.

[260] Machinimas are fan-made videos that are usually produced by recording in-game or by modifying the game engine.

[261] Lisa Nakamura, 'Don't Hate the Player, Hate the Game: The Racialization of Labor in World of Warcraft', *Critical Studies in Media Communication* 26, no. 2 (1 June 2009): 128–44, p. 137.

[262] Ibid., p. 130.

mindless repetition. Moreover, the metaphor also works to re-establish the hierarchy in which the 'NPC' are at the bottom of the social network.

At the same time, the deliberate humanisation of algorithms and devices that occurs in the corporate representation can be seen as inflation of the agency of autonomous entities. As algorithmic services and devices such as Amazon Alexa are increasingly portrayed as humanised, as bots or virtual assistants, they also provide the potential for shifting responsibility for a product onto the product itself. The 2016 case of Microsoft Twitter chatbot Tay is a good example of how subtle such redirection can be. Tay, depicted as a young woman of colour on her avatar, was meant as a self-learning experiment in computer-generated conversational language, but instead quickly adopted extreme language, accumulating racist, misogynistic and anti-Semitic terms and phrases from social media. Media coverage described the bot as a 'neo-nazi sexbot' and 'racist', the artificial intelligence as 'dangerous', and the whole case as 'not a part of Microsoft's plan'.[263] The imaginary agency of the chatbot, in this case, as in many others, works as part of a rhetorical obfuscation that masks the systemic problems of machine bias by shifting the blame onto an anthropomorphic, seemingly autonomous virtual agent.

The cases described above demonstrate how the NPCs and bots inhabit the world of cultural imaginaries, crossing from the gamespace to the real world. As the figure of the NPC enters the social arena online, it contributes to hierarchical relations in the conditions of competition for and accumulation of social capital (such as on anonymous message boards). They also perpetuate the constructions of agency in which they had previously been involved. The figuration of NPCs therefore becomes symptomatic of the processes of dehumanisation within techno-mediations of subjectivity in the shared networks where 'the whole of life appears as a vast accumulation of commodities and spectacles, of things wrapped in images and images sold as things'.[264] Moreover, both in virtual and real environments, the treatment of the scripted

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[263] See Rachel Metz, 'Microsoft's Neo-Nazi Sexbot Was a Great Lesson for Makers of AI Assistants', *MIT Technology Review*, 27 March 2018; John West, 'Microsoft's Disastrous Tay Experiment Shows the Hidden Dangers of AI', *Quartz*, 2 April 2016; James Vincent, 'Twitter Taught Microsoft's AI Chatbot to Be a Racist Asshole in Less Than a Day', *The Verge*, 24 March 2016.

[264] Wark, *Gamer Theory,* para 6.

behaviour as dehumanised is part and parcel of the social and economic processes of alienation, where the 'humanness' of the opposing party is defined by the visible markers of their belonging to the privileged groups. In the case of the gold-farmers, one such marker is the capacity to speak English, and in the case of the alt-right appropriation of 'NPC' as a meme, the marker is simply the adherence to a given set of political values. The humanness of actors within the network cannot be taken for granted but is instead a quality that needs to be assigned. Bollmer cites the example of CAPTCHA as one such test, where '"humanness" as such is not assumed online, but is attributed to a user through a minimal act of pattern recognition'.[265] In the network space, 'one is not born a human (or worker), but, rather, one becomes one on the internet through computational means of differentiation'.[266] Similarly, every time the human player has to identify an NPC as such, she acts on external, audiovisual, cultural and interfacial markers in order to attribute 'humanness' to the thing that she encounters.

Seen in this light, the encounter of humans and non-humans in the networked aesthetic spaces can be surveyed by returning to Karen Barad's 'specifically posthumanist notion of performativity'.[267] In commercial games interactions with characters are heavily regulated in-game. However, considering them in the light of Barad's theory, in which the epistemological boundaries between objects and subjects are continuously redrawn, emphasises the actual encounter, in which players might consciously choose not to follow the prescribed way of interacting. Fan-made content, modifications, bots and YouTube videos can all be examples of this. Therefore, I see the shift from 'agency' to 'agential' and the emphasis on local-ness as useful to surveying the procedural encounters of the players and the NPCs. The gamespace is enabled by the game engine, an apparatus of simulation where the stakes of scientific accuracy might not be at risk, but performance as a non/human and the potential for empathy become of primary importance instead.

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[265] Grant Bollmer, *Inhuman Networks: Social Media and the Archaeology of Connection* (Bloomsbury Publishing USA, 2016), p. 138.

[266] Ibid.

[267] Barad, 'Posthumanist Performativity', p.808.

In cases where the player's agency is limited from the beginning, such as in procedural films, which preclude intentional interaction, encounters with NPCs might produce alternative experiences. The renegotiation of agency can then work as an aesthetic method rather than a given condition. This approach can then be used as an artistic device that contributes towards dismantling traditional systems of representation. Considering the inactivity of the player in posthumanist terms, then, opens up ideas of non-human subjectivities, and building worlds and systems that promote curiosity, reflection and empathy, rather than competition and self-validation.

Independent Games, Artificial Life and Procedural Films

So what happens when the ludic function is completely or partially removed from an environment that is, visually and aesthetically, potentially ludic? Following up the investigations of idle time in the previous chapter, it becomes interesting to consider a space of inactivity produced by the idleness of the player. Where the ludic function is understood as the culture of fast consumption of game and film spectacles, this results in 'slow gaming', a trend Heather Corcoran identifies in the interview with artist Bill Viola about his experimental video game *The Night Journey* (2010). The game mechanics of *The Night Journey* primarily consist of storytelling through exploration. Unsurprisingly, in the framework of the current research, the slow experiences accompany the game engine as surely as they did the screensaver in the previous chapter. Works that have exploration and movement as the main ludic vector made by independent developers, such as *The Path* (2009, Tale of Tales), *Flower* (2009) and *Journey* (2012) (Thatgamecompany), *Dear Esther* (2012, The Chinese Room), or *Proteus* (2013, David Canaga and Ed Key for Microsoft), are mirrored by big companies embracing the trend for the 'open world' games that allow undirected, free player movement and large game-worlds.[268] Slow gaming accentuates the details and the functioning of the world over the process of gratification of achieving the game goals. Bill Viola

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[268] These include, for example, such companies as Rockstar with *Red Dead Redemption* (2010–2017) and *Grand Theft Auto* (1997–2013), Square Enix with *Final Fantasy*, Interplay Entertainment with *Fallout*, CD Projekt RED with *The Witcher*, Konami with *Metal Gear Solid V*, Bethesda Game Studios with *Skyrim*, etc.

describes it as a shift towards a mode of reflection and observation that creates encounters rather than satisfaction:

> First person perspective is not only about line of sight… In cinema, it typically signals a shift to the inner subjective state, as the camera transitions from external optical perception to the inner visions of mental and emotional states of being. One of the core mechanics of *The Night Journey* is the user's ability to 'reflect', that is, to stop and look deeply into some feature in the landscape which in turn reveals a vision of another invisible dimension within that object. Here, the heart of interaction is to slow down and to see past the surface in a process of raw discovery. Looking deeply into things is rewarded, and this is only made possible by momentarily relinquishing control of interaction and giving oneself to vision.[269]

The same mechanics are reflected by David O'Reilly's independent game *Mountain* (2014), a mountain simulator. In a remarkably deadpan way, it does exactly that: the gameplay consists of a mountain floating in deep space. The only actions available to the player are the initial sketch according to which the mountain is generated, changing the camera angle and making bell sounds on the keyboard. Time passes, the weather changes; from time to time, various objects, from trash cans to sports equipment, crash into the slopes. At some point, after 15 to 50 hours, the mountain explodes. The game then ends and can be started again, offering no reward. *Mountain* does not merely simulate the ambient state in the absence of player activity; it engages an active transformation of the user/player into a reflective observer. The only 'character' in the game is the mountain itself. *Mountain* challenges the idea of what a gamespace should be by its quiet absurdity, its over-emphasised centrality in the player's experience and its anticlimactic gameplay. In the culture of fast rewards, it provides a meditative experience that produces a space of (self-)reflection and empathy.

In a manner similar to Galloway's notion of ambient environments as 'living tableaux', game mechanics can also completely exclude interaction, resulting in

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[269] Bill Viola, 'About the Journey, Not the Destination: Slow Gaming and an Interview with Bill Viola', in *Artists Re:thinking Games*, edited by Ruth Catlow, Marc Garrett, and Corrado Morgana (pp. 20–25) (FACT, 2010), pp. 23–24.

procedural films. One example of a procedural film that directly delegates all agency to an NPC is the art simulation *San Andreas Deer Cam* (2015–2016) by Brent Watanabe (mentioned in the introduction). Instead of the main character, the work follows a deer—an animal NPC that continues to follow its normal autonomous operation. Initially the work was livestreamed on Twitch, a popular platform where players can share their experiences in-game. Having an NPC as the main character, however, opened up an experience that is drastically different to normal gameplay. The virtual world is seen from a different position than usual, not tied to in-game goals and directions. Rather, it is shown in its ambient state, in a state of simulation that has been left to run on its own. As the witnessing of such 'internal' logic of the game precludes all interactivity, it re-imagines the game-world as a space where the player's agency is removed. Instead, the procedural agency of the NPC, however limited it might be, becomes the main engine of the aesthetic experience.

The movement of the NPC in games is usually reliant on pathfinding techniques: layers of information expressed as grids, navigation meshes or waypoints, which the pathfinding algorithm uses to locate the best route. In *San Andreas Deer Cam* Watanabe gives the deer the same functions that are already available to a pedestrian NPC, but he also alters them so that the movement is more unpredictable. This includes, for instance, occasional transportation to a random location, which prevents the deer from getting stuck. The scripting of NPCs in *Grand Theft Auto V* is already quite complex and aimed at creating realistic *social* behaviour, which allows the viewer a glimpse into the secret life of the other inhabitants—beachgoers, policemen and bystanders (who at some points attack the deer). In addition, the work was originally shared on a platform used by players to live-stream themselves playing. This set up the perception of the work as an act of anticipating the agency of the 'player'—in this case, the computer itself. The space of presentation in this sense is an integral part of the local encounter of the viewer and the NPCs. All these elements come together to produce an aesthetic experience in which the emergent behaviour and interactions of the characters become the focus point. This artistic reversal of roles leads to an important rethinking of the hierarchical 'topology' of the gamespace, even while in most

role-playing games (RPG) the explicitly emergent behaviour and unpredictability of NPCs still represent too great a financial risk.[270]

Unlike the warfare entertainment paradigm, in the games that are influenced by the field of artificial life,[271] emergent behaviour is encouraged. In the context of the figurations of NPCs, artificial life presents interesting insights for their perception as independent agents. The liveness can be seen as an aesthetic device that closely links to the movement (animation) of the NPCs and arises from their *perceived* agency. Here, procedural liveness requires an investigation into technical and cognitive aspects of posthumanist performativity. As Stacey and Suchman suggest, echoing Barad's approach,

> recognizing the animating power of movement can draw our attention to the possibilities for liveliness inherent in the materialities with which we are entangled, and to differences that matter between the life of incarnate beings and the liveliness of things.[272]

The liveness in artificial life discourse is particularly linked to the movement of the virtual characters, who no longer present as targets but as entities with an agenda.

One of the early biological inspirations for computer systems of artificial life can be seen in John von Neumann's 1949 cellular automata, a model for a self-replicating machine constituted as cells in a grid, each cell being able to assume a finite number of states and to affect the cell closest to it. Von Neumann was working on the design of self-replicating robots at the time. However, it was collaboration with Stanislaw Ulam, von Neumann's colleague at Los Alamos National Laboratory, who was studying the growth of crystals, that prompted the model of self-replication imagined as cells. Von Neumann's model pre-dated raster graphics, mathematically based on pixels, or dots, arranged in a grid, even though in its initial iteration it was only a design drawn on paper.

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[270] Ironically, warfare-orientated games, and especially first-person shooters, can be noted as an exception: the game AI (Artificial Intelligence) systems responsible for warfare activities are a popular field of development, as they do not require extensive or close interaction with the NPCs themselves. The creation of emergent *social* behaviour in commercial games, however, is still, at the time of writing, a niche trend rather than mainstream practice.

[271] From the examples that are more focused on the non-player characters rather than large scale simulations—*Creatures* (1996)*, The Sims* (2000), and recently *Species* (2018).

[272] Jackie Stacey and Lucy Suchman, 'Animation and Automation—The Liveliness and Labours of Bodies and Machines', *Body & Society* 18, no. 1 (1 March 2012): 1–46, p. 31.

One of the first models of self-replicating artificial life visualised on the screen was John Conway's 1970 *Game of Life*, inspired both by a game of go and von Neumann's automata. The game constitutes a simple 2-dimensional grid game with cells that could exist as either 'dead' or 'alive', and evolve after the initial pattern is set by a player. Each generation, or turn, the following rules would apply: any dead cell with exactly three neighbours becomes alive; and any live cell with more than three or less than two neighbours dies, due to overcrowding or loneliness respectively. The rules ensured that the replication of the cells would not fall in either of the two extremes, becoming homogenously disordered or completely empty.[273] The introduction of the game coming at the same time as accessible personal computers made it extremely popular, resulting in players exploring the 'patterns' that could lead to one or another sort of behaviour. The basic patterns that Conway discovered while developing the game fell into static 'still' forms and repeating 'oscillators'. Once launched, the *Game of Life* would develop on its own, leaving the player to watch the patterns' movement.

Artists such as William Latham, Jane Prophet, Karl Sims and others produced what could be considered the first evolution-mediated digital artworks at the end of the 1980s and the beginning of the 1990s, roughly at the same time as the scientific community developed artificial life simulators. William Latham's collaboration with software designer Stephen Todd yielded a series of evolutionary derived digital sculptures, from the first *Coiled Form* (1987), *Artist as Gardener* (1987), *White Horn* (1990) and *Mutator C* (1993) to *Mutator2* (2013), an extension that implemented not just static forms but a real-time environment, accessible online. Latham (1992) remarked of *Mutator C* that it 'derives its methods from processes of nature, and was partly inspired by a simulation of natural selection'.[274]

In Karl Sims' artwork *Evolved Virtual Creatures* (1994), the survivability of the organisms is measured on the basis of fitness of locomotion in a physical environment. As attempts at locomotion are not always successful, the

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[273] Martin Gardner, 'Mathematical Games: The Fantastic Combinations of John Conway's New Solitaire Game "Life"', *Scientific American* 223 (October 1970): 120–123.

[274] Stephen J. P. Todd and William Latham, *Evolutionary Art and Computers* (Academic Press, 1992)*,* p. 2.

movements of the characters, built out of simple geometrical shapes, are perceived either as successful or as a struggle, or sometimes as comical—not unlike the pathfinding struggles of NPCs. Hayles, writing about this work, notes that 'invariably viewers attribute to these simulated creatures motives, intentions, goals, and strategies'.[275] Artificial life representations, as even scientific projects show, always involve the perception of such movement as agential, in some sense. Stacey and Suchman cite Stefan Helmreich's observation of an artificial life program *Artificial Fishes with Autonomous Locomotion* at the fourth conference on Artificial Life in 1994:

> As the audience laughed at the video, and at the movements of these artificial fishes on the screen, it became clear that the 'lifelike' quality of these simulations produced an unease and sense of wonder that was precisely the cultural resource that made these creatures seem lively.[276]

A more recent example, the OpenWorm[277] project that started in 2011, is aiming to become one of the first programs to completely simulate the locomotion of a simple organism (in this case, the roundworm *Caenorhabditis Elegans*). The goal of recreating the whole function by simulating all 959 cells active in the body of the worm is tellingly formulated as building 'the first digital life form'.[278]

What becomes visible from the discussion of the unease produced by the artificial organisms' locomotion is the act of witnessing itself that perpetuates the liveness of virtual characters. As Kember notes:

> What ALife aesthetics emphasises then […] is the *affect* of lifelike behaviour and the experiential existence of intelligent or autonomous agency in the eye/I of the observer. This aesthetic may be as old as the history of automata but it is currently expressed as a factor of biological machines which by definition share agent status with human-animals,

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[275] Katherine Hayles, *My Mother Was a Computer: Digital Subjects and Literary Texts* (University of Chicago Press, 2010), p. 193.

[276] Stacey and Suchman, 'Animation and Automation—The Liveliness and Labours of Bodies and Machines', p. 8; Stefan Helmreich, 'An Archaeology of Artificial Life, Underwater'. in *Genesis Redux: Essays in the History and Philosophy of Artificial Life*, edited by J. Riskin. (University of Chicago Press, 2007), pp. 324–325.

[277] http://www.openworm.org/

[278] Ibid.

but which in the discourses and practices of autonomous agent
research, derive agent status from human-animals.[279]

Kember's observation responds well not only to the conception of 'life' in the sciences in general, and where the agential 'border' is drawn, but also to the dilemma of characterising NPCs as a kind of artificial life. While artificial life may be restricted to scientific models of natural processes, games inspired by Darwinian evolutionary processes, for instance, are still unfolding in the aesthetic field of a simulation. The liveness, meant as a pre-attribution of agential qualities, becomes visible in such works, even if the player's position is one of the all-powerful creator/voyeur. The affect produced by the autonomously operating virtual characters is often explained by the well-known effect of the 'uncanny valley', proposed in 1970 by robotics engineer Masahiro Mori, which described a strong sensation of eeriness at witnessing human-like replicas. While initially the effect was linked with the appearance of its instigating object, a study by Stein and Ohler suggests that it might also be a case of cognitive dissonance, tied to the fact that the viewer can have a prior categorisation of the subject as human or non-human, and accordingly attributes agency and the ability to feel emotions.[280] In the study, four groups of participants were shown the same scene, built in Unity 3D: a dialogue between two virtual human characters in a VR environment. The information given to the groups differed in the following respects: that the characters were controlled by a human operator or by a computer; and that the dialogue was generated live or scripted. The study showed that the group which found it the most eerie was that which was told that the dialogue was improvised and was a result of autonomously working AI, confirming the study's initial suggestion that there is also an 'uncanny valley of the mind',[281] as the authors put it.

A similar unease can be seen in the discussion of special effects and digital animation. As Aylish Wood points out in her investigation of computer-generated animation software, moving images can reveal traces of their digital origins,

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[279] Sarah Kember, *Cyberfeminism and Artificial Life* (Routledge, 2003), p. 130.

[280] Jan-Philipp Stein and Peter Ohler, 'Venturing into the Uncanny Valley of Mind—The Influence of Mind Attribution on the Acceptance of Human-Like Characters in a Virtual Reality Setting', *Cognition* 160 (March 2017): 43–50.

[281] Ibid., p. 43.

something that she calls 'digital contours' that 'add another affective dimension to our experience of moving images'.[282] Leon Gurevitch, describing the computer graphics of biological kinematics in *Finding Nemo* (2003), *Shark's Tale* (2004), *Antz* (1998) and *A Bug's Life* (1998), notes:

> In all these features, the animation supposedly deals with the natural world, but in all cases the teeming masses of animated objects betray a certain industrial and mass-produced nature. What is apparent in the mass-produced quality of these features, that betrays their synthetic nature, is the fact that nonhuman automation has clearly played a large part. The task of rendering and animating so many hundreds of thousands of objects, characters and environments would be so large for analogue animators as to be near impossible. Instead, what the viewer beholds is a composite of animated and simulated image forms only made possible by the synthetic means of computer automation.[283]

From this description, it becomes clear that the technical aspects of perceptual realism in digital animation cannot be accounted for just by laying computer graphics out on the commercially orientated scale that ranges through various stages of perfection—from 'schematic' to perpetually imperfect (framed as a still-imperfect tool), to 'indistinguishable from real' and further to 'hyper-real'.

Following the discussions in artificial life and computer graphics, the procedural liveness of the moving image could be approached from different positions. Even if the procedure is regarded in its instrumental, functional capacity, it can be still seen as actively remaking the human counterpart. Dan North notes that

> special effects can be perceived by their mechanical idiosyncrasies or deficiencies, by inadequacies of their manufacture, or by simple acknowledgment of impossibility…but these are not truly *failings* of the technology or the technicians. Rather, they are points of access for the spectator's critical engagements with the film on the technical level.[284]

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[282] Wood, *Software, Animation and the Moving Image*, p. 10.

[283] Gurevitch, 'Computer Generated Animation', pp. 134–135.

[284] Dan North, *Performing Illusions: Cinema, Special Effects and the Virtual Actor* (Wallflower Press, 2008), p. 5.

The instrumentality of the procedure becomes a point of emancipation of the viewer, given the critical engagement. Alternatively, procedural liveness in artificial life is a more radical renegotiation. Historically, one of the stronger claims within the field of artificial life is the potentiality of seeing it not as a replication of existing process but as a process of life in its own right. In his discussion of behavioural 'phenotypes' in artificial life, Langton (1993) suggests that 'the "artificial" in artificial life refers to the component parts, not the emergent processes. If the component parts are implemented correctly, the processes they support are genuine—every bit as genuine as the natural processes they parallel'.[285]

Jane Prophet and Helen Prichard describe the progression from 'weak' to 'strong' conceptions of artificial life as a shift in agential position. The former 'is built around a human protagonist (programmer) breathing life into technical artifice, writing a lifelike program that potentially exceeds the programmer's rules by displaying emergent behaviour', and the latter suggests that it is possible to create life with different media, computational, chemical or other, if the definition of life is focused 'on the usefulness of seeing life as dynamic processes intra-acting with their environment'.[286] In art simulations, concern shifts from the authenticity of the processes towards their perception by the human observer and qualities such as complexity, movement, figuration into recognisable patterns. Liveness therefore presents as a complex co-articulation of the technical aspects of the simulation, movement on screen and pre-attributed agency. Emergence implies that properties or programs appear on their own, often developing in ways not anticipated by the person who created the simulation. Structures that lead to emergence typically involve complex feedback loops in which the outputs of a system are repeatedly fed back as input. As the recursive looping continues, small deviations can quickly become magnified, leading to the complex interactions and unpredictable evolutions associated with emergence.[287]

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[285] Christopher Langton, *Artificial Life*, section 6.5 'Genuine Life in Artificial Systems'.

[286] Helen Prichard and Jane Prophet, 'Performative Apparatus and Diffractive Practices: An Account of Artificial Life Art', *Artificial Life* no. 21 (2015): 332–343.

[287] Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics* (The University of Chicago Press, 1999)*,* p. 225.

The liveness of the NPCs is the main drive behind *Emissaries*,[288] the trilogy of live simulations by Ian Cheng. *Emissaries* presents virtual environments made in the game engine Unity 3D and filled with NPCs whose behaviour is generated live according to an evolutionary-inspired algorithm. Throughout the trilogy, the viewer develops a profound sense that the characters on the screen live their own life. This is especially prominent in *Emissary Forks at Perfection* (2015–2016), where it is supported by a narrative and the way the characters look and move. In a future where humanity has already become extinct, an artificial intelligence Talus Twenty Nine controls evolution or, as Cheng puts it, is 'compulsively gambling'[289] on its outcomes. As such, the narrative also works as a meta-narrative for the simulation itself, as the gamble takes place each time the work runs a new cycle. The narrative (or, rather, its rough outline) repeats each run: a dead body of what seems to be a 21st-century human celebrity is dug up, and Talus Twenty Nine sends the Shiba Emissary, its super-pet, to guide the zombie-like human figure through the generative landscape of its world. The lush surroundings are what was previously a site of a massive catastrophe (an erupting volcano in the prequel, *Emissary in the Squat of Gods*), which Cheng describes as a 'fertile Darwinian playground'[290] where the characters and the land can evolve, interact, and play out emergent variations that constitute the basis for the work. And as Nora Khan notes, 'this world can run on indefinitely, with no end state, and no final form'.[291]

In a talk at the Whitney Museum of American Art, Cheng said that the first experiments with the game engine were fuelled by a desire to create 'a video game that plays itself'.[292] All three of the works, as described by Cheng, contain a live simulation and a story, which 'threaten to destabilize and mutate one

[288] The *Emissaries* trilogy consists of *Emissary in the Squat of Gods* (2015), *Emissary Forks at Perfection* (2015–2016), and *Emissary Sunsets the Self* (2017).

[289] http://iancheng.com/, accessed on 15.01.2018.

[290] Ibid.

[291] Nora Khan, 'No End State: Ian Cheng's Live Simulations', lecture, 'New Ways to See: Digital Art Criticism Now' at Whitney Museum of American Art, New York, November 29, 2016. https://www.youtube.com/watch?v=TAgoFaR98cE

[292] Ian Cheng, talk in 'New Ways to See: Digital Art Criticism Now' at Whitney Museum of American Art, New York, 29 November 2016.

another into new patterns of behavior'.[293] Within this dichotomy, the traditional figure of the NPC is re-imagined as the Emissary, a 'narrative agent',[294] the force that changes the story, rather than following it. The NPC is therefore a figure that challenges the human viewer. The complexity and unpredictability of the environment constantly disrupt any attempts to make sense of the narrative or motivations or reasons behind the NPC's behaviour, resulting in an interesting balancing act where the viewer is simultaneously both alienated by and attracted to what is happening on the screen.

Cheng's position in a sense approaches the concepts suggested by the field of artificial life. His idea of simulation expands beyond 'contained nature' or a copy of existing processes; he suggests that, paradoxically, the simulation has a better access to the 'real' of the world than human beings. For him, the causal 'forking' of his work belongs to 'the real' of the world, to which we as human beings only have a limited access:

> For humans eager to touch outside their own humanness, or for humans who long for a closer relationship to reality's messy dynamics, an open-ended simulation may provide a new kind of exercise. The game is called Forking at Perfection: As the simulation produces change after change after change before you, and emergent behaviors and perceivable truths parade into your neocortex, you resist the awe of discovery, the stress of chaos, the delight of mutation, and the temptation to satisfactorily walk away then and there with new knowledge or ideas. Those are just human-scaled trophies. Instead, fork that feeling like nature forks perfection and keep the simulation in play. For learning to love this forkish feeling is learning to love the vulgarity of being alive is learning to love simulation and simulation might be all we ever really got.[295]

Suggesting the 'forking' as a dynamic in its own right brings us back to the discussion of algorithmic superstructuring as procedural remediation. Procedural films can be seen in the same light as oscillation between the algorithmic function and animation. As Pasi Väliaho notes in *Biopolitical*

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[293] http://iancheng.com/#simulations, accessed on 03.01.2019.

[294] Ibid.

[295] Ian Cheng, 'Simulation: Forking at Perfection', *Mousse Magazine* 49, Summer 2015.

Screens, 'computer-generated images such as the ones we encounter in video games and virtual reality applications seem to function less like optical processes and more like the affective-cognitive processes associated with hand-eye coordination and with the brain's capacity to simulate'.[296]

The discussion of the dynamic between the perception of liveness and its technical apparatus therefore leads to an interesting consideration of oscillation between the filmic and the algorithmic in procedural films. Procedural autonomy of NPCs is normally regulated by a limited set of elements: animation sequences, behavioural trees and realistic physics of light and movement. As can be seen from the discussion of artificial life, independent games and visual effects, however, even simple means are sufficient to create an illusion of liveness, or even life. In this, procedural films that rely on the apparatus of simulation, resonate with the theories of animation, in which the plasticity and movement themselves are sufficient to evoke liveness. In a seminal quote, Eisenstein, writing on Disney, describes this feeling in the following way:

> We *know* that they are . . . drawings and not living beings.
>
> We *know* that they are . . . 'miracles' and tricks of technology, that such beings don't really exist.
>
> But at the same time:
>
> We *sense* them as alive.
>
> We *sense* them as moving, as active.
>
> We *sense* them as existing and even thinking![297]

Eisenstein clearly identifies the gap between rational perception and affect. The animating power of moving image does not cancel out its rationalisation but acts independently as direct impact on the senses. In this sense it also approaches the previous elaboration of posthumanist and technical aspects of affect. Where gamespace easily relies on uninterrupted cinematic illusion to immerse its viewers/players, it also disrupts as easily when processing power or

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[296] Pasi Väliaho, *Biopolitical Screens: Image, Power and the Neoliberal Brain* (MIT Press, 2015).

[297] Sergei Eisenstein, *Eisenstein on Disney*, edited by Jay Leyda (Seagull Books, 1986), p. 55.

Image 8. Screen capture from *Non-Player Character* (2019).

bandwidth proves insufficient and the gamespace 'lags'.[298] Such technical glitches constitute the gamespace alongside other elements, and can also be re-appropriated as artistic methods. The liveness then both 'proceeds', in the sense of the original Latin meaning of the word 'procedure', and breaks the perceptual realism.

Non-Player Character (2018–2019): Procedural Film

The artistic work that I have undertaken as a part of my research into game engines developed as an investigation of autonomy re-imagined as reflective practice. The procedural film *Non-Player Character* presents a mechanical automaton, *Tipu's Tiger*, re-made in a gamespace. The documentation can be found in Practice Overview and Documentation section of the current thesis, pages 164—166. A larger context for the work comes from *Tiger Bones,* a lecture-performance first written in 2016 and then re-written in 2018. In many aspects it outlined the ideas that led to the creation of *Non-Player Character*;

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[298] 'Lagging' occurs when the game system works at a noticeable delay between the player's action and the environment's response (for example, in online games lagging might exist between the server that houses the game and the player's computer).

Image 9. Automaton Tipu's Tiger, ca. 1793. © Victoria & Albert Museum.

the second version specifically explored the succession of cultural imaginaries of the tiger, culminating in *Non-Player Character.* For this reason, I include the lecture for reference, as a part of research and investigation for this work,[299] but I do not consider it a part of the argument about procedural films.

The main character of Non-Player Character is based on a mechanical tiger made for Sultan Tipu of Mysore, India, in the late 18th century (Image 9). Tipu spent 17 years of his rule fighting against the British East India Company. *Tipu's Tiger* is an almost life-size scene of a tiger attacking a white man, presumably a soldier, reaching for his throat. At the end of the fourth Anglo-Mysore war, in May 1799, Sultan Tipu was killed during the Siege of Seringapatam, and in 1800 the automaton was despatched to London along with other loot. It became a popular exhibit in East India House, the company headquarters, changed locations several times in the process of the company's dissolution, and was finally moved to South Kensington Museum, re-named the Victoria and Albert

[299] See Practice Overview and Documentation section of the current thesis, p. 168.

Museum in 1899.[300] It can still be seen on display as a part of the permanent collection of the V&A.

Tipu's Tiger is an example of the image prized for its symbolic power. The automaton's historical trajectory can conceivably be seen in gamespace terms, where the symbolic power of images enables real socioeconomic relations. Re-imagined as an NPC, it gains new agency within a new set of relations to the world it inhabits. The mechanical automation gives way to the programmed automation of movement not restricted by the demands of the game balance. As the mechanical automation of the 18th-century automaton gives way to the movement of a 3D model, the affective space similarly shifts from the space of conquest, to the space of reflection or even boredom.

The original automaton was conceived as a musical instrument. The inside of the tiger conceals a mechanical organ that can be operated by two people: one to turn the handle that moves the bellows (as well as the man's arm and the tiger's ear), and the other to play the keyboard with button keys made of ivory. The sounds are meant to reflect the man's moans and the tiger's growling.

The virtual re-imagining of the tiger also re-instates it as a generative musical work. The coding of *Non-Player Character* was done in collaboration with Rob Homewood, the 3D-modelling by Zoë O'Shea, and the library of sounds was created by composer James Wilkie, combining new fragments with the sounds derived from the recordings of the original automaton's operations. The tiger in the work walks through a symbolic forest, with birch trees that extend vertically throughout the space that does not have any typical representation for the 'floor'. As the tiger walks, the sounds activate and are attached to 'invisible objects'—a technique often used in game design in order to facilitate the operation of various effects.[301] These objects attach themselves to the closest trees at random, leading to a processual generative composition that not only depends on the tiger's movements and its stops, turns and disappearances, but which is also spatialised, as any potential viewer, given an appropriate sound system, would be able to sense the distribution of the sounds in space around

[300] Susan Stronge, *Tipu's Tiger* (V&A Publishing, 2009), pp. 65—71.

[301] For a particulary 'animist' explanation, see Nathan Grayson, 'The Invisible Bunnies That Power World of Warcraft'. *Kotaku*, 24 January 2017. https://kotaku.com/the-invisible-bunnies-that-power-world-of-warcraft-1791576630.

her. This presents a curious inverting of the original automaton's mechanism, with 'pipes', or sources of sounds, being re-made as environment, rather than being placed inside the musical instrument.

The random operation of the tiger is limited. It is reduced, essentially, to the gesture of walking and several other options—turning, stopping and disappearing. The perlin noise algorithm,[302] a popular tool in procedural content generation, is used to produce random values, which are then inserted into scripts controlling the tiger's speed, the rate at which it turns and the camera rotation (Image 10). The camera movement also repurposes the script that was initially created for feeding the values from the mouse input (rotation and zooming in and out with the mouse wheel) into the virtual camera, as normally happens in interactive game environments. In *Non-Player Character,* the camera moves are controlled at random. The tiger also switches between several states, which are determined by a simple random number generator. A similar repurposing of previous assets can be seen in the model of the tiger itself. The initial 3D model was acquired from Unity's asset store, a large depository for ready-made solutions, models, datasets and plug-ins that simplify a game's construction. It was based on a realistic animal, which my collaborator Zoë O'Shea modified so that it started to resemble the wooden automaton. There is a certain contradiction in the tiger's model. The texture is recognisably that of a wooden surface but the movement corresponds to that of the anatomically realistic animal. The dataset can be alienated from the original model and superimposed over any other 'rigged' skeleton.[303] The gamespace in this sense also becomes a space of ready-mades, where various data and commercially made elements can be remixed into a required configuration.

Non-Player Character also creates a large amount of reflection and new research contexts. While developing this work, I considered two other strategies for aligning the procedural aspects of the film with the technical conditions of game engines. One strategy was actually to involve one of the existing games

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[302] Adrian Biagioli, 'Understanding Perlin Noise', 2014. https://flafla2.github.io/2014/08/09/perlinnoise.html.

[303] Rigging, in the most basic sense, is a technique of creating a 'skeleton' for a 3D model. As it allows the 3D model to move much in the same way that a puppet for animation can be moved, it can be used to create a realistic range of movement that is coherent to the in-game laws of physics and the model's 'anatomy'.

```
// Function to generate noise used to drive the camera
    void MoveGenerator()
    {
        _xNoise += 0.001f;
        _yNoise += 0.001f;
        float xMove = Mathf.PerlinNoise(1 + _xNoise, 2 + _yNoise);
        float yMove = Mathf.PerlinNoise(100f + _xNoise, 200f + _yNoise);
        float dMove = Mathf.PerlinNoise(1000f + _xNoise, 2000f + _yNoise);
        AutoX = Utils.RangeRemapClamped(xMove, 0f, 1f, -0.1f, 0.1f);
        AutoY = Utils.RangeRemapClamped(yMove, 0f, 1f, -0.1f, 0.1f);
        AutoD = Utils.RangeRemapClamped(dMove, 0f, 1f, DistanceMin,
DistanceMax);
    }

    // Function to drive the camera movement
    void LateUpdate ()
    {
        if (Target)
        {
//              _x += Input.GetAxis("Mouse X") * XSpeed * Distance * 0.02f;
//              _y -= Input.GetAxis("Mouse Y") * YSpeed * 0.02f;

                _x += AutoX * XSpeed * Distance * 0.02f;
                _y -= AutoY * YSpeed * 0.02f;

                _y = ClampAngle(_y, YMinLimit, YMaxLimit);

                Quaternion rotation = Quaternion.Euler(_y, _x, 0);

//              Distance = Mathf.Clamp(Distance - Input.GetAxis("Mouse
ScrollWheel")*5, DistanceMin, DistanceMax);
                Distance = AutoD;

                RaycastHit hit;
                if (Physics.Linecast (Target.position, transform.position, out hit,
_layerMask))
                {
                        Distance -=  hit.distance;
                }
                Vector3 negDistance = new Vector3(0.0f, 0.0f, -Distance);
                Vector3 position = rotation * negDistance + Target.position;
                transform.position = Vector3.SmoothDamp(transform.position,
position, ref _velocity, SmoothTime);
                transform.LookAt(Target);
        }
    }
```

Image 10. *Non-Player Character.* Source code. The previous script's functions are commented out, and perlin noise is introduced.

with the already developed set of relations. This, like in Brent Watanabe's work, would probably work as a shortcut for connecting the space of the artwork to the mixed ecology of the game engine that I explore in this chapter. The other strategy was creating a system relying on external generative process (such as Nicolas Maigret's *Pirate Cinema*), including the sociopolitical space, by direct involvement of procedurally analysed data. While I am still exploring both strategies for other works, in the case of *Non-Player Character,* I chose to underline the isolated, minimalistic character of the environment. What I was interested in is the *filmic* experience of the gamespace, and I felt that this required a certain amount of distancing from the practices of machinima and modding that both rely on existing games.

Non-Player Character was also created as an experiment in re-articulation. If Tipu's Tiger can be considered as a historical case of a non-player character, then its virtual re-make becomes an algorithmic automaton. Where the original had French mechanism installed,[304] the virtual one borrows algorithmic ready-mades from the asset store. Similar to the original, it has clearly defined rules and a limited range of freedom. However, even small amounts of randomness injected into work result in liveness. In this sense, *Non-Player Character,* as a re-articulation of re-articulation—from a live tiger to a virtual one—opens up potential for techno-animist considerations of procedural films.

In live simulations and other works made with the help of game engines, seemingly opposite vectors converge: liveness as a unique quality of animation, as affective power of mutating and shifting; and liveness as scientifically inscribed life—formalisation and quantification of the bodies and bodily movement. In this chapter I have addressed the idea of gamespace as a topological network that includes human and non-human participants. I have explored the affective spaces in independent games, artificial life and artistic simulations in order to see how procedural autonomy can be articulated in relation to virtual characters. Finally, I have outlined the concept of my artistic work *Non-Player Character* in relation to these investigations.

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[304] According to Arthur Ord-Hume, 'Tipu's Tiger - Its History and Description - Part I', *Music and Automata* 3, no. 9 (1987):24-25.

Conclusion

In this thesis I put forward the idea of 'procedural films' and proposed a conceptual framework in order to investigate their affective and critical potential. In so doing, I analysed them as techno-cultural artefacts implicated in broader sociopolitical design of time and human experience. Seeing them in the context of filmic-algorithmic affective entanglement, and addressing algorithmic autonomy as an important factor in this context, led to a renegotiation of the spectatorship models as discussed by film studies, as well as the ideas of film perception, duration and temporality. I conducted a theoretical and artistic investigation of the two case studies, the screensaver and the game engine. Through these the thesis also engaged with broader questions posed by the automation of cultural processes, exploring the role of autonomy in filmic/ algorithmic affect in the sociopolitical design of the technical apparatuses, and in the various cultural imaginaries that they produce.

These questions have been shaped by an interest in the ways in which algorithmic logic can enter the space of filmic experience in artistic practice, and how artistic practice, in its turn, can interrogate the political aesthetics of this intersection. The research also aimed to address the gap between the related, but rarely articulated in terms of this relation, areas of media art and experimental moving image. Addressing this gap, the thesis aimed to produce not only a conceptual framework for procedural films within the boundaries of my own artistic research practice, but also as framework that could be applied to broader scope of generative techniques in media art, and as an investigation of autonomy as affective space, which could be extended to other considerations.

My artistic and curatorial work informed the investigation. In order to reflect the intertwined positions of theory and practice, I have structured the thesis as a progression from establishing the frameworks and operational concepts to an investigation of the case studies, drawing on and developing concepts initiated by my curatorial work in the third chapter, and including the discussions of my own artworks in the last two chapters.

In the first chapter I set out the initial framework for the investigation of procedural films as techno-cultural artefacts, with an emphasis on filmic-

algorithmic entanglement and on algorithmic autonomy. By investigating the idea of spectatorship, I proposed an alternative conception for an 'apparatus' of procedural films, drawing on work of Karen Barad. The posthumanist renegotiation of the traditional positions of the film and the film's spectator then opened the space for considering the material and technical construction of affect.

In order to do this, in the second chapter, I analysed the construction of affective space-time in procedural films. Where affect can be considered as pre-individual, as I argued, one can also see it as technical. In this way, the externality of filmic/algorithmic affect is channelled by the autonomy of algorithmic performance, and by the imaginary 'inhumanity' of the material processes involved. Developing this concept, I outlined a genealogy of autonomy in moving image practices, drawing on the practices of structural film-makers and the algorithmic generative techniques in contemporary art practices. I demonstrated how algorithmic affect is characterised by liveness and driven by the specific logics of the technical apparatus behind the film, and situated the practical aspects of my own artistic methodology in relation to the renegotiation of agency between the viewer and the work.

In the third chapter, drawing on Rancière's notion of the 'distribution of the sensible' and on discussions of algorithmic governance in my curatorial work, I developed the concept of algorithmic superstructuring. In doing so, I addressed the question of political aesthetics as a procedural algorithmic remediation and investigated how algorithmic autonomy operates within algorithmic governance. I argued that seeing software artefacts in algorithmic networks, processes of labour and design, processes of distribution of affect, reveals the critical capacity, motivations, agencies and imaginaries of the participants involved, including media artists.

The next two chapters were dedicated to the investigation of the two case studies from my artistic practice. In the fourth chapter I analysed the sociopolitical design and affective space-time of the screensaver. I have initially outlined the screensaver's multiple iterations as a feature for protecting hardware, as a decorative object and as an object of nostalgic curiosity. I addressed the screensaver as a technical artefact situated at the intersections of human labour and bureaucratic design of time and experience, revealing the fascinating temporalities of idle and productive time. Where the attention

economy and the techno-capitalist acceleration of productivity have encroached on every instance of idle time, the screensaver remains an enigmatic artefact, a space where boredom, reflection and un-productivity constitute the affective space-time. In the discussion of my artistic work, I have constructed this space in two ways. The procedural algorithm of *Chronic Film* constructs a meditative space of reflection much in the same way that the screensaver does, drawing on the idea of techno-materialist construction of images as signals concealed in the noise. The lecture-performance *Chronic Film* takes this idea further, constructing a space of reflection by a radical re-imagining of the traditional cinematic model of spectatorship. By enacting the idea of mental images, and by letting them be derived from the visual noise of the algorithm, the lecture-performance presents a cognitive structuralist investigation of algorithmic generative procedures in the space of filmic/algorithmic affect.

In the fifth chapter I addressed the media artefact of the game engine. Drawing on the work of McKenzie Wark, I outlined the topological construction of the gamespace as transversal network of affects, figurations and imaginaries, where the sociopolitical design of the technical apparatus and the agencies of game corporations engage in the regulation of human and non-human participants. Based on these findings, I have further investigated the construction of power relations and imaginaries of autonomy through the figure of the non-player character. Here, I relied on Karen Barad's notion of 'posthumanist performativity'[305] and theories from the field of artificial life in order to suggest a non-hierarchical model of encounter with non-human agents. Finally, I extended the discussion to include my artistic work *Non-Player Character.* The development of the work—essentially, the process of reconfiguration of the mechanical automaton into an algorithmic one—also contributed to the idea of procedural films as complicated networks of human and non-human agents. While the interest in non-player characters has informed my practical and theoretical investigation from the beginning, the development of this work opened up additional questions of randomisation, algorithmic ready-mades and techno-animism.

The motivation for exploring procedural films was fuelled not only by their marginal status as objects of study. Exploring algorithmic autonomy becomes

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[305] Karen Barad, 'Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter', *Signs: Journal of Women in Culture and Society* 28, no. 3 (1 March 2003): 801–31.

especially important in the moment where advanced processes such as machine learning and big data analytics are used in the creation of various 'intelligent' machines, virtual assistants and chatbots. The investigations of how they are sustained by filmic and algorithmic affect in the current thesis become increasingly relevant. In light of overwhelming marketisation of such processes by the large corporations who remain stakeholders in big data collection and development of proprietary algorithms, the calls for raising media literacy and de-mythologising of the discourses of technology gain prominence.

By bringing the political aesthetics of procedural films to the fore, the thesis prepares the ground for further practical and scholarly pursuits. Investigating the game engine as a tool for artistic research has provided me with further plans, drafts and artwork proposals. In particular, in the next year I will be undertaking a re-articulation of my film *Data Field* (2018) as a game environment. The film constructs a posthumanist version of the intersections of my family history with the history of Soviet Union, in particular, through the figure of the old wooden village house that was built by my great-grandfather in 1918. Re-articulating these sites of memory and history as procedural spaces will be, in essence, a continuation of direction already hinted at in *Non-Player Character,* which engaged with the mechanical tiger as a historical case of non-player character.

Another unexplored investigation of procedural films lies in the important topic of machine learning, its relationship with moving images and the specific task of video frame prediction. While I have briefly touched upon the topic in my study of algorithmic superstructuring, there was not enough time and space to engage with it within the scope of my practice. This was partly owing to the fact that the techniques themselves are still in the early stages, and that the relevant technical papers making them accessible have been published in the last several years.[306] The cultural and media archaeological investigation of frame

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[306] See, for instance, Carl Vondrick, Hamed Pirsiavash and Antonio Torralba, 'Anticipating Visual Representations from Unlabeled Video', in *The IEEE Conference on Computer Vision and Pattern Recognition (CVPR)* (2016), pp. 98–106; T. Xue, Jiajun Wu, Katherine Bouman and Bill Freeman, 'Visual Dynamics: Probabilistic Future Frame Synthesis via Cross Convolutional Networks', in *Advances in Neural Information Processing Systems* 29, edited by D. D. Lee, M. Sugiyama, U. V. Luxburg, I. Guyon and R. Garnett (pp. 91–99) (Curran Associates, Inc., 2016); Ruben Villegas, Jimei Yang, Yuliang Zou, Sungryull Sohn, Xunyu Lin and Honglak Lee, 'Learning to Generate Long-Term Future via Hierarchical Prediction', in *Proceedings of the 34th International Conference on Machine Learning—Volume 70* (pp. 3560–69) (JMLR.org, 2017).

prediction techniques, however, would be an immense contribution to the considerations of autonomy and affect in procedural films.[307]

Procedural films, both as a framework for investigating techno-cultural artefacts, and as artistic practice that explores the autonomous algorithmic affect, can take on the task of de-mythologising the various imaginaries of technology, as well as of deliberate use of such mythologies, as I showed in my research. My hope therefore is that not only this thesis could contribute to further recognition of procedural films as unique and under-explored objects of study, but also potentially be useful to other practitioners, to contribute to the understanding of how exactly the blackboxing of technology happens, and what role various visuals, mythologies, fictions and imaginaries play in the construction of technology.

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[307] For example, see Gil-Fournier and Parikka, 'Visual Hallucination of Probable Events' (Routledge, 2020/2021).

Practice Overview and Documentation

This section contains the overview of the practical component of the current thesis, and provides an expanded description of the materials submitted. Where the thesis draws on my artistic or curatorial practice, this section serves as a reference in the same way that the bibliography does for theoretical works, and can be consulted for illustrations, further links and clarifications. The sections are dedicated to the three bodies of work: *Algorithmic Superstructures* concept; procedural film and lecture-performance *Chronic Film* (2018); and procedural film *Non-Player Character* (2018-2019). I also provide a brief description of the works that are referenced in the thesis, but are not a part of practical submission.

Algorithmic Superstructures

IMPAKT Media Art festival, October 2018, Utrecht, The Netherlands

The research conducted within the conceptual framework of *Algorithmic Superstructures* is a part of the argument of the current research, and applies to both artistic and curatorial aspects of my work. The initial research done for IMPAKT festival Algorithmic Superstructures, however, only applies insofar as it served as a starting point and a breeding ground for the ideas that I have developed and presented in the third chapter. For this reason, I attach the initial concepts and information on the festival for reference and documentation purposes, and as a research record.

   My share of responsibilities in curating the festival reflects my skillset as artist-researcher, film-maker and educator. I coined the term 'algorithmic superstructures', and together with Yasemin Keskintepe we developed the concept. I was also responsible for the larger part of education programs for the students of Utrecht School of the Arts (HKU) and Royal Academy of Art in The Hague (KABK), and curated the film program. For the outline of the film program, please see the brochure submitted as the practice component.

Image 11. Festival Poster. IMPAKT 2018.

INHOUDSOPGAVE
TABLE OF CONTENTS

Image 12. Festival Catalog, Table of Contents.

Festival Description

Algorithmic superstructures are looking over your shoulder. Moving as you move, determining what you see, anticipating what you desire, they construct the reality around you. How and when did that happen, and why haven't we noticed?

Algorithmic superstructures reimagine the world as a matter of computational design. Caught in the interconnections of opaque operating systems, created in pursuit of profit and control, we have become streams of data subjected to continuous analysis.

As the democratic foundations of our society are being actively hollowed out and populist rhetoric takes over public space, protocols and interfaces come to govern our experiences, aspirations, life decisions and even politics. The IMPAKT Festival 2018 explores the architecture behind algorithmic superstructures. What hidden realities and new imaginaries do algorithmic superstructures uncover in the post-truth era?

Algorithmic Superstructures offers you a diverse programme of art, technology and media culture.

The IMPAKT Festival 2018 is curated by a team consisting of Luba Elliott (UK), Alex Anikina (UK/Russia) and Yasemin Keskintepe (Germany).

Educational Programs

May 22, 2018: guest lecture *Algorithmic Superstructures* and tutorials for the students at MA Non-Linear Narratives at the Royal Academy of Art (KABK) in the Hague, Netherlands.

June 17-22, 2018: 5-day workshop *Algorithmic Superstructures* for undergraduate students of HKU University of Arts, Utrecht, Netherlands. Workshop's themes - 'Black Boxes for Fiction Makers', 'Post-truth, Soft Power and Algorithms', 'Post-Truth Methodologies' - engaged with the artistic strategies of addressing the conditions of algorithmic governance and social media populism.

Image 13. Workshop Algorithmic Superstructures for undergraduate students of HKU University of Arts, at the IMPAKT Centre for Media Culture. June 17, 2018.

List of Materials Supplied as Practical Component with the Thesis

- *Algorithmic Superstructures.* Festival brochure. Filename: IMPAKT2018-booklet.pdf

- 'Algorithmic Superstructures, IMPAKT EVENT', Festival theme presentation on May 23, 2018, IMPAKT Centre for Media Culture, Utrecht, Netherlands. Video documentation. Filename: Algorithmic_Superstructures_IMPAKT_Festival_Theme_Presentation_May_2018.mp4

List of Additional Materials Accessible Online

- Festival archive https://impakt.nl/festival/2018/

- Video documentation of festival panels, keynotes and talks: https://www.youtube.com/user/ImpaktChannel/videos

- Algorithmic Superstructures exhibition documentation: https://www.youtube.com/watch?v=Q2Q0ybSZq5o

- *Algorithmic Superstructures*, podcast in collaboration with Serpentine Gallery: https://radio.serpentinegalleries.org/podcasts/on-work/on-work-episode-8-algorithmic-superstructures/

***Chronic Film* (2018)**
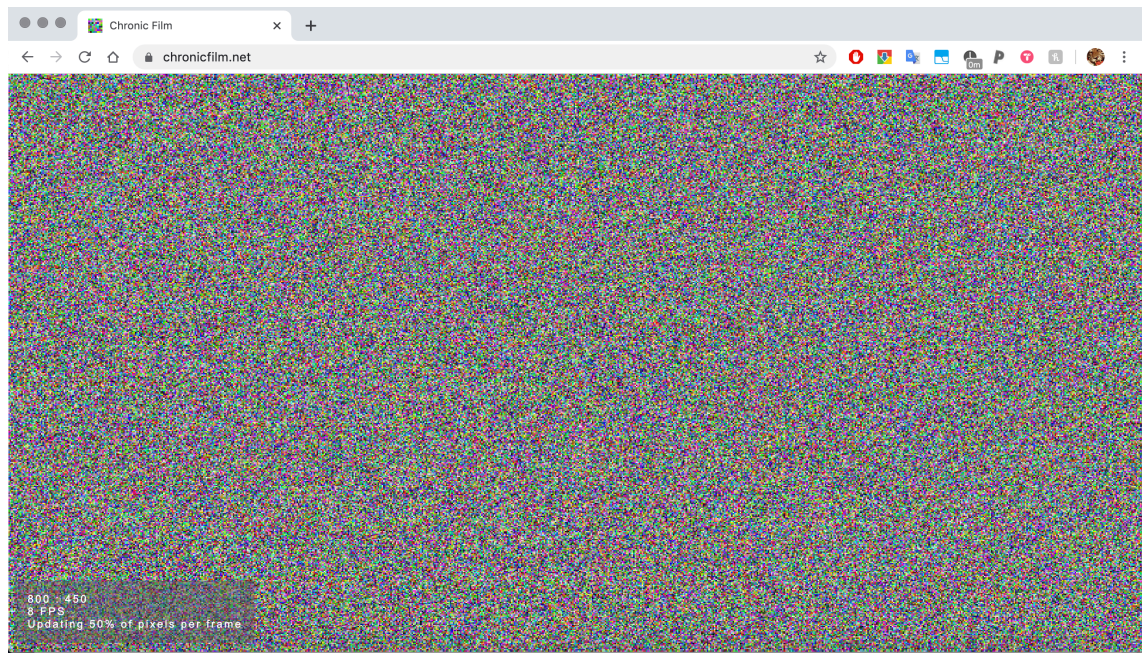
Procedural film, finite duration.

Image 14. *Chronic Film* (2018), web version.

Description

Chronic Film exists as a procedural film and a lecture-performance. As procedural film, *Chronic Film* is a generative algorithm that plays out every possible combination of pixels that can be generated on a screen of a given resolution. It is visualised as continuous noise. Similar to structuralist-materialist approaches, the algorithm re-assembles the digital apparatus of cinema so that it loses figurative power and enters a chronic condition, where the film has to last for billions of years in order to play all possible images.

   The main iteration of the algorithm is located at chronicfilm.net, where all participants can view the two current resolutions and contribute to the labour of exhausting all possible recombinations.

List of Materials Supplied as Practical Component with the Thesis

MacOS versions:

- *Chronic Film,* 800: 450 resolution, 100% update. Filename: Chronic_Film_800x450_Full_Update_macOS.app

- *Chronic Film,* 1280: 780 resolution, 50% update. Filename: Chronic_Film_1280x720_Partial_Update_macOS.app

Windows versions:

- *Chronic Film,* 800 : 450 resolution, 100% update. Filename: Chronic_Film_800x450_Full_Update_Windows (folder)

- *Chronic Film,* 1280 : 780 resolution, 50% update. Filename: Chronic_Film_1280x720_Partial_Update_Windows (folder)

Exhibition History

November 9 - December 9, 2018, Sanatorium Gallery, Istanbul, 4-channel version.

Image 15. *Chronic Film* (2018), November 2019. Courtesy Sanatorium Gallery.

Image 16. *Chronic Film* (2018), November 2019. Courtesy Sanatorium Gallery.

Chronic Film

Lecture-Performance, duration: approximately 45 minutes.
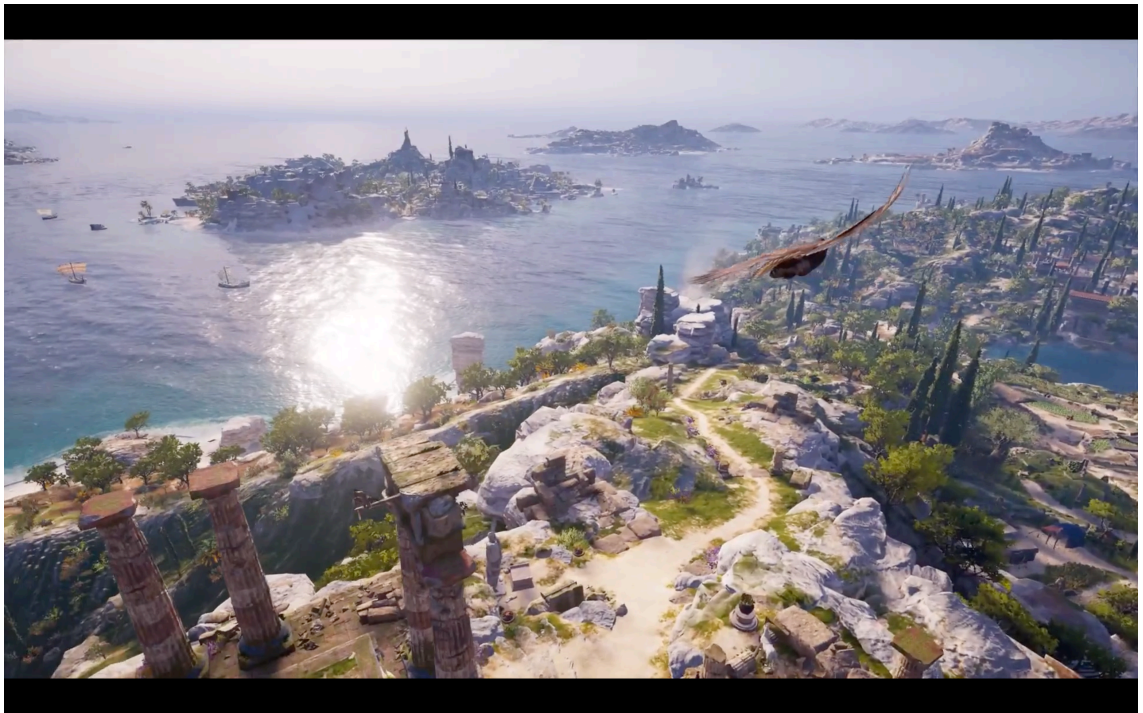

Image 17. Still from lecture-performance *Chronic Film* (2018).

Description

The lecture-performance takes the posthumanist reading of *Chronic Film* to the three temporal locations that unsettle the traditional ideas of film by addressing the multi-layered computational aesthetics that underlie image processing and transmission. The lecture works with the Shannon-Weaver model of communication where the signal is seen in relation to the noise that accompanies the transmission. In order to see how the fetishistic dimension of the figurative image works within with the processes of commodification and cultural appropriation, the lecture considers the figurative image as a signal, and the technical processes surrounding it as noise.

In order to do that, the lecture-performance starts from ancient Greece, at the island of Delos, which is considered to be the birthplace of Apollo. The parallel thinking of artefacts as the ones that this island houses, and of digital images, helps to outline an alternative history of the image and its figurative practices. Two re-imaginings become important here. First, a figure of a female oracle who

deciphers the visions that come to her in a smoke; the sybil is re-imagined as a computer (drawing on the times when computers were still human and predominantly women). The second re-imagining concerns the statues of the white lions of Delos: as replicas, as poor images, they degrade with time and compression caused by the elements. These two elements help to set up the processes of noise, of decoding and degrading of signals against the commodifying aspects of figuration, so that in the lecture's final part, the digital noise of the algorithm, by forcing the viewer's brain to form mental images, is seen as a meditation, as a hallucinatory escape from the economies of efficiency and monetisation.

List of Materials Supplied as Practical Component with the Thesis

- *Chronic Film.* Main documentation. Filename: Chronic_Film_Lecture-Performance_Main.mov

- *Chronic Film* at NABA Academy, Milan, Italy, July 2019. Video documentation. Filename: Chronic_Film_Documentation_NABA_2019.mov

Performance History

- July 10, 2019: Media Design department at NABA, Nuova Accademia di Belle Arti, Milan. http://workshop.naba.it/2019/07/10/chronic-film-from-dust-to-pixels/

- July 8, 2019: WORK HARD! PLAY HARD! SIDE AFFECTS, Skype Lecture, Minsk, Belarus. http://workhardplay.pw/en/2019/

- May 26, 2018: META MARATHON, NRW-Forum Düsseldorf, Germany https://2018.metamarathon.net/

- July 21, 2017: Moscow Experimental Film Festival. http://en.mieff.com/2017/alexandra_anikina

Image 18. *Chronic Film* at WH!PH! summer school, July 2019. Skype lecture.
Courtesy Dzina Zhuk and Nicolay Spesivtsev.

Non-Player Character

Procedural film, infinite duration.

Image 19. Screen capture from *Non-Player Character* (2019).

Description

Non-player characters are computer-controlled characters in games. Usually they serve as expendable targets: they are habitually shot and 'looted', or used as crutches for the narrative. The NPC is animated only as far as it is necessary in order to appear realistic to the player. This is consistent with commodified visual culture that game engines perpetuate. Precise mathematical models apply both to players' virtual bodies and the in-game objects. The models, in their turn, are based on the quantification of user experience, enabled through data collection and telemetric tools.

The main character of *Non-Player Character* is based on a mechanical tiger made for Sultan Tipu of Mysore, India in the late 18th century, who spent seventeen years of his rule defending his province against British East India Company. Tipu's Tiger is an almost life-size scene of a tiger attacking a British soldier, reaching for its throat. At the end of the fourth Anglo-Mysore war Tipu's

Tiger was seized and transported to UK, where it was first exhibited in the East India Company headquarters and can currently be seen in the V&A collection, London.

Tipu's Tiger is an example of the image prized for its symbolic power. Re-imagined as an NPC, it gains new agency within a new set of relations to the world it inhabits. The mechanical automation gives way to the programmed automation of movement not restricted by the demands of the game balance. What new pathways can be created by an NPC that is given to chance operation rather than to assume the role of a target?

List of Materials Supplied as Practical Component with the Thesis

- MacOS version, *Non-Player Character*. Filename: NPC_macOS.app.

- Windows version, Non-Player Character. Filename: NPC_Windows (folder).

Exhibition History

- September 2019: *Besides the Screen* conference exhibition, São Paulo, Brazil

- June 28 - August 18, 2018: 'The Matter of Horror', Solyanka VPA Video Performance Animation, Moscow, Russia.

List of Additional Materials Accessible Online

- *Besides the Screen* exhibition catalog. https://issuu.com/menotti/docs/besides_the_screen_2019__cat_logo_/114

Image 20. *Non-Player Character* (2019). Screenshot of work in progress. 2018.

Artworks from my practice, referenced in the current research

Some Entropy in Your Tea **(2013)**

Image 21. Still from *Some Entropy in Your Tea (*2013)

See video online: http://red-in-blue.com/index.php/movingimage/some-entropy-in-your-tea/**.**

Tiger Bones (2016-2018)

Image 22. Slide from *Tiger Bones* (2016-2018).

Access the lecture online: https://docs.google.com/presentation/d/
1F6Tvtu8AvBFqn9pdG60KLM-gtWMnA55fuhhPxqaaRWs/edit?usp=sharing.

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