

IN BETWEEN ART AND CODING.

***HELLO WORLD!* GROUP EXHIBITION: A CASE STUDY**

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Acknowledgement

This project is dedicated to my father, the person who gave me the motivation and the strength to face any obstacle in my life. Today, his absence always reminds me to be curious, and to always look further than the mere appearance. Without his life lessons, I would not have been the person I am now, and this is why he is the person I thank most for this project. With him, I need to thank my family for the support and for never giving up on me. Without them, this project would not have ever come to an end.

Least but not last, I want to thank my supervisor László Munteán for his infinite patience and empathy, and my internship tutor Fabian van Sluijs to make me so passionate about coding. They both guide through my journey in different ways, and without them, I would have never discovered this new side of myself.

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1. INTRODUCTION

Research Internship with CCU

In September 2018, I started an internship with CCU (Creative Coding Utrecht) as a part of the Research Master Art and Visual Culture at Radboud University. The Utrecht-based foundation is an open platform exploring computational logic and digital tools through a creative approach that leaves aside the mere functionality. Experimental; playful; pushing boundaries; critical; open to mistakes to test the limits of rules and digital systems.

That's how CCU describes its activities, promoting events such as workshops, live coding meet-up and lectures to bring together a community of experts and non-experts alike. From visual art to music, from design to social experiments, CCU plays with the community vibes to engage a conversation on technology in terms of playful exploration rather than efficiency. Proposing a definition of creative coding in terms of non-definition and variety, the Utrecht community combines talks, workshops and music performances to engage an on-going dialogue with the audience from different perspectives.

At the beginning of November 2018, CCU's cofounders organised an art exhibition presenting the variety of works and experiments of the community. The group show was a way to combine diverse creative practices to approach software and programming without the necessity of a specialised background. The title *Hello World!* refers to the first programme used to learn how to code looking at the syntax of a programming language, an invitation to introduce the diverse computational experiments of the Utrecht community. As an assistant researcher, the plan was to

collaborate with anthropologist Axelle van Wynsberge for the exhibition catalogue, the artists' interviews and the exhibition's curatorial set up to write an academic review at the end of the internship. When I started preparing on the artists for the interviews, '*Daily Things*' by Saskia Freeke was the creative research catching me the most. Since 2015, the Amsterdam-based artist is making daily sketches and animation with the programme Processing, exploring colours and geometrical shapes in digital format. She was the first artist Axelle and I interviewed.

We arrived in Amsterdam on a Monday morning, heading from the station to Makerspace, an ex-military building now site for artists and creative makers. The office with multiple desks was on the first floor, while the downstairs space has been turned in a huge working space, full of wooden working tables, 3D printer and laser cut machines. Giving us a short tour of the building, the artist confirms the interdisciplinary combination of makers and creatives using the workshops, also a source of inspiration for her work. Browsing around the diverse tools and cables in the huge space without walls or physical divisions between tables, we met one of Saskia's colleagues, who gave us a live performance on how to use the laser-cut machine and examples of the reaction of diverse physical materials. Once upstairs, we started the video interview. Talking about her daily practice, Freeke highlights the playfulness of the making process and experimental elements. For CCU exhibition, the artist presented three series of three laser-cut wood sculptures reproducing digital sketches made with Processing. Rather than just using it, her daily research explores what you can make and create with technology in terms of playfulness, pushing boundaries, exploration and discovery. The point is not being perfect or making a finished artwork, rather investigating how the individual responds to digital technologies.

Representing the core of CCU experimental research, this interview was the first inspiration to start the theoretical research at the core of the final review. Materials, both digital and physical, have a kind of response to the artist's input that, to a certain extent, tests the initial idea of the creator. Rather than seeing this response as a complication or a limit, *Hello World!* collected the variety of these explorations to showcase the diverse possibilities of playing with technology. On November 2, the data-driven studio design Sensor Lab became a playground to discover the world behind the computer screen through the explorative and playful perspective of the Utrecht community. Between the extreme precision of mechanical arms making sketches, video mapping and live composition with trained algorithms, curator Fabian van Sluijs presents the artworks in combination with participative workshops, talks and code jam to showcase an alternative approach to digital tools from different perspectives during the event.

Alongside the research on field and the setup, I contributed welcoming visitors and giving tours of the show. One of the most valuable memories of that time happened the second day of the exhibition. Starting slowly and silently, the morning passes with a few visitors coming for the tour and browsing around waiting the afternoon talks. Soon after the opening, a Belgium family with two children came to Utrecht for the talk with designer and artist Sabrina Verhage. The 9 years old child, Simon Tiger Houben, is really passionate about coding practices, actively participating to workshops and creating artworks (Figure 1). Despite being a little genius of coding, Simon is impressed by the free and creative elements of the exhibition. Especially in the 'secret cellar', the surprising optic tricks of the 360° mapping installation *RE:* by DEFRAME collective captures the family's imagination, also impressed by the fluid steel wave by Art van Triest. During the tour, Carolien Teunisse, member of DEFRAME and co-curator of the

exhibition, brings the family in one of the crew offices for an insight of the programme behind the mapping installation.



Figure 1.

This was one of the most meaningful tours of the exhibition. As a researcher and part of the organisation, I felt the exhibition was a site to engage a discussion about technology from a more individual perspective. The intention of combining different perspectives and turning the angle of analysis created the opportunity of discussing different scenarios and coding practices in the creative field. That same evening, CCU hosted a Pre-Algorithm meet-up dedicated to music and the infinite possibilities of sound exploration through coding. After the meet-up, visitors and musician head to EKKO to enjoy a live performance of the different angle proposed during the talks. The open atmosphere in EKKO breaks the usual boundaries between artists, visitors and crew. With experimental music and live coding, the artists challenge the dance floor experimenting sounds while showing their experimentation on the spot.¹ In the evening, musicians and performers share their amusement for the huge support of the people at

¹ Vimeo, "Algorithm at Ekko [Aftermovie]," last accessed January 8, 2020. https://vimeo.com/298983550?fbclid=IwAR1xxGZVRyMIkqb2M_TqyDZQ7oEERAK-Sqo07uuEiM2hWr6LRD1Hzdz_tdl.

the venue helping each other when the tech equipment failed or handling the mistakes onstage. The open relationship between creative coders from different field seems to be the real point of attraction for new members willing to join the scene. The community atmosphere invites new participants to join and experiment coding practices, spontaneously supporting and helping each other to grow and learn as a community.

The exhibition ends with a talk by programmer Sylvain Vriens and artist Saskia Freeke on the importance of exploring the digital world as a part of daily routine not only for the sake of functionality. Proposing a definition of creative coding in terms of non-definition, the variety of visual and sound explorations suggests a dialogue between diverse fields and approaches, rather than a competition. Celebrating this openness and sharing vibes, CCU proposes this variety of artworks not only to invite who is not familiar with coding, but also to think in proactive terms our role as an individual part of a bigger community, stimulating a creative approach to be part of today's society.

Making a problem statement

This experience on field led my research in a slightly different direction comparing to what I first expected. Slowly, I began to realise the role of technology in our daily gestures. Having or not a digital device does concretely influence how we think and how we concretely 'plan' actions. For example, missing the Wi-Fi and consequentially Google Maps can be a challenge in a city you do not know, especially when you are late for an important appointment. Besides, AI research is becoming every day more sophisticated, while robots able to keep a conversation 'as a human' are slowly appearing in diverse fields such as hospitality or elderly care. Global auction

houses Sotheby's and Christie both sold the first artworks made with neural networks and algorithms.²

Digital and technical development seem given to us, and it is easy to forget the process behind the formation of these technologies, as well as the transformation of social and political dynamics around the possibility of being 'virtually' connected. Societies are increasingly more dependent on computational systems to transmit and process an amount of data that would be impossible to store and manage only with human skills. If human have always been relying on technology to improve the system and daily activity, the core difference introduced by software and code is not only the exponential increasing of volume and speed, but also the introduction of new dimensions. Thousand of lines of code are compensating hours of labour, while mental processes of high sophistication are delegated to computational systems and software with a degree of agency that would have been impossible without a technical system. Networked software is also encouraging a communicative environment of quick exchange of feedback tidying human and non-human together into new aggregates. Because of the greater use of embedded and quasi-visible technologies, software is increasingly quantifying and measuring our social and everyday life.³

If, in 1637, René Descartes questioned the relationship between human and machines claiming that even the most sophisticated machines are less intelligent than the most stupid man, today it seems almost impossible to imagine a city without

² Gabe Cohn, "AI Art at Christie's sells for \$432, 500," *The New York Times*, October 25, 2018, <https://www.nytimes.com/2018/10/25/arts/design/ai-art-sold-christies.html>. Benjamin Sutton, "An artwork created by AI sold for £40,000 at Sotheby's, failing to generate the fervor that propelled another AI work to sell for 40 times its estimate last year," *Artsy*, March, 6, 2019, <https://www.artsy.net/news/artsy-editorial-artwork-created-ai-sold-40-000-sothebys-failing-generate-fervor-propelled-ai-work-sell-40-times-estimate-year>.

³ David M. Berry, *The Philosophy Of Software Code And Mediation In The Digital Age* (repr., London: Palgrave Macmillan, 2011), 2.

machines or a digital screen.⁴ The use of digital devices is so deeply entangled with daily habits that we have spontaneously developed a vocabulary in which programmes become nouns and verbs: we Google something, we Facebook someone, we Instagram an event. The proliferation of technology in daily practices grows with the belief that computers allow complete transparency. In order to become transparent, computers have to generate new texts and images rather than reproduce something existing somewhere else. While more to read and see is offered to users, software and hardware are slowly disappearing behind interfaces easy to control and use. These complex systems are hidden behind digital surfaces meant to represent the world of the user, traducing code into a language that we can understand and control.

In this sense, it is also an act of faith of the user: we believe these images and systems more for ideological and metaphorical reasons than a technical one.⁵ As much as machines are created and developed to satisfy human needs, there is an independent evolution of these devices in terms of social interactions and cultural habits. The process of hiding software and hardware to facilitate the approach, use and visualisation is creating “a system in which the intangible and the implicit are driving the explicit.”⁶

From traffic lights to big databases, the majority of objects that we are using daily are

⁴ ‘I specifically paused to show that, if there were such machines with organs and shape of a monkey or some other non-rational animal, we would have no way of discovering that they are not as these animals. But if there were machines that resembled our bodies and if they imitated our actions as much as is morally possible, we would always have two very certain means for recognising that, none the less, they are genuinely human. The first is that they would never be able to use speech, or other signs composed by themselves, as we do to express out thoughts to others [...] it could not arrange words in different ways to reply to the meaning of everything that is said in its presence, as even the most unintelligent human being can do. The second means is that, even if they did many things as well as or, possibly, better than anyone of us, they would infallibly fail in others. Thus one would discover that they did not act on the basis of knowledge, but merely as a result of the disposition of their organs. For whereas reason is a universal instrument that can be used in all kinds of situations, these organs need a specific disposition for every particular action’. Descartes, René, *Discourse on Method in Discourse on Method and Related Writings*, trans. Desmon M. Clarke. Penguin Edition, 1999. Part 5, 40.

⁵ Wendy Hui Kyong Chun, *Programmed Visions: Software And Memory*, 1st ed. (repr., MIT Press Scholarship Online: August 2013, 2011), 17.

⁶ Chun, *Programmed Visions: Software And Memory*, 19.

depending on thousand of lines of computer code and constant maintenance to keep them running. More or less hidden behind the most familiar gestures of our routine, technical system control and organise networks permeating our society and its functions.⁷

Hello World! exhibition was an attempt of combining all these questions on technology through the language of art. Combining the complexity of perspectives, rather than focus on one specific question, the exhibition aimed to encourage an interaction with, and understanding of, technology alternative to the demystification of it. The core of the exhibition was to present an overview of digital practices not to give a unique answer but rather to explore diverse possibilities without a real goal. While seeking discovery rather than efficiency, the relationship between artists and autonomous systems is a peculiar example of the active role of software in speculative and explorative terms, rather than looking at the implication of code in terms of profit, commodification, and users' manipulation. In these terms, rather than focussing on one question or isolating a specific issue within this broad topic, this research asks to what extent generative art is a way to visualise the materiality of code through its variety of tools and techniques. Starting with the assumption we are already living in a digitalised society, CCU showcases diverse digital and generative art practices with the intention of encouraging a more proactive attitude to programming, and of making understandable the creative process. Focussing on the exhibition space, the selected artworks and the range of activities around the exhibition, this research aims to explore the relationship between artists and software in terms of mutual shaping rather than command-control. This investigation is not aiming to answer one specific question, or unfold the complexity of the topic as a whole. Rather, this research aims to visualise through the

⁷ Berry, *The Philosophy Of Software Code And Mediation In The Digital Age*, 2.

creative process, and not only the final art piece, the mutual relationship between artist and software, opening the question as to how art production can offer a starting point to question the daily use of these technologies in cultural and social terms.

Scope & Significance

The combination of theoretical and ethnographic findings will offer visual representations to unfold the complexity of the topic, isolating critical issues that can open several directions to continue the research on coding. Following a philosophical and materialist approach, this analysis is indeed valuable when looking at examples to visualise the role of non-humans in the formation of memory and identity. The dialogue between the artist and the digital tool is an example of how things have a role in the way we think and act. Alongside the analysis of the cultural impact of digital devices, this research can contribute to the discussion on creativity and authorship. The use of autonomous generative systems not only challenges traditional approaches to creativity, but also it questions the role of artists since the artwork is partly created by a non-human medium. Besides, differently from ruins and physical artworks, most of these digital artworks are a non-physical written code reproducible in different places at the same time. Looking at code on live stream during the performance challenges traditional approaches to classification of digital tools as art media opening new discussions on the role of conservation and heritage.

Besides, a humanistic lens on technology can create a bridge with software engineering and app design, analysing how the attention on functionality and efficiency has an influence not only in terms of speed but also in terms of culture. Since during the performance the algorithmic process is visible and combined with visual and sound

input, this analysis is also valuable to social science research. Nowadays, a job interview can be decided by software analysing CVs according to set parameters, as well as programmes that can filter social media content. Analysing the process of writing code visible to the audience can reveal elements to build an analogy with wider issues concerning the ever-growing digitalisation of society.

2. CORE THEORIES

Code and Art

Hello World! exhibition was an attempt of combining diverse questions on technology and computational logic through artworks and creative experiments. Playing with the complexity of the topic rather than focus on one specific question, the scope of the exhibition was to encourage a proactive and alternative understanding of technology. While seeking discovery rather than efficiency, the relationship between artists and autonomous systems is a key example of the active role of software during the process of creation of the artwork. Philip Galanter describes generative art as a “practice in which the artist cedes control to a system with functional autonomy that contributes to, or results in, a completed work of art. Systems may include natural language instructions, biological or chemical processes, computer programs, machines, self-organizing materials, mathematical operations, and other procedural invention.”⁸

According to this definition, the term ‘generative’ directs to a subset of art production in which the material has a crucial role in the creation of the final piece. Unlike other media or techniques, software has the possibility of looking at both the incorporeal nature of running code and the visual representation.⁹ The combination of formal description and creative action can be referred to as *double coding*, well established in software art practices and where programme code is literate. What is known specifically as ‘codework’ provides an example of how the practices of writing

⁸ Philip Galanter, "Generative Art Theory", *A Companion To Digital Art, First Edition*, 2016: 154.

⁹ Jussi Parikka, "Ethologies Of Software Art: What Can A Digital Body Of Code Do?", *Deleuze And Contemporary*, 2010, 116.

and programming can recombine formal logic and poetic expression. Codeworks are often non-executable, underlying the idea that the execution is the only site of interpretation of code. Not executable code exemplifies the material aspects both on the functional and expressive level, promoting the notion that all commands are open to failure and errors. In this sense, challenging the extreme principle that programme codes have to be concise, a programme can also run in unpredictable ways challenging human expectations.¹⁰ Unlike apps and software engineering, writing code in creative practices is a key example to look at how code works as a material thing. The focus on generative art allows looking at the process of writing code in combination with the visual outcomes, exploring how software plays a role in the creation of the final piece.

David M. Berry defines *source code* as the textual form of programming code edited by programmers.¹¹ In order to process and mediate any object, a digital or computational system needs to translate this object into a digital code that a computer can understand to materialise a visible interface. Without the possibility of this *discrete* encoding, the computational device has no object to process. This process of digital mediation depends on the necessity of computers to transform a sequence of numbers into a readable representation.¹² In order to categorise the world following this logic, the information about reality needs to be discarded to store a representation in the computer. The process of writing code produces ambiguities and possibilities of re-coding its deterministic tendencies, which means that it cannot simply be reduced to its functional aspects.

¹⁰ Cox, McLean and Berardi, *Speaking Code. Coding As Aesthetic And Political Expression*, 8, 9, 10.

¹¹ David M. Berry, *The Philosophy Of Software Code And Mediation In The Digital Age* (repr., London: Palgrave Macmillan, 2011), 29.

¹² David M. Berry, "The Computational Turn: Thinking About The Digital Humanities.", *Culture Machine* 12 (2011): 1-22, <http://sro.sussex.ac.uk/49813/>: 2.

Looking at how software exceeds the modes of organisation and recognition typical of human beings, it is possible to frame the mutuality between artists and generative systems exploring the role of the software during the creative process. At the core of materialistic analyses is the recognition that people and things are mutually shaping in the production of social worlds, and objects are fundamental actors in the socio-historical evolution, rather than a mere frame of theoretical discourses. Departing from Descartes's distinction subject/object, in which the active human interprets and decides on a measurable and fixed world, a philosophical and materialistic approach is leading to an alternative conception of the external world in which nonhumans have 'agency' in shaping our understanding of the world. In generative art, the autonomous system is a way to visualise the materiality of code through its variety of tools and techniques. In this sense, it is possible to explore code through the notion of the materiality of things. Rather than being passive and subservient to human beings, material things are a process, and their agency lies in the fact that they cannot be fully captured or contained.¹³

Speaking of software art as the art of the imperceptible, Jussi Parikka highlights how a Deleuze-Guttarian perspective on software can be elaborated in terms of "affects, sensations, relations and forces."¹⁴ In '*Ethologies of Software Art: What Can a Digital Body of Code Do?*', the author explores these primarily non-human notions to reflect in terms of agency of things. Software art, or more generally generative art relying on coding or computational tools, can be characterised by this logic of imperceptibility. In a phenomenological sense, code is imperceptible because it evades human sensorium. For example, Google is imperceptible not only for its complex

¹³ Elisabeth St. Pierre, Alecia Jackson and Lisa Mazzei, "New Empiricisms And New Materialisms: Conditions For New Inquiry", *Cultural Studies – Critical Methodologies* 16, no. 2 (2016): 99-110, doi:doi:https://doi.org/10.1177/1532708616638694.

¹⁴ Parikka, "*Ethologies Of Software Art: What Can A Digital Body Of Code Do,?,*" 116.

coding system but also for the interactions it creates.¹⁵ This interpretation offers the opportunity of challenging the expectation of what source code does and what might happen when it runs.

The relationship between code and the real world is indirect, since software mediates the written code and the running of it.¹⁶ The process of writing code is connective, mediating and constructing our media experiences in real-time as software, and, for this reason, it has to be understood in context as processual. Code needs to be approached in its multiplicity, without forgetting that it exists in the virtual space of a digital computer, a 'space of flows'. In these terms, there is a performative dimension of code in which software acts as a space where diverse forms of practices can take place. Besides, any code can only be interpreted within a wider network of relations embedded into the wider process of command and control and, in this sense, code cannot be separated by the technological system in which is embedded in.¹⁷ Even as an expressive medium, code and computational language remain constrained in what the computer understands in its final instance, encouraging the development of a community to share techniques, tools and solutions. This contributes to the challenge of analysing the empirical and material elements of code, which acts simultaneously as material and symbolic, technical and social.¹⁸

¹⁵ Parikka, "*Ethologies Of Software Art: What Can A Digital Body Of Code Do,?*," 118.

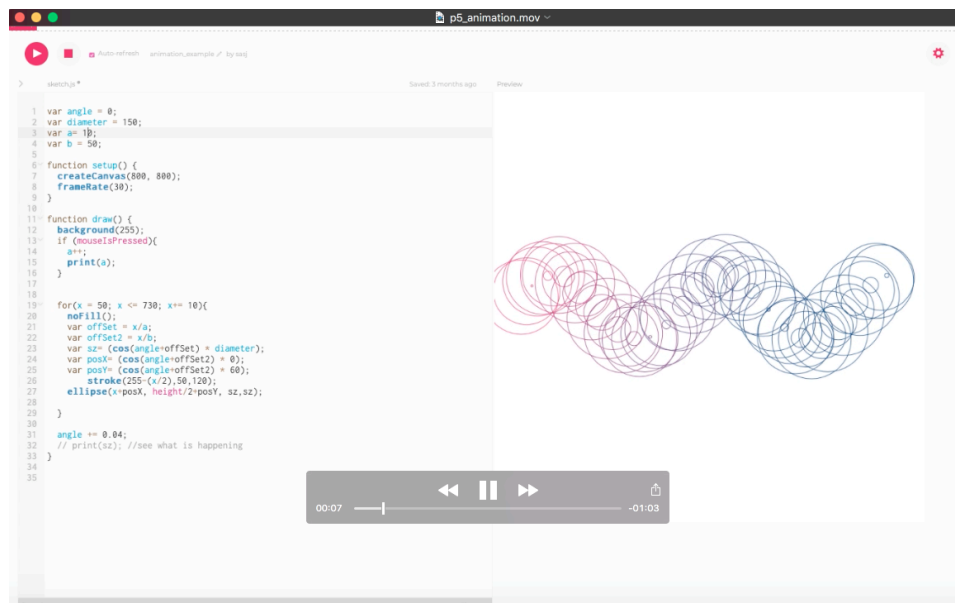
¹⁶ Berry, *The Philosophy Of Software. Code And Mediation In The Digital Age*, 37.

¹⁷ Geoff Cox, Alex McLean and Franco "Bifo" Berardi, *Speaking Code. Coding As Aesthetic And Political Expression* (repr., London, England: The MIT Press, 2013): 3.

¹⁸ David M. Berry, "The Computational Turn: Thinking About The Digital Humanities," 1.

Code as logos

Nowadays, with the spread of software-driven technologies, the process of writing code determines the functionality of objects and forms of communication we are using daily. Behind common apps such as Instagram or Tinder, for example, there is a complex algorithmic process written by programmers and software engineers. To visualise the coding process in the context of this project, it is relevant to take as an example Saskia Freeke's work once again. The following screenshots are a sample of her geometric creations with the programme Processing (Figure 2 & 3).



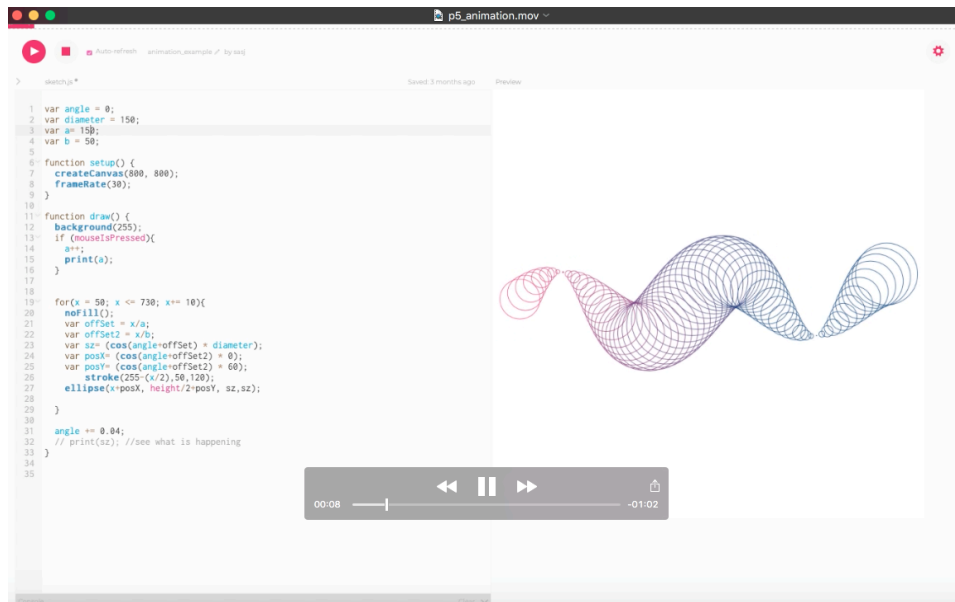


Figure 2, 3.

In the left window are the lines of code, in which any word and symbol correspond to a function. In the right window, you can see the visual result of this set of functions and how it changes according to the writing process. As you can notice in the two pictures looking at the third line of code, the visual changes accordingly to the instructions of the creator. Looking at the third line of code, in the first screenshot the function “a=10;” produces frontal circles changing size. In the second screenshot, the function “a= 150;” moves the circles on the sidelong.

For the computer, any of these functions is a command to execute producing an outcome. As we mentioned in the introduction, however, during the interview the artist highlighted the playfulness of the process and the possibility of mistakes. Theoretician Wendy Hui Kyong Chun compares the relationship between software and programmer to the Hegelian metaphor of the master and the slave. As much as the slave needs the master for legitimacy, the latter depends on the slave for his own survival since the

slave's actions are making possible his existence.¹⁹ In analogy, as much as a code script needs humans to be run, the programmer needs coding to concretise his/her project. Despite the focus on its production, the definition of *techne* is more sophisticated than just a routinely or empirical practice because it contains a speculative element. If a technical relationship engages art or craft, in analogy code does not automatically follow a command but it responds 'in a crafty, speculative manner in which meaning and action are both created'.²⁰

Following this interpretation of *techne*, the execution of code is never simple but rather axiomatic since a technical relation is far more complicated than a numerical one.²¹ The process carries possibilities for trial and mistakes since code does never unfold linearly and it can be modified as it runs. It is impossible to foresee in advance the actual course of a sequence of code, since any iteration can alter the meaning of its functions. As a regenerative and iterative process, "*source code only becomes a source after the fact.*"²² Software is layered not only because source code is different from an object, but also because code as a thing is embedded in operating systems.

Illustrating how code becomes a source only after its execution, Chun introduces the notion of code as *logos*. When programme are turned into logos, they enter into language describing concrete actions that have an impact within society and individual daily routine. Expressions like 'I'll Google it' or 'I'm gonna find him on Facebook' belong to the spoken language, revealing how software driving devices are deeply entangled with daily activities. Highlighting how software emerged as a thing

¹⁹ Wendy Hui Kyong Chun, *Programmed Visions: Software And Memory*, 1st ed. (repr., MIT Press Scholarship Online: August 2013, 2011): 31.

²⁰ Chun, *Programmed Visions : Software And Memory*, 24.

²¹ Chun, *Programmed Visions : Software And Memory*, 19.

²² Chun, *Programmed Visions : Software And Memory*, 24.

through a process of commodification and commercialisation, code as *logos* does not mean to see code as immaterial, but rather investigating how the ‘immaterial’ becomes a thing connected with the external environment.²³ Intending code as *logos*, code becomes a source, the representation of an action.

Besides, the process of making software easy to use is creating a system in which invisible lines of code are driving the setting of enjoyable and visible interfaces. This tendency to simplify the programme obfuscates the process of execution and the machine transforming code into a fetish that implies pleasure. Essentially, code has no other reason to be than instructing some machine on how to act. Yet, the translation from source code to executable information depends on the action, human or not, of compiling, interpreting and executing.²⁴ Writing code is not only a combination of commands for the computer, but also a process to learn a new language that will be then translated by the computational system. If the artist can play with these unpredictable outcomes and let the programme be a part of the final creation, a software engineer has to follow a specific goal which makes these mistakes, so to speak, an error. The lack of a specific goal, or at least the lack of the scope of satisfying the user for a specific action, opens the avenue to explore the interactions around the use of digital devices. This difference allows looking at the creative process to understand and visualise how daily apps and programme we take for granted are actually created and structured while influencing daily routine and cultural habits.

²³ Chun, *Programmed Visions : Software And Memory*, 51.

²⁴ Chun, *Programmed Visions : Software And Memory*, 19.

Code and Things

As I have said, the notion of code as *logos* focuses on how source code represents a concrete action; on the axiomatic element of the process of writing; and on how this process is hidden behind usable interfaces. This theoretical approach is possible only intending the process of coding as a thing mutually shaping with the external environment. Tim Ingold describes an artwork as a thing, highlighting the importance of looking at the process over the form itself. The role of an artist is not to reproduce a preconceived idea, but rather to follow and join the material flow “that bring the form of the work into being.”²⁵ An artist does not focus on the abduction but on the improvisation to follow the flow of the world, and to let things rise without pre-classifying them. Rather than looking for an agent with specific goals acting on a passive matter, the creative process seeks to join the forces to bring a form into life.

Also for Gilles Deleuze the talent of the painter is the ability of playing with accidents and mistakes through an act of choice which creates something new for the artist her/himself.²⁶ The creative process is a game in which the artist's ability is to abandon the certitude of a pre-set path or image to engage a multitude of directions and ideas. In Deleuzian terms, the manual act, the hand of the painter, marks the form on the canvas, but the final artwork is a combination of ‘accident and chance’ having a role within the creative process.²⁷ Exploring software as a thing, it is possible to build an analogy between speech and code looking at the degree of indeterminacy they share as well as the entanglement with the environment. In some ways, speech is always out

²⁵ Tim Ingold, "Bringing Things To Life: Creative Entanglements In A World Of Materials", *ESRC National Centre For Research Methods* 15 (2010), 1.

²⁶ Gilles Deleuze, “The Painting Before Painting,” in *Francis Bacon : Logique De La Sensation*: 86, 89, 92, 93,94, 95, 96.

²⁷ Deleuze, “The Painting Before Painting,” 94, 95.

of control because it is far more distributed and networked than a single body. In this sense, there is a social aspect of speech that is, to a certain extent, unpredictable.

Particularly live coding shows how the writing, working and creative use of coding establishes an unstable relationship to its output. Like other forms of speech, programming oscillates between process and expression.²⁸

By definition, code is a process that unfolds in time and hence it is prone to accidents inherent in any process defined in its duration. Creative temporality in code becomes evident when we understand its executability, and for this reason, code exists only in its execution.²⁹ Code is a declarative and comparative mechanism that ‘ticks’ through each statement one-at-a-time. This means that code run sequentially, in a way that makes possible to follow the sequence in an action able to run thousands of time faster than we can actually think.³⁰ If the speed of running code is impossible to follow line by line, software called ‘debuggers’ allows the programmer to follow the writing of code in detail by slowing down or even forcing the programme to execute the order step by step to ensure the code functions as desired.³¹ To a certain extent, programming language model the world as a game. Programmes such as Hello World! or Processing make students believe that code is easy since you can see the result of your code straight away. What makes this sort of programming languages so engaging is that you can make the computer do what you want, but you still have to figure out how.³² Using a specific formal language or programme, the different response of the algorithm tests ideas and solutions of the programmer.

²⁸ Cox, McLean and Berardi, *Speaking Code. Coding As Aesthetic And Political Expression*, 5, 6.

²⁹ Parikka, *Ethologies Of Software Art: What Can A Digital Body Of Code Do?*, 123.

³⁰ Berry, *The Philosophy Of Software. Code And Mediation In The Digital Age*, 38.

³¹ Berry, *The Philosophy Of Software. Code And Mediation In The Digital Age*, 38.

³² Chun, *Programmed Visions : Software And Memory*, 47.

Following Ingold, “things *leak*, forever discharging through the surfaces that form temporality around them.”³³ A thing is a process, a site in which multiple ‘on-going’ becomes entwined. To understand the thing we need to look at the gathering with the connection with the environment and at how these interactions and implications are exceeding our full understanding – rather than at the isolated object.³⁴ The crucial theoretical key of this discourse is the connection between thingness and social life. Things do not exist without the consideration of people as well as things shape people, in a mutual relationship that challenges the traditional distinction between subject/object.³⁵ Also Bill Brown remarks how the complexity of things goes further than the mere materialisation or utilisation of the object itself.³⁶ Irreducible to objects, things are the occasion of contingency, ‘the chance of interruption’, which reveals the ambiguous and malleable connection of things with the environment.³⁷ As Brown puts it, “we begin to confront the thingness of objects when they stop working for us.”³⁸ While an object stands in front of us as a completed entity, to which we relate to through the apparent surface, a thing places itself against the setting in which it is placed.

As Parikka points out, since software is in between incorporeal and material, it is relevant to look at the imperceptibility of software art for two main reasons. First, software is more than visual and representational, it works through a logic of translation

³³ Ingold, "Bringing Things To Life: Creative Entanglements In A World Of Materials," 4.

³⁴ Ingold, "Bringing Things To Life: Creative Entanglements In A World Of Materials," 4.

³⁵ Bill Brown, "Thing Theory", *Critical Inquiry* 28, no. 1 (2001): 7, 9, 13.

³⁶ Brown, "Thing Theory," 5.

³⁷ Brown, "Thing Theory," 4.

³⁸ Brown, "Thing Theory," 4.

– between visual interface, source of code and machine process.³⁹ This translation does not happen in terms of contents but in terms of intensities, since what is translated is in between visual interface, source code and the machine process at the heart of any computer. Secondly, software is often not even recognised as art, it is more defined as a social and cultural practice. Interpreting software as a thing through art production offers the opportunity of fully exploring not only of the process of writing but also the interactions around the use of these technologies. Following a Marxist approach to labour, Berry speaks of ‘absolute code’ to be able to look at its general form to trace the common traits between the variety and differences of programming languages. Absolute code would look not only at the grammar of code itself, but also try to capture what it does mean for programmers to think computationally.⁴⁰ Within a variety of media and techniques, generative art practices are visible examples of how the machine and the programme are both contributing to the final piece. The result is always a combination of the two; the artist is never a mere director just like the machine is never only executing a command.

With the spread of digital techniques in daily routine, the distinction between programmer and user is erased. This approach offers a way to think of the relationship between human and machines in new scenarios in which technology is part of our life and not a separated entity.⁴¹ In these terms, considering that software and digital interfaces are not written by machines but human beings, often one line at the time, by looking at the relationship between software and programmer it is possible to visualise in what sense code is a thing influencing how we structure reality. Focussing on the creative process, this analysis will explore the artworks of *Hello World!* exhibition to

³⁹ Parikka, “*Ethologies Of Software Art: What Can A Digital Body Of Code Do,?*,” 116.

⁴⁰ Berry, *The Philosophy Of Software. Code And Mediation In The Digital Age*, 33.

⁴¹ Chun, *Programmed Visions : Software And Memory*, 20, 46.

analyse how digital technologies are intertwined with daily life and culture; the process of translation between computational language and human logic; the element of unpredictability during the process of writing code. This following chapter illustrates the methodology at the core of the analysis of the chosen case studies that will be guiding the future structure of the project.

3. METHODOLOGY & CASE SELECTION

This chapter illustrates which methodology will be used to analyse the selected cases in combination with the theoretical framework. To the theories explained above, I will combine the findings of the ethnographic research held during the preparation of the group exhibition *Hello World!*, specifically looking at the transcripts of the video-interviews with the artists, field notes, reports and theoretical research at the core of the exhibition catalogue. As I said, rather than isolating a specific issue, this research asks to what extent generative art and coding practices are a way to visualise the materiality of code through its multiplicity of tools and techniques. Looking at the creative process in combination with the final piece, the project focuses on the relationship between artists and software to visualise in what sense it is possible to talk about the materiality of code and how this approach can be a starting point to question the daily use of these technologies in cultural and social terms.

The Walkthrough method

To proceed with the analysis of the selected cases, this research takes inspiration from the cognitive walkthrough method. The methodology aims to study society and culture through the use of apps and interfaces focussing on the socio-cultural influences of technology. In formal academic settings, these techniques aim to improve the quality of code and the user's experience from a software engineering point of view.

The algorithmic code behind established interfaces, such as Google or Facebook, or dominant brands such as Samsung or Apple is usually never shared publicly even for research purposes. The consequent decline of open sources and the spread of apps are generally associated with the introduction of Apple, around 2008, in

combination to smartphones' applications. This closure challenges not only the formation of established digital research methods, but also a systemic way to access data for research purposes. Consequentially, this methodology relies on automated systems collecting data and metadata to overlook the symbolic elements of an app.⁴²

Combining data collected by automated systems with the ethnographic experience of the researcher allows compensating the decline of open sources to analyse the app beyond its mere usability. Understood as a 'software application', an app is a subset of computer programmes created to solve specific needs of the user.⁴³ The programming behind apps and interfaces is prescriptive because the diverse functions are meant for a specific goal. For example, Google Maps is meant to give you direction wherever you are while Tinder is meant to connect you to new people. For this reason, this methodology considers the app as an *environment of expected use* since its functions are meant to anticipate and satisfy the user's needs.⁴⁴

In the user's shoes, the researcher follows a step-by-step narration of these functions aiming to uncover the users' expectation and cultural implications connected to the technological artefact.⁴⁵ These techniques are employed to test if users are responding accordingly to the designer's intentions, and it explores how to critically look at software as a socio-technical artefact.⁴⁶ Looking at specific app's features step by step, this method closes the analysis with a holistic perspective able to include what's behind the usability of the app.

⁴² Ben Light, Jean Burgess and Stefanie Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," *New Media & Society* 30, no. 3 (2018): 885.

⁴³ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 884.

⁴⁴ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 883.

⁴⁵ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 887.

⁴⁶ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 885, 886.

Case Selection

By showcasing diverse digital tools among the final artworks in the exhibition space, CCU aims to suggest a proactive approach to technology as a fundamental part of daily routine. Expanding the research on the possible means of coding and computational systems, the Utrecht-based foundation looks at the creative applications of software to suggest new ways of thinking of the spread of technology in the way we perceive reality and social interactions. The community of creative coders based in the Netherlands is composed of creative makers coming from different fields, such as artists, designers, programmers, performers, musicians, scientists, and craftsmen.

As curator Fabian van Sluijs states: “Research is also a core activity that is embedded in everything that we do. We always interview makers to see what the important influences are in their work. With this, we aim to stimulate reflection on creative coding as a discipline and the importance of playing and experimentation with technologies in our current society. This way of employing this type of research is what makes CCU stand out within the scene of creative coding meetups. Focusing more on our community, we explicitly focus on building bridges between disciplines: from developers to designers, from researchers to media artists.”⁴⁷

The exhibition expands the idea of coding from the daily use of digital programme to a way of exploring computational logic with physical materials. Their media and practices can range from the use of steel to replicate digitally-modelled

⁴⁷ Fabian van Sluijs, “In between Creative Coding and Society. Interview with Fabian van Sluijs,” interview by Costanza Tagliaferri, *Digitcult*, January, 2019, <https://digicult.it/slider/between-creative-coding-and-society-interview-with-fabian-van-sluijs/>

sculptures, to the use of wood to create laser-cut algorithmically designed geometric pieces or playing with autonomous systems creating virtual representations of the city. *Hello World!* guides the audience through software and digital tools highlighting the role of experimentation in the creative process and its potential as an emancipatory practice to explore new approaches to digital technologies.

To direct the audience within this variety of digital techniques, a side part of the exhibition was called Cabinet of Curiosities. Among the artworks, in this ‘spin-off’ tools and software were presented as ‘artefacts’ to uncover the underlying processes of digital technologies. Showcasing the making process behind the artworks, CCU points out how software is not a way to make ‘ready-made’ artworks, rather an on-going and iterative process. The creative process behind the final artwork shows how the relationship between the artist and the programme often involves both control and randomness.

Through this selection of ‘artefacts’, the Cabinet of Curiosities illustrates to the audience how software and programme have the capacity of creating autonomous responses contributing to the outcome. The work is often the result of an iterative process of twisting and playing with algorithms and machines producing a final result not entirely predictable by the creator. Focussing on the creative process rather than the medium itself, CCU aims to stimulate the creative exploration of digital technologies across diverse disciplines. With a range of activities such as meet-up, talks and workshops, the foundation offers a ground to combine theoretical and practical research on technology and digital means.

The focus on engaging the community is also emphasised by the side events such as the music and visual live performance in EKKO, or the workshop for beginners on Processing with artist Saskia Freeke. Beside, the idea of presenting the artworks in

Sensor Lab, a data-driven design studio, enforced the interdisciplinary elements at the core of the community's experiments. In an almost-institutional setting, the event allowed moving beyond the usual boundaries between the organisation, creative makers and audience to engage the diverse background as a possibility for exchange and conversation on the topic of code.

Why this method?

The idea of using this methodology in analogy to analyse the *Hello World!* exhibition builds on three main reasons: the theoretical framework at the core of the method's strategies; the identification of the app with an environment of expected use; and the active role of the researcher. As much as the writing code is usually kept secret and meant for a specific goal, the artworks of the exhibition were presented in combination with the creative process as well as being the result of a process of trial and error. Because of this radical difference, it is possible to employ the strategies of this methodology not to reveal the cultural features of an app's function, but rather to visualise the key points of the theories explained in the previous chapter. By combining the final piece with the creative process and giving an overview of the implications of technology in daily life, any visitor could become familiar with the programming process without the necessity of a specialised background. As a result of a more proactive response to the digitalisation of society, the artworks of the exhibition become a visual example of the mutual shaping between human and technology giving an overview of the possible means of code as a material thing.

Theoretical Framework

As I said, the first reason behind this analogy relates to the theoretical framework of this methodology, which finds its roots in the principles of the Actor Network Theory (ANT) and the Computational Turn in the humanities. Both theories work on the assumption that there is a mutual shaping between human and non-humans. The recognition of this mutual shaping is necessary to identify how cultural values are embedded in the app, and how its features are working to reinforce this value among users by examining both technical mechanisms and cultural references.

This method implies a relational ontology in which sociocultural and technical dynamics are mutually shaping. The ANT makes a difference between intermediaries and mediators, identifiable with human and non-human. While intermediaries pass meaning along with unchanged networks, mediators are transformative and able to alter meanings or circumstances within a system. Looking at software as a mediator allows analysing the materiality of code and how it is affecting the external environment through the action of the user. Despite the level of technical understanding of the user, “technologies are designed, experienced and further developed within a culture that shapes and is influenced by them.”⁴⁸ This theoretical framework allows for the consideration of how digital devices are algorithmically improved to satisfy users’ need on one hand, and on the other how the daily use of these software-driven devices is influencing daily habits.

In analogy, during the creative process the artist both guides and is guided by the algorithmic response of the autonomous system. Shifting the focus to generative art, these theoretical premises allow expanding the discourse to analyse the role of software

⁴⁸ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 887.

during the creative process through diverse programme, rather than looking at the artists' techniques or specific medium. This perspective implies the materiality of code, which allows avoiding the classification of this variety of tools as media to explore how software-driven approaches are guiding the artists in their creative research and explorations.

Following a materialistic and philosophical perspective, social life is an “activity within shared ecologies of people and non-humans” rather than a human drama.⁴⁹ Suggesting an interdisciplinary and flexible perspective to traditional methods, a materialistic perspective encourages a bottom-up approach to understand the multiplicity of the world. The core of these approaches and methodologies aims to overcome the fixed, uniform and measurable world of the Cartesian dogmatism. Instead, the world is agentic and transformative, a process of constant change, opening the possibility of a more flexible reading of history in which objects and nonhumans have ‘agency’ in shaping social life, culture and society.⁵⁰

If in the scientific field emerges that “science was a complex of material activities rather than a single, distinctive way of knowing,” after World Wars social sciences expand the understanding of material power and climate change to highlight the mutual relationship between people and things. Within post-humanist research, the focus is on the entanglement between human, nonhumans and social environment.⁵¹ Shaping differently in diverse fields of research, it is almost unproductive to provide a

⁴⁹ Chandra Mukerji, *The Material Turn* (repr., *Emerging Trends in the Social and Behavioral Sciences*: Robert Scott and Stephen Kosslyn, 2015): 2.

⁵⁰ Elisabeth St. Pierre, Alecia Jackson and Lisa Mazzei, "New Empiricisms And New Materialisms: Conditions For New Inquiry", *Cultural Studies – Critical Methodologies* 16, no. 2 (2016): 100.

⁵¹ Mukerji, “The Material Turn,” 5.

fixed and applicable definition of new materialism since these methodologies “are in process and they are not one thing.”⁵²

Common to these diverse fields is, however, the recognition that people and things are mutually shaping the production of social worlds, and objects are fundamental actors in the socio-historical evolution rather than a mere frame of theoretical discourses. Departing from Descartes’s distinction subject/object, in which the active human interprets and decides on a measurable and fixed world, a philosophical and materialistic approach is leading to an alternative conception in which objects and nonhumans have ‘agency’ in shaping our understanding of the world. It follows that ‘new’ does not necessarily mean innovation or progression, but a different, turned, vision with different outcomes and unpredictability of discoveries and connections.⁵³

In the essay for *Hello World!*’s catalogue, Michiel Pijpe describes generative art as an art form created, entirely or in part, by a self-managing or self-regulating system, which is usually non-human and able of establishing general characteristics of the artwork. The term ‘emergence’ refers to the irregularities and unexpected patterns emerging from this interaction between the artist and the autonomous system.⁵⁴ In Pijpe’s view, the starting point of each artist is a personal response to the unpredictability of the world. Even when the result is impressive, however, often the piece is just a visible representation of something already existing, of something that explains how things are.

⁵² St. Pierre, Jackson and Mazzei, "New Empiricisms And New Materialisms: Conditions For New Inquiry," 99.

⁵³ St. Pierre, Jackson and Mazzei, "New Empiricisms And New Materialisms: Conditions For New Inquiry," 108.

⁵⁴ Michiel Pijpe, "An Infinite Collection Of Images", *Hello World! Exhibition Catalogue. Utrecht: Creative Coding Utrecht*, 2018: 36, 37.

Pijpe sees in the production of all these images and experiments the possibility of teaching something about how society is dealing with digital technologies through art. Looking at how artists are responding to this unpredictable element, it is possible to give cultural meaning to technological innovation with a new approach while facing different stages of this ever-growing digitalisation.⁵⁵ Exploring the possible creative applications of software and machines, artists are blurring the line between art, tools making and technology. Expanding the context of generative systems to biology and chemistry, Pijpe highlights how artists can use diverse systems with unpredictable behaviours as material or reference. Even when placing limitation to these self-regulating systems, the control gained by the artist always depends on the response of the generative system, which in part determinates the final outcome. In both digital and physical environment there is an unpredictable element, an interaction between different levels of control, opening the question as to how artists are dealing with this unpredictable element.⁵⁶

This theoretical framework allows us to look at the relationship between artists and software to explore the role of machines and programming during the creative process. In these terms, the artworks of *Hello World!* are a visible example of this mutual dynamics not because of the type of art but rather because of the multiplicity of techniques and approaches exploring an autonomous system. Following Philip Galanter, generative art refers to the way art is made, rather than the 'how' or its content; second, generative art is not, by definition, coupled with any specific

⁵⁵ Pijpe, "An Infinite Collection Of Images," 39.

⁵⁶ Pijpe, "An Infinite Collection Of Images," 36.

technology and it can also be not 'high-tech'; third, the realm of generative art must be self-contained in order to operate autonomously.⁵⁷

Referring to the way in which art is made, coding practices are a peculiar example to look at the relationship between the artist and the autonomous systems. Since generative art is not coupled with any specific technology and it can also be not high-tech, it is possible to consider any material used to explore the computational understanding of the world, moving further the issue of categorising software and code as media. At last, since the written code depends on the technical system to be executed and the instruction of the artist contains the field of creativity, it is possible to analyse the creative process behind the artwork. According to this reading of generative art, it is possible to analyse the artworks within the context of the exhibition to illustrate the materiality of code through diverse and multiple techniques.

Environment of Expected Use

If the theoretical framework allows analysing the artworks in the context of the exhibition, the narration presenting the artworks is the key to identify the group show as an environment of expected use. Promoting the exhibition, CCU aimed to showcase not only the variety of creative applications with digital tools within the community but also objects visualising for the audience these complex techniques. As van Sluijs says: "We structured the exhibition around 3 perspectives. The first was focused on how creative coders can use their skills to question the technologies that are embedded in our daily lives. The 2nd strand was more focused on how digital is a process that

⁵⁷ Philip Galanter, "What Is Generative Art? Complexity Theory As A Context For Art", 2003: 4.

creates not only digital media but can also transform physical materials. The last strand focused on the presentation of making processes.”⁵⁸

The research in the artists’ studios was fundamental to enrich the angle of analysis on the experimental and playful aspects of coding and software. The perspective of the artists was presented through the artworks combined with video extracts from the interviews to provide an extra tool to explore the three perspectives behind the exhibition. The disposition of space, the combination of side events and visual artworks call for an audience of expert and non-expert alike willing to be stimulated on the topic of coding practices. From the questionnaires’ report also emerged how, even when coming from a different background, on average the audience was already interested in the discussion on technology, expecting to be stimulated on the topic of data and programming through diverse curatorial solutions.⁵⁹ As much as a user expects that the function of an app will help to achieve a certain goal, visitors attending CCU’s events expect to be stimulated to broaden the understanding of this specific topic.

The way in which CCU presents its activities to the audience allows identifying the exhibition as an environment of expected use to look at the artworks in the context of the exhibition’s narrative. In analogy, the researcher investigates, from the user’s perspective, how the single features are designed to achieve the goal of the app. Science and Technological Studies (STS) highlight how cultural dynamics are influencing technological systems. For example, if a male-dominant technology industry will

⁵⁸ Van Sluijs, interview.

⁵⁹ As a part of my internship, I did also contributed to the workshop ‘Designing Recipes for Sustainable Food Futures’, which was not strictly related to the exhibition. Researcher Markéta Dolejšová employs speculative design to engage a conversation on how food culture is transforming with technology and global trades. Looking at the video interviews after the workshop, it became evident how the participants were willing to challenge their original perspective, and interested in alternatives tools and strategies to speculate on possible future with technology and food.

provide a menstruation-tracking app, it will not be a surprise if the designer symbolises the pre-menstrual period with a whirlwind icon implying how women lack control during that time. Technologies are developed with a particular symbolism to reinforce the aim of a creator who belongs to a particular social group, which could also be oppressive or exclusive.

Following a materialistic approach, these influences are identified as ‘master narratives’ referring to “an arrangement of actors that declares a particular understanding.”⁶⁰ This project isolates the three trends at the core of the exhibition as the master narrative which guides the presentation of the artwork in the context of the exhibition. This perspective allows focussing on the single artworks not to analyse medium or technique, but rather how the artwork fits into a wider discussion on technology.

Around the 1960s, a form of cultural criticism began to give to the exhibition space critical precedence to the single art object. Following this curatorial turn, a new form of criticality begun to look at the role of the curator as a potential to engage discussion, debate and critique, expanding the parameters of the exhibition’s analysis to incorporate a cultural and geo-political discussion.⁶¹ Curatorial studies highlight the necessity of putting works into context to create a collective experience part of a wider field of communication and communing.⁶² Alongside possible spatial arrangements, the exhibition location is not neutral and already defines a possible final outcome since it represents a certain type of institution – or not institution.⁶³ Thinking curating as

⁶⁰ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 887.

⁶¹ Paul O'Neill, "The Curatorial Turn: From Practices To Discourse", *Issues In Curating Contemporary Art And Performance*, (2007):13.

⁶² Florian Malzacher, "Empty Stages, Crowded Flats. Performativity As Curatorial Strategy", *Repr., Maia: House On Fire*, 2017: 29.

⁶³ Malzacher, *Empty Stages, Crowded Flats. Performativity As Curatorial Strategy*, 33.

performative, in the sense of producing and constructing meaning about society, allows thinking “art not *in* but *as* public space.”⁶⁴

The key point of this perspective is to look at the formation and exchange of knowledge depending on how performative curating frames social situation.⁶⁵ As much as the single app’s features are modelled according to the scope of the interfaces page, through the curatorial narrative proposed by CCU the artwork becomes part of a wider discussion on technology and society. With this method, it is possible to use the ethnographic findings to explore how the disposition of space, selection of artworks and range of side activities are representing the intentions of the Utrecht-based foundation. Identifying the exhibition as an environment of expected use gives the context to explore how the artworks and the creative process are a visible example of the materiality of code.

Ethnographic Sensibility

Here comes the third reason why the structure of this project takes inspiration from the walkthrough method. Implying that users typically prefer to learn a system by using it, rather than from a manual, the strength of this methodology is the active role of the researcher in the user’s shoes. Generally speaking, walkthroughs are established in vernacular cultural practices mainly to analyse the consumption and evaluation of cultural goods. In this vernacular sense, walkthroughs can have pedagogical and commercial values while revealing intricate details on the artefact took into account. This unfolding of hidden details creates a step-by-step narration which makes explicit

⁶⁴ Malzacher, *Empty Stages, Crowded Flats. Performativity As Curatorial Strategy*, 38.

⁶⁵ Malzacher, *Empty Stages, Crowded Flats. Performativity As Curatorial Strategy*, 39, 49.

what is implicit, assuming that, like any cultural text, walkthroughs video and narratives reflect the discursive and ideological position of the researcher.⁶⁶

As I said, in more formal academic settings, the walkthrough as a technique is grounded in software engineering studies, meant to improve the quality of code and user's experience. Departing from this background, the methodology used here does not look only at the response of the user, but rather explores how 'to illuminate the material traces of those interactions' to critically analyse the app as a socio-technical artefact.⁶⁷ Combining the step-by-step technique to the theories illustrated previously, this methodology allows visualising the mutual shaping between technical devices and society in the cultural, social, political and economic context.

According to this materialistic perspective, the technological architecture of an app can be compared to an infrastructure. Taking the example by Star, infrastructures are invisible in the same sense of a glass of water. When someone pours water in a glass, it is very rare to think of the complex process of plumbing behind that simple object. In analogy, users rarely question the process behind icon and screen sequences, forgetting how apps are closed systems controlled by organisations with specific programme and aims. This 'infrastructuralisation of platforms' allows analysing apps through infrastructures techniques. This approach suggests to bring an 'ethnographic sensibility' to make the features of these close-off systems available for critical analysis. While the first stage is normally employed to review apps by collecting data, the interpretative method relies on a theoretical framework looking at the contextual elements of an app's interface.⁶⁸

⁶⁶ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 885, 886.

⁶⁷ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 886.

⁶⁸ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 882, 887.

For this project, the ethnographic findings will be the ground to explore the theoretical framework through the single artwork in the context of the exhibition. As an assistant researcher, I was able to engage with the production of the exhibition during the setup, with the artists for the interviews and with the audience during the exhibition tours. Because of this role in between, my ethnographic position will not identify with the visitor in the sense of a user. Rather, as an active observer, I will build the analysis from the point of view of those producing the narration of the exhibition. These findings and experience in the field will be structuring the step-by-step narration through the selection of three artists to analyse how the artworks, in combination with location and activities, are communicating the narrative behind the exhibition. Following the position of the organisation, the structure of the analysis will build on the three main strands at the core of the exhibition. This grill will be the ground to illustrate the theoretical framework with the scope to visually illustrate the materiality of code. Based on CCU catalogue, the analysis of the single artist will isolate on each point, with the focus on the dynamics between artists and software during the creative process.

The first strand focuses on how artists are exploring digital abilities to question how technologies are embedded in everyday life. For this first point, the project takes into account the artist Sylvain Vriens presenting the artwork *Immer Geradeaus: The World On Autopilot* (2017). The piece is an “artistic experiment on how the world looks through the screen of a navigation device.”⁶⁹ It changes the map into a straight line, and thereby the way you perceive a city. When we use Google Maps, we often follow a blue dot without necessarily observing our surroundings, and experience a linear path from point A to point B. His work makes this experience tangible, as it “re-

⁶⁹ Sylvain Vriens, “Interview for *Hello World!*,” interviewed by Axelle van Whynsberghe and Costanza Tagliaferri, CCU Archive, October, 2018.

imagines the city as a long strip along your route, eliminating all turns by bending the city around your route so it truly becomes a straight line from A to B.”⁷⁰

The programmer also shows some of the internal structure of how the satellite images of Google Maps are presented to us by showing all the colourful tiles that he uses to compile the image. Sylvain Vriens is a programmer who is creating interactive installations mainly with physical electronics and videos for over a decade. Based in Utrecht, Vriens calls himself a “programmer, developer, coder, creative technologist.”⁷¹ He has obtained an MA in Media Technology from the University of Leiden and now works for a range of clients, such as visual artists, theatre companies, museums, and advertising agencies. Besides his work as a developer, the programmer gives lectures and workshops about art, computers and electronics, and teaches interactive performance design at the University of the Arts Utrecht. In his pieces, Vriens states that he strives to “create fun, immersive experiences where the technology feels natural and becomes invisible at the same time.”⁷²

For the second strand questioning how digital practices can be explored with physical material, the artwork taken under examination is *Sea Plane* by Art van Triest. Part of the series *Imperfect Primitives*, the steel sculpture is an example of how the core difference between pixel and steel cannot be directly translated. Van Triest confronts the viewer with a powerful visual language, between skilled craftsmanship and creative coding. *Imperfect Primitives: Sea Plane* (2018) reflects on the relationship between the digital and the physical. Using 3D modelling software, van Triest deforms virtual geometrical shapes, called primitives, to reproduce them in steel. The different reaction

⁷⁰ Viens, interview.

⁷¹ Viens, interview.

⁷² Viens, interview.

of the two materials reveals how a one-on-one translation from virtual to physical is impossible. *Imperfect Primitives* is a metaphor celebrating the imperfection of the physical making process.

The last perspective focused on the presentation of making processes. For this last critical point, this project analyses *Neural Cities* (2017) by Jasper van Loenen. In this work, he trained Pix2pix to turn depth maps from Google street view into street view photos. Pix2pix is a machine learning tool that takes a given a training set, and uses neural networks to translate an image into another image. Jasper van Loenen is an artist based in Rotterdam, working in the field of interaction and design. His pieces mainly use open source code and technology and often strive to reveal the underlying processes and systems of the technologies that we use and trust. His work *Linger* (2016) addresses the signals that known routers receive from personal devices, and allow the user carrying the work to rebroadcast the signals of others and create an ever-expanding ‘virtual crowd’. Some of his works, such as *DIY (Drone It Yourself) v1.0 Kit* (2013) also question our assumptions of technology.

The analysis of the single artworks will be the step-by-step narration relying on the findings collected on the field during the preparation of the shows, specifically looking at the artists’ interviews and transcription. The following chapter analyses the narration of *Hello World!* exhibition through its spatial arrangements to identify the exhibition with an environment of expected use and contextualise the interpretation of the three artworks.

3. MATERIALITY, NARRATIVES AND THE EXHIBITION SPACE

Material Culture: Things and Artefacts

As I mentioned in the previous chapter, the first reason why this project relies on the Walkthrough method is the theoretical framework. According to a materialistic perspective, the methodology considers how digital devices are algorithmically improved to satisfy users' needs as well as how the daily use of these software-driven devices is influencing daily habits. In '*The Computational Turn*', Berry remarks how research is increasingly mediated by technology in both epistemological and ontological programmes. Today it is common to speak of digital humanities since online sources and research software are widely spreading in research methods, even though every discipline is not relying on digital technologies in the same way. Digital humanities attempt to take into account how the plasticity of the digital form is leading towards a new way of representation and mediation. Initially seen as a support tool for research, computational devices became a condition of possibility to answer numerous questions in several fields of cultural analysis.⁷³

As much as computational devices are transforming the way in which knowledge in universities is produced, the spread of technology in daily life is transforming cultural habits and social implications. As it was with pen and paper, Berry sees in this *computational turn* the possibility of empowering human thinking by looking at how knowledge is transformed through particular computational techniques,

⁷³ David M. Berry, "The Computational Turn: Thinking About The Digital Humanities", *Culture Machine* 12, (2011): 1-22, <http://sro.sussex.ac.uk/49813/>: 2

specifically software.⁷⁴ Inspired by Hofstadter, Berry calls for digital *intellect* rather than digital *intelligence*. If the intelligence seeks to grasp, manipulate and re-order to immediately size in a situation to evaluate it, the intellect is the creative, critical and contemplative side of mind – examining, imagining and theorising a situation seeking the understanding of the whole. Technology can be the promise for a collective *intellect* in which knowledge can be shared on a common language without geographical boundaries.⁷⁵ Berry proposes to look at culture through technical devices to understand the materiality of this ever-growing digitalisation of society.

The recognition of the mutual shaping between digital devices and users allows building an analogy with generative art practices, since during the creative process the artist both guides and is guided by the algorithmic response of the autonomous system. These theoretical premises allow expanding the discourse to analyse the role of software and the materiality of code during the creative process regardless of the medium or technique. Ingold recognises an artwork as a thing since an artist follows the flow of the world to let forms rise without a pre-classification or a pre-set form. As a thing, an artwork has a concrete and material existence, which exceeds our full understanding because of the constellation of influences and interactions constructed around it.⁷⁶ Especially generative art is a visual example of how materials, digital or not, can have an active role in the realisation of an artwork. Without being coupled with any specific technology, generative art refers to the way art is made, rather than to the ‘how’ or its content.⁷⁷ Besides, the realm of generative art must be self-contained in

⁷⁴ Berry, “The Computational Turn: Thinking About The Digital Humanities,” 11.

⁷⁵ Berry, “The Computational Turn: Thinking About The Digital Humanities,” 7-8.

⁷⁶ Tim Ingold, "Bringing Things To Life: Creative Entanglements In A World Of Materials", *ESRC National Centre For Research Methods* 15 (2010).

order to operate autonomously. Any written code needs a technical system and the artist's set of instruction to be executed, circumscribing the field of analysis of the artwork. According to this reading of generative art, it is possible to analyse *Hello World!* artworks within the context of the exhibition to illustrate the materiality of code through diverse and multiple techniques.

Speaking of 'material culture' means to put the attention on how inanimate things are acting on people within the environment. This shift of attention has the scope of exploring how things are carrying out social functions, regulating social interactions and giving symbolic meaning to social activities. The intention is to see culture as something created and lived through objects, while seeking new forms and connections between social and economic dynamics and society's structures.⁷⁸ Specific networks of cultural and political discourses and relations produce objects, which are also reproduced by human actions. Interpreting culture through a materialistic perspective means to look at the mutuality of the interactions between objects, environment and people.⁷⁹

For the scope of this project, I will focus on the notion of things and artefacts to explore the interactions that software can establish. In materialistic analyses, an artefact is a symbol of some crucial aspects of social and cultural activities. In '*Understanding Material Culture*,' for Ian Woodward artefacts are important because of their materiality, which makes them "the subject of retrospective interpretation and ordering."⁸⁰ With the idea of giving visual elements to visualise the creative process,

⁷⁷ Galanter, Philip. "What is generative art? Complexity theory as a context for art theory." GA2003 – 6th Generative Art Conference, 2003: 4.

⁷⁸ Ian Woodward, *Understanding Material Culture*, 1st ed. (repr., London: SAGE Publications, 2007): 3-4.

⁷⁹ Woodward, *Understanding Material Culture*, 15.

⁸⁰ Woodward, *Understanding Material Culture*, 15.

CCU presented a series of ‘artefacts’ related to the digital practices behind the artworks. Collaborating with anthropologist Axelle van Wynsberghe, a side part of the exhibition was inspired by the *Wunderkammer* of anthropological museums. Called Cabinet of Curiosities, this spin-off was dedicated to pieces of works, screenshots and videos illustrating the variety of techniques behind the artworks.

Without following a chronological logic or classifying the tools in a set order, the idea was to visualise how artists are dealing with these tools and what is behind the final artwork. Saskia Freeke, for example, presented a screenshot of the making process with Processing in conjunction with some geometric puzzle for the audience. By showcasing the programme and the puzzles, the artist wanted to remark not only the playfulness of the process but also how digital and physical material respond differently to her manipulation. The intention of combining these artefacts to the final artworks was not a way to guide the viewer through a fixed interpretation but rather a way to provide key elements to visualise the creative process of the artworks.

To illustrate how things mutually interact with each other exceeding our full understanding, Ingold introduces the notion of meshwork. Through the example of a spider web, the author points out how the spider spins the web nodes and how they lay down as it moves around. The web becomes an extension of the spider body, creating an entanglement with the environment since the spider lives and perceives the world through the web. This line, however, does not create a direct connection between the spider and the world, rather the *conditions of possibility* for the spider to interact with the environment. In this sense, lines become relations not in ‘between’ but ‘along’ two entities.⁸¹ The exhibition space works as the spider web, creating the condition of possibility for things and artefacts to interact. For the scope of this project, materialistic

⁸¹ Ingold, "Bringing Things To Life: Creative Entanglements In A World Of Materials," 12.

theories are the theoretical ground to analyse the artworks looking at the multiple interactions they create within the context of *Hello World!* exhibition, rather than focussing on what the artwork means as a single piece isolating one direct connection.

As I mentioned in the previous chapter, the second reason why this project takes inspiration from the Walkthrough method is the analogy between the exhibition space and the environment of expected use. If the interface's features are working to reinforce the functionality of the app, the combination of artworks and artefacts illustrates the narration of the exhibition in the space arrangements. As cultural agents, curators and artists produce cultural values, and therefore exhibitions "produce a set of values and social relations for the audience."⁸² Paul O'Neill points out how especially event-exhibitions contribute in the formation of cultural and social relations, becoming a space to legitimise specific forms of artistic and curatorial practices. The exhibition space creates a connection between art, display and reception, acquiring a crucial role in giving meaning and significance to the art displayed.

Curatorial practices are a mode of discourse, which presents and gives meaning to the artworks in the exhibition space.⁸³ By presenting a certain kind of narrative to their audience, exhibitions are always rhetorical and ideological media regardless of their form. In analogy with app interfaces, an exhibition is a strategic system of representation, organised at its best to exploit the inherent elements of the art displayed. The next section will focus on how the location and space arrangements are organised to illustrate the narrative behind the exhibition, and in what sense the exhibition space can be interpreted as an environment of expected use.

⁸² Paul O'Neill, "The Curatorial Turn: From Practices To Discourse", *Issues In Curating Contemporary Art And Performance*, (2007):16.

⁸³ O'Neill, "The Curatorial Turn: from Practices to Discourse," 16, 17, 25.

Narratives and Curatorial Practices

To analyse *Hello World!* through the notion of things and artefacts means to take the narrative of the exhibition as a crucial element to interpret the single piece. Within the wide range of terms employed in materialistic analyses, the notions of narrative and performance are connected to the role of inanimate objects, and a key to understand how knowledge is formed and constructed.⁸⁴ As Woodward points out, there is mutuality between people and objects since “the effective performance of any identity relies on particular engagement with, and presentation of, objects.”⁸⁵ Without a narrative story-line, an object is basically invisible within a culture, and material things have power on our vision of society only in the narrative context in which they are embedded in. Besides, since humans interact with objects in their daily routine, things are part of any social performance actively constructing and communicating meaning.

As I mentioned before, curatorial studies highlight the importance of understanding artworks into context to explore the interactions between the audience and the art piece.⁸⁶ The location of an exhibition and the spatial arrangements are never neutral, influencing the reception of the artworks. Thinking curatorial practices as performative means to see how meanings about society are constructed and produced.⁸⁷ The key point is to look at the formation and exchange of knowledge depending on

⁸⁴ Woodward, *Understanding Material Culture*, 151-152.

⁸⁵ Woodward, *Understanding Material Culture*, 152.

⁸⁶ Florian Malzacher, *Empty Stages, Crowded Flats. Performativity As Curatorial Strategy* (repr., Maia: House on Fire, 2017), 29.

⁸⁷ Florian Malzacher, *Empty Stages, Crowded Flats. Performativity As Curatorial Strategy* (repr., Maia: House on Fire, 2017), 38.

how performative curating frames social situations.⁸⁸ In conjunction with this performativity, things require a narrativisation in order to acquire social life.⁸⁹

Narratives are an important component in the construction of culture, since not only objects have a social life but are also represented as images with global mobility.⁹⁰

In the essay ‘*Curating the City: Urban Interfaces and Locative Media as Experimentation Platforms for Cultural Data*’, Nana Verhoeff and Clancy Wilmott introduce the notion of curator as *dispositif* to approach the diversity of media practices.⁹¹ Looking at contact, participation and play as well as individual experiences, the role of a curator as a heuristic concept relates to the broader sense of designing cultural spaces in which reflection and experience are coming together.⁹² Rather than referring to the traditional sense related to museums and exhibition spaces, the use of the word curator wants to leave aside the technical principles of an exhibition to focus on the multiple levels in which curatorial practices can intervene to present the artworks. In this sense, curation is intended ‘as *care* for the constellation of elements,’ while selecting and organising, giving an interpretative framework to the artworks.⁹³

In the context of an art exhibition, the story-line presenting the artworks assumes a crucial role to guide the viewer through the selected works. CCU presents the exhibition through a narrative which combines diverse creative explorations

⁸⁸ Florian Malzacher, *Empty Stages, Crowded Flats. Performativity As Curatorial Strategy* (repr., Maia: House on Fire, 2017), 39, 49.

⁸⁹ Woodward, *Understanding Material Culture*, 153.

⁹⁰ Woodward, *Understanding Material Culture*, 28-29.

⁹¹ Verhoeff and Wilmott. “Curating the City: Urban Interfaces and Locative Media as Experimental Platforms for Cultural Data” in *Code & The City* ed. Rob Kitchin and Sung-Yueh Perng (London: Routledge, 2016):120.

⁹² Verhoeff and Wilmott, “Curating the City: Urban Interfaces and Locative Media as Experimental Platforms for Cultural Data,” 120.

⁹³ Verhoeff and Wilmott, “Curating the City: Urban Interfaces and Locative Media as Experimental Platforms for Cultural Data,” 121.

through the lens of playfulness. The exhibition was built on three main trends to explore the connection that software can establish: the first asked how programmer are exploring their skills to test technology we are using everyday; it explores how the digital process also concerns physical material; it focus on the presentation of the making process.⁹⁴ The disposition of space, the combination of side events and visual artworks on the topic of coding practices were open to an audience of expert and non-expert alike. In addition to the artefacts, in the Cabinet of Curiosities video extracts from the artists' interviews provided an extra tool to explore the three perspectives behind the exhibition.

How CCU presents its activities to the audience allows identifying the exhibition as an environment of expected use to look at the artworks in the context of the exhibition's narrative. As much as the single app's features are modelled according to the scope of the app, through CCU's narrative the artworks become part of a wider discussion on technology and society. As I said previously, technologies are developed with a symbolism reinforcing the scope of the creator. Following a materialistic approach, these influences are identified as 'master narratives' referring to an arrangement of actors that declares a particular understanding.⁹⁵ In analogy, the narrative proposed by CCU becomes a story-line for the artworks, guiding the viewer in the fruition of the exhibition without imposing a pre-set path.

The exhibition space can be interpreted as an interface with a critical function, directing the viewer and transforming the message into a visible interpretation.

Specifically looking at temporary exhibitions and site-specific projects, care is not

⁹⁴ Fabian van Sluijs, "In between Creative Coding and Society. Interview with Fabian van Sluijs," interview by Costanza Tagliaferri, *Digitcult*, January, 2019, <https://digicult.it/slider/between-creative-coding-and-society-interview-with-fabian-van-sluijs/>

⁹⁵ Ben Light, Jean Burgess and Stefanie Duguay, "The Walkthrough Method: An Approach To The Study Of Apps", *New Media & Society* 30, no. 3 (2018): 887.

intended as conservation, rather as exploration for the arrangements of possibilities and experimentation.⁹⁶ O'Neill points out how group exhibitions are a canonical model of this representation by inducing forms through visual and audible relations with the audience. The curatorial narrative is crucial to guide the viewer through the diverse artworks producing particular and general forms of communication. Bringing different artists in an exhibition creates a way of engaging with different perspectives on a common theme, expanding the trans-cultural context.⁹⁷

By organising the artworks in combination with the artefacts, *Hello World!* exhibition becomes a laboratory for experimentation not only for the Cabinet of Curiosities but also for the talks and interactive workshops during the event. By combining these diverse elements together, CCU uses the space to illustrate the narration behind the exhibition focussing in the three main strands mentioned above. The exhibition was held in SensorLab, a data-driven studio design in the heart of Utrecht centre and next to the University. Unlike galleries or museums, the studio focuses its interdisciplinary activities on data and sensors with internships, interactive workshops and talks to combine different disciplines. The location enforced the narration of the exhibition moving the attention on technology to interpret the artworks and engage with different fields of expertise. SensorLab was a space to play with the making process, moving the attention on tools and techniques rather than isolating the artworks in an aesthetic discourse.

In addition to the location, the exhibition space was organised to guide the viewer through the diverse creative experimentations of the artists. As O'Neill remarks, the exhibition space is a temporal and architectonic structure. As spatiotemporal

⁹⁶ Verhoeff and Wilmott, "Curating the City: Urban Interfaces and Locative Media as Experimental Platforms for Cultural Data," 123, 124, 125, 126, 127.

⁹⁷ O'Neill, "The Curatorial Turn: from Practices to Discourse," 14.

phenomena, also the spatial arrangements interact with the viewer on three levels: surrounding the viewer that moves through it; only partly interacting with the viewer; containing the viewer in its space of display.⁹⁸ The author highlights three spatial coordinates to represent organisational strategies as much as plans of interaction through which the viewer experiences the show.

The background is the architecture of the exhibition space. As the first layer, it is basically the fixed walls of the structure emphasise or demystify the 'white wall'.⁹⁹ The exhibition was spread in the down floor, the laboratory and the downstairs cellar. In *Hello World!* exhibition, the use of the white wall is the first spatial organisation. The artworks and the two sounds installation are displayed on a white wall to focus on the diverse techniques and materials, while the two interactive installations are in the cellar to give an immersive experience to the viewer. The Cabinet of Curiosities is in the glass lab in the centre of the studio, guiding the viewer without forcing a unique reading of coding practices. Walking in, the viewer had the impression of passing through an aisle. On the right wall just at the entrance, the mechanical arms of the Axidraw machine are constantly drawing 3D models by Saskia Freeke and Carolien Tenuisse. Mixing different techniques, the wooden sculptures by Saskia Freeke, the long print by Sylvain Vriens or the mathematical draws by Wouter Willebrands are displayed in sequence on the white wall. On the opposite side, the entrance of the Cabinet of Curiosities in the glass lab was inviting the visitors to wander between tools and screenshot programme. In the talk space are the sound installations by Ren Yuan and Roald van Dillewijn. In the downstairs cellar, the video mapping by DEFRAME creates an immersive experience with a projector projecting on itself, next to steel wave by Art van Triest. The exhibition space was meant to create a free and individual

⁹⁸ Paul O'Neill, "The Culture Of Curating And The Curating Of Culture(S)", *The MIT Press*, 2012: 92.

⁹⁹ O'Neill, "The Culture Of Curating And The Curating Of Culture(S)," 93.

wander between the artworks and the Cabinet, without suggesting a separation but rather a combination and interrelation between the diverse space of the data design studio.

The middleground is an area in which the audience is partially intended to interact. This is coherent with the exhibition design and it depends on how such elements work with the overall framework of the group exhibition. The middleground is used as a mean to guide the viewer in the exhibition in prescribed ways.¹⁰⁰ By presenting the artworks in combination with talks and workshops, CCU manages the audience activities on both a reflective and practical level that combines an individual reflection to a proactive approach to the topic. Two workshops are particularly representative of this intention. *The Data Flâneur* City Tour by Cristina Cochior and Ruben van de Ven starts in the lab and brought the audience around the centre of Utrecht to explore where data collection is happening in the simplest daily gesture. The workshop by Saskia Freeke on Processing for beginners is an opportunity to create a small sketch with one of the artists of the exhibition. The intention of presenting a more playful and explorative attitude to technology for expert and non-expert alike is not only in the spatial arrangements but also in the activities around it.

The foreground represents a space of containment, in which the viewer takes direct contact with the artefacts, remaining intact after the event of the exhibition.¹⁰¹ The artefacts were placed in the glass laboratory in the centre of the data-driven design studio. Because of the glass walls and introductory text, the audience could see inside and connect the separated space in the context of the exhibition without the necessity of a pre-set path. Besides, the central position allows the visitors choosing how to explore and combine the input of the show, making their own path according to their personal

¹⁰⁰ O'Neill, "The Culture Of Curating And The Curating Of Culture(S)," 93.

¹⁰¹ O'Neill, "The Culture Of Curating And The Curating Of Culture(S)," 93.

interpretation of the creative research. The Cabinet works as a representation of the interdisciplinary and explorative intent behind of CCU narration, not aiming to suggest a unique outcome but rather a discussion on the hybrid elements of technology.

Because of the curatorial narration and spatial arrangements, the exhibition space becomes a dialogical space. As a strategic system of representation organised at its best to exploit the inherent elements of the artworks, the exhibition space works as an environment of expected use. To analyse how the app functions contribute to the user's experience, the Walkthrough method focuses on three specific elements to analyse the app interface. The 'Vision' involves the purpose, target user and scenario of use, which are often communicated through the app's provider organisational material; the 'Operating model' involves business strategy and revenue sources indicating the underlying political and economic interests; the 'Governance' refers at how app providers seek to manage and regulate users' activity to sustain their operating model to fulfil their vision.¹⁰²

In analogy with O'Neill's spatial coordinates, the background works as the vision, moving the attention on how the disposition of the artworks is organised to guide the viewer through diverse coding practices. The totality of the exhibition space was meant to create a free and individual wander between artworks and artefacts. The operating model is in analogy with the middleground, since the side activities such as talks and workshops enriched the visitors' experiences with the artists' perspective and a direct approach to data and programming. The governance is in analogy with the foreground, since the Cabinet of Curiosities was a site to crystallise and visualise the research behind CCU's activities. Among the artefacts, to further clarify the intention of the Cabinet, a video with extract of the interview was included in the show as well as

¹⁰² Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 889 - 891.

essays around the exhibition to contextualise the research on data and computational tools. The disposition of the artefacts next to the *Wunderkammer* with tools and books guided the visitors through the variety of practices evolving around the exploration of the digital world and computational logic (Figure 4).



Figure 4.

The analogy between the exhibition space and the environment of expected use leads to the last reason why this project takes inspiration from the Walkthrough method. As I said previously, the strength of this methodology is the active role of the researcher in the user's shoes. During my internship, I video interviewed the artists of the exhibition with co-curator Axelle van Wynsberghe. The transcriptions of these interviews are at the core of the following analysis of the artworks. As I said previously, the notion of code as logos implies how source code represents a concrete action; on the axiomatic element of the process of writing; and on how this process is hidden behind usable interfaces. Through the analysis of the artworks by Sylvain

Vriens, Art van Triest and Jasper van Loenen, the next section will show these artworks are a visible representation of these implications, not only because of the medium but also because of the narration behind the exhibition.

Ethnographic sensibility

In academic settings, the walkthrough is a technique meant to improve the quality of code and the user's experience. The collection of metadata is combined to the direct experience of the researcher to supply the closure of dominant brands such as Google or Facebook 'to illuminate the material traces of those interactions' to critically analyse the app as a socio-technical artefact.¹⁰³ This approach implies an 'ethnographic sensibility' of the researcher in analysing the findings of the direct experience of the app as a user.

As an assistant researcher, I was able to engage with the production of the exhibition during the setup, with the artists for the interviews and with the audience during the exhibition tours. In this project, rather than being in the position of a visitor, the role of the researcher identifies with the point of view of those producing the narration of the exhibition. Based on the transcription of the interviews, I selected three works which are particularly representative not only of the three main focus at the core of CCU narration, but also of the implication of interpreting code as logos. Taking under analysis the final piece and the artefact in the Cabinet of Curiosities, the following analysis is not meant to isolate a single meaning connected to the artwork, but rather to explore how the single piece is a visible representation of the narration of the exhibition.

¹⁰³ Light, Burgess and Duguay, "The Walkthrough Method: An Approach To The Study Of Apps," 886.

Sylvain Vriens - Immer Geradeaus: The World on Autopilot (2017)

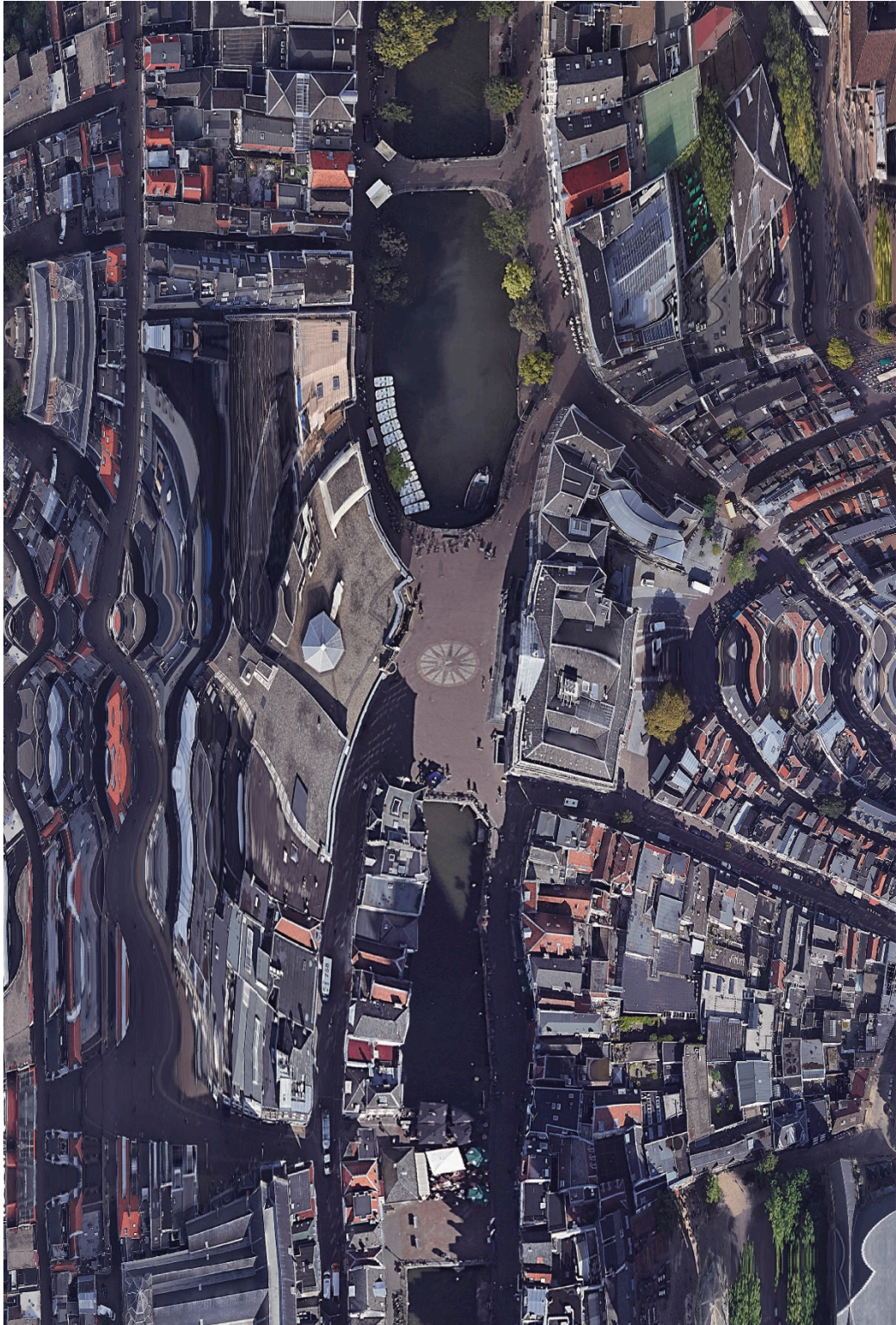


Figure 5.

The first focus of CCU exhibition explores how programmers are challenging their skills to test technologies we are using daily. *Immer Geradeaus: The World on Autopilot* asks what the bike path from Torre Dom to Utrecht Centraal would look like through computational eyes. The artistic project portrays the bike path of Utrecht centre re-imagining the city in the form of a digital map. The tower and the train station, as well as roofs' houses, are still recognisable after a careful look. The process of bending turns to follow a straight line, however, deeply transforms the city creating a representation of the artificial way of organising natural space. As programmer Sylvain Vriens explains: "That's why it's called *Immer Geradeaus*, German for 'always straight on.' I made this visualization of cities – the routes I take by bike and through the city – and re-render the map of the city in such a way that the road I drive is actually a straight line."¹⁰⁴

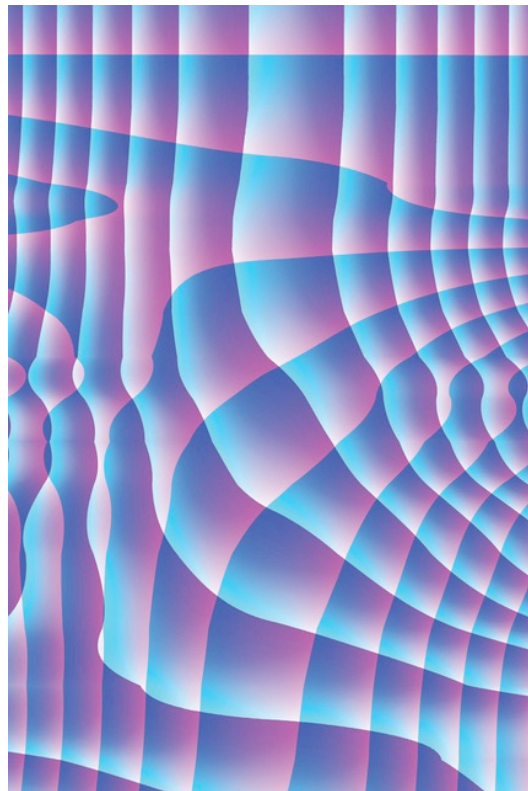
Vriens combines computational and natural space to visualise how we take for granted the support of digital devices when we experience the world. As Vriens states: "It's fascinating how we tend to get sucked into these technologies in day to day life without noticing how it has actually changed [...] I find it interesting that we never stop and think about what happens and 'what does it mean' for us as humans in the end. It's all technology driven now, so, are we still the same humans we were ten years ago? I don't know."¹⁰⁵ Choosing a navigation device, Vriens points out how technology is encouraging a computational understanding of the world in daily gestures.

As an artefact to visualise the making process to twist the city, the programmer presented three screenshots illustrating the process of tweaking and testing algorithms. In the first phase, the algorithm recalculates the points along a given route creating a

¹⁰⁴ Sylvain Vriens, "Interview for *Hello World!*," interviewed by Axelle van Whynsberghe and Costanza Tagliaferri, CCU Archive, October, 2018.

¹⁰⁵ Vriens, interview.

visual representation of how each satellite image will be distorted. The colours in the image represent the orientation of the real world, where blue waves point towards northwest and white towards the southeast. At this stage, Vriens needs to tweak the parameters of the algorithm to generate an image without too many extreme deformations (Figure 6). In the second phase, the selected satellite images are downloaded, lined up and distorted using the same parameters of the first phase. At this point, the artist can test the degree of manipulation of recognisable points as in the case of Torre Dom and Utrecht Centraal. If these get too distorted, the parameters need to be adjusted starting the whole process over again (Figure 7). In the final phase, the satellite imagery is rendered with the previous parameters eliminating the coloured overlays (Figure 8).



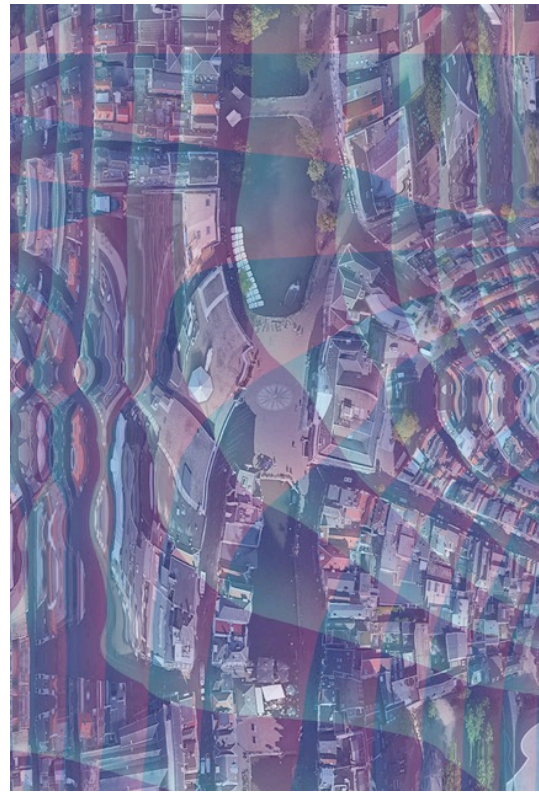
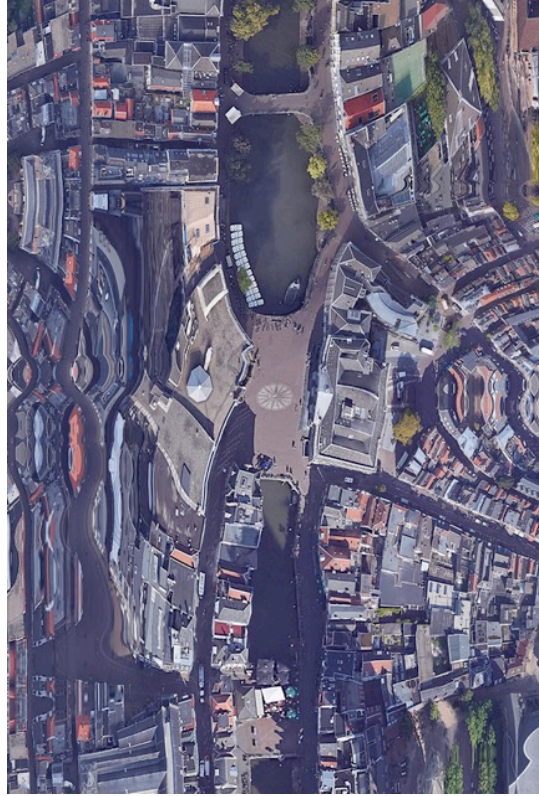


Figure 6, 7, 8.

These artefacts illustrate how natural space becomes distorted to fit into computational logic. The visualisation of this process of twisting and tweaking algorithms is not only a guide for the viewer, but also a visualisation of how the natural space needs to transform to fit into computational logic. As I said previously, in order to process an object, any digital or computational system needs to translate this object into a digital code that a computer can understand to materialise a visible interface. In the case of a navigation device, position and distance are constructed through a digital screen showing a world-view based on how software ‘sees’ space. By presenting this picture of reality as an automatic result of geo-data, tags and other content, augmented technologies are creating an understanding of the world that implies an ‘informationcentric’ familiarity. As part of the common background experience, this computational familiarity becomes central in the way we experience the world.

In ‘*The Philosophy Of Software Code And Mediation In The Digital Age* ,’ Berry points out how we ‘forget’ technology when we experience the world through the example of a mobile phone. When we lose the phone as an object, we also miss the habitual practices around social interactions with friends and colleagues. The use of digital devices is so entangled with daily gestures, that we have learnt how to accept the constant updates of interfaces to perceive the vantage of this technological evolution. Looking at the peculiarity of the ‘digital age,’ Berry points out how computational knowledge is increasingly coming into a ‘given’ shared background since a technical understanding is implied in the way we interact with the world. Yet, because of the facilitation of apps and interfaces, we often forget the complex process of coding and digital translation hidden behind this fast and efficient daily use.¹⁰⁶

¹⁰⁶ David M. Berry, *The Philosophy Of Software Code And Mediation In The Digital Age* (repr., London: Palgrave Macmillan, 2011).

Without being trained to the use of digital devices and interfaces, the viewer would not be able to contextualise the artwork in the narration of the exhibition. Unlike interface apps aimed at a specific goal and course of actions, *Immer Geradeaus* explores and plays with the incongruences between physical architecture and a digital map. With algorithms and Google Street Views, Vriens blurs the differences between these two ways of understanding reality reflecting on the implications of the daily use of technology from an individual perspective. For this reason, this piece is particularly representative of the first focus of CCU narration. The programmer employs his knowledge to suggest a discussion not only on how we take for granted digital devices, but also how these programmes become the representation of daily gestures.

Code as logos implies how programming has become the representation of a concrete action. When someone approaches reality computationally, there is already an attitude towards the world as it has been ‘mapped, classified, digitalised,’ which means that digital objects are performative and normative in a mutual relationship with the users.¹⁰⁷ Even though humans have always relied on technology and machines, the rise of software and coding highlights the importance of looking at how objects are actors in the construction of reality. The city distortions of *Immer Geradeaus* show how we are constantly oscillating between two ways of interpreting reality, and even forgetting about, these digital objects are transforming the way we perceive space. Vriens’ artistic experiment, in combination with the artefacts, illustrates and plays with these mutual dynamics, suggesting to the viewer a discussion in terms of speculation and exploration.

¹⁰⁷ David M. Berry, *The Philosophy Of Software Code And Mediation In The Digital Age*, 123.

Art van Triest – Imperfect Primitives: Sea Plane (2018)

The second point focuses on how the digital world can be explored with physical materials. *Sea Plane* is a physical reproduction in steel of a 3D model. As Art van Triest states: “The project started with the idea that, when you work digitally, nothing is actually round. Of course, if you work vector based, the forms you make are mathematically designed or calculated—but you always gotta deal with pixels, and pixels are straight; they are squares. So, something that is really curved doesn’t actually digitally exist.”¹⁰⁸



Figure 9.

As an artefact, van Triest presented a small, rounded yet square, piece of steel with a hole in the middle and two bigger circular pieces of steel held together by straight steel bars in semi-symmetric order (Figure 9). As van Triest explains: “I made

¹⁰⁸ Art van Triest, “Interview for *Hello World!*,” interviewed by Axelle van Whynsberghe and Costanza Tagliaferri, CCU Archive, October, 2018.

this circle – this is a circle from 36 pieces; so, every little piece of steel is cut in twice, 5 degrees, 10 degrees... and then 36 times, so it is 360 degrees. So, it is a circle but it is not round – it is just a lot of straight pieces welded back together. So, if you make 36 of these, you get just a huge donut: one piece is also the all thing.”¹⁰⁹

To create a circular shape with the physical material and elude the impossibility of pixel of being curved, the artist reproduces 360 times a small piece of steel. As shown by the artefact, by combining the angles of these small pieces it is possible to translate the digital doughnut into a steel sculpture. The final result, the doughnut, depends on the impossibility of a pixel of being curved. In this sense, the intention of making explicit this core difference between the digital and physical world, where actually nothing is straight, drives the creative process of the artist.

The process of creation of the doughnut opens the possibility of combining digital and physical materials through their differences, playing with the potential of an impossible direct translation rather than with its limitation. As the artist says during the interview: “If you transfer the physical into the digital, there is going to be some loss – some loss of information; some loss of details; some loss of materials; some loss of... you name it. That’s because you gotta simplify reality to actually grab it digitally.”¹¹⁰ Since a one to one translation between virtual and physical is not possible, the artist has to explore different ways to concretely realise his initial idea adapting to both the laws of the programme and the structure of the physical material. With *Imperfect Primitives*, the artist offers a visualisation of how the ‘immaterial’ code, the linearity of the pixel, becomes a thing connected with the external environment by guiding the artist in this process of experimentation with steel.

¹⁰⁹ Interview to Art van Triest by Axelle van Wynsberghe and Costanza Tagliaferri for CCU’s Hello World! exhibition (Utrecht, November 2018).

¹¹⁰ van Triest, interview.

In the artwork *Sea Plane*, the internal square web gives the idea of the movement of a sea wave, giving identity to both digital and material version of the artwork. In the randomised 3D model, the precision of dots connecting angles and lines together gives the sense of movement, while the artist can endlessly deform the shape and stretch the angles to explore different solutions. In the steel sculpture, on the contrary, the material cannot be endlessly elaborated, and what gives the sense of movement is the game of lights and shadows of the sculpture in the space. Besides, the imperfect welding of angles, sometimes with a small excess of steel to cover the limitation of the material deformations, not only is holding together the cardinal points of the sculpture but is also increasing the sense of waving recalling the dots of the digital model. (Figure 10, 11)

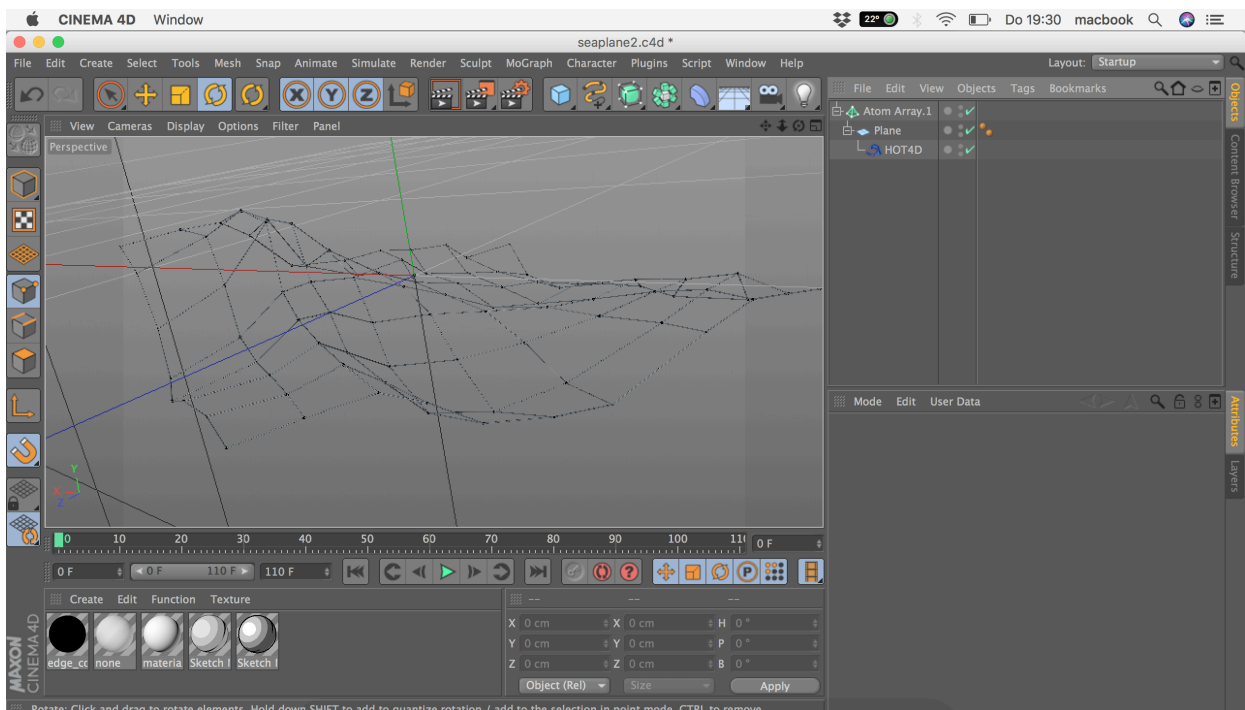




Figure 10, 11.

As the artist explains the process behind *Sea Plane*: “I discovered that if you wanna 3D modelling a sea, I go it from a tutorial YouTube, you get a plain and just drop a randomiser on it [...] I really love to work with random stuff because I don’t have to think of it myself, but you can just let it happen. The computer, of course, is a really good way to work with randomised processes. So, I just got a plain... drop digital randomiser on it and rebuild it into an object.”¹¹¹ If digital randomisation can be endlessly repeated, steel imposes a physical limit to these deformations showing how a one-to-one translation is not possible. *Sea Plane* is an artwork for either the randomized 3D modelling, the incorporeal and ephemeral element; either the steel sculpture, the material manifestation incorporating the ‘imperceptible’ in the unpredictable loss of precision during the process of translation.

¹¹¹ van Triest, interview.

Even setting limitations to the autonomous system, the creative process is axiomatic and the final result is always unpredictable comparing to the original idea. As Parrikka remarks, the process of translation acts not on the content itself but on the intensities – on the incongruences between the code and the physical material.¹¹² As the artist describes: “Because, when you are modelling, you are just working with standard forms and those standard forms, the primitives, build your reality - that’s why it is called *Imperfect Primitives*. [...] You gotta simplify reality to actually grab it digitally. That’s what is interesting me a lot, because a lot of my work evolves around control – controlling reality, letting go of control. 3D modelling is also controlling nature, trying to control reality to make it fit in a digital panel.”¹¹³

As much as we try to simplify reality through our system of knowledge, the process of translation between virtual and physicals reveal the complexity of this simplification. If Vreins’ work showed how digital objects have an active role in the way we construct our thoughts and understanding of reality, the way in which van Triest has to abandon control to the response of the material is an example of how non-humans have an active role in our action. The game of loss and the gain resulting from this process of translation leads to an experimental attitude while exploring the limit and potential of this tension between visible material and invisible code. The steel sculpture is not representing the digital design, but rather the impossibility of a direct translation and how the artist is dealing with these incongruences. Consequentially, both the material and the artist are playing a role in the creation of the physical version of the wave. The impossibility of a direct translation shows not only how the digital world can be explored through physical materials, but also how the process of writing

¹¹² Jussi Parrikka. 2010. “Ethologies of Software Art: What Can a Digital Body of Code Do?” in *Deleuze and Contemporary*: 117.

¹¹³ van Triest, interview.

code is axiomatic and open to unexpected results, since any iteration can alter the meaning of its functions.

Jasper van Leonen – Neural Cities (2017)



Figure 12.

The last focus of the exhibition was on the making process. Artist and programmer Jasper van Leonen uses neural networks to generate cityscapes of Arnhem. The generative network was trained with over 6,000 photos of the city to create a fictional version of the city through algorithmic eyes. The programme used for *Neural Cities* is Pix2Pix, which allows curating a data set with images. As the artist explains in the interview for the exhibition: “In Pix2Pix, you present a system with two images that are somehow related; for example, it could be a regular image and a black and white image. Then, you make this combination, like, thousands of these combinations. You show them to the system and at some point it tries to figure out the relationship between the black and white image and the coloured image. So, when it’s done training and you

show it a black and white image, based on what it has seen before, it will try and create its own coloured image.»¹¹⁴

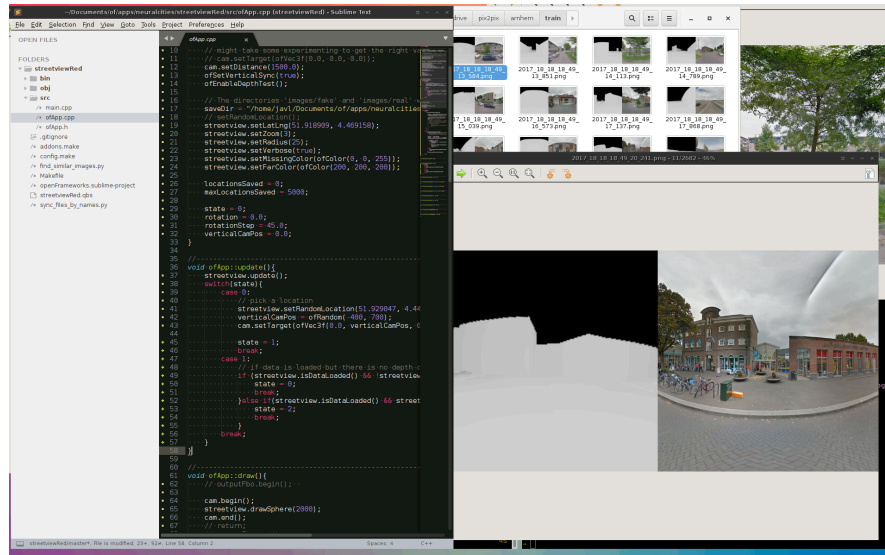


Figure 13.

For the Cabinet, van Leonen presented videos of the making process to show the speed and randomness inner to the use of generative systems (Figure 13).¹¹⁵ This artistic project is particularly representative of how the mutuality between the artist and programme remains hidden, since the final artwork never shows the process of training and manipulation behind the final outcome. As van Leonen describes: “It’s true that it doesn’t really show what it does [...] A lot of people respond ‘oh, so a computer made this?’, they really feel like this system some sort of standalone thing that makes its own decisions and can create these images instead of this sort of play between me and the

¹¹⁴ Jasper van Leonen, “Interview for *Hello World!*,” interviewed by Axelle van Whynsberghe and Costanza Tagliaferri, CCU Archive, October, 2018.

¹¹⁵ “Neural city, test 1,” Vimeo, last accessed January 8, 2020.
https://www.google.com/url?sa=t&rct=j&q=&esc=s&source=web&cd=6&cad=rja&uact=8&ved=2ahUKEwj6i_uF1oXnAhXaysQBHVtYDt8QwqsBMAV6BAGKEAk&url=https%3A%2F%2Fvimeo.com%2F209378203&usg=AOvVaw0HXyXMc9HGTRdGIQu1WN2B

computer. I select the images it has to look at, then I select the images that I want to use as an end result. So it's this combination between what I'm doing and what the system is doing; it's not just the computer. But it is something that is quite hidden, I think, in the end result."¹¹⁶

As said, a technical relationship is far more complicated than a numerical one and comparable to the Hegelian metaphor of the master and the slave, in which both are fundamental for each other survival.¹¹⁷ Code does not automatically do what the programmer says, but it responds "in a crafted and speculative manner in which meaning and action are both created."¹¹⁸ This process of creation carries possibilities for mistakes, deviances and unpredictable outcomes. As the artist says: "These data sets are really big, so at some point I had to delete them to make space for new data sets. Then I realised that the data that I had used before had a nice outcome – I could actually use that for something I wanted to do. I never manage to get my set back, to create a data set that was good as that one. So in that case it was mostly that I did something by mistake basically, or I got really lucky that I got a nice even though at the time I didn't see it as a nice result, and I never managed to find it back."¹¹⁹

There is a random element at the core of any generative system, for which the artist has to be in a dialogical position with the tool in order to make changing on the outcome. Gilles Deleuze highlights how the creative process is a game in which the artist's ability is to abandon the certitude of a pre-set path or image to engage a multitude of directions and ideas.¹²⁰ The artist knows what to do but not how to

¹¹⁶ van Leonen, interview.

¹¹⁷ Wendy Hui Kyong Chun, *Programmed Visions: Software And Memory*, 1st ed. (repr., MIT Press Scholarship Online: August 2013, 2011): 20.

¹¹⁸ Chun, *Programmed Visions: Software and Memory*, 24.

¹¹⁹ Van Leonen, interview.

materialise it until the process of creation starts, as much as code becomes *logos* only in its execution. Software is axiomatic since “you can make the computer do what you want, but you have to figure out *how*.”¹²¹ Programming code in generative systems is more than commanding a functional element, implying a dialogical and mutual relationship between artists and software hidden by the final result.

Without a visual representation of the different stages, it would be impossible for an inexpert audience to recognise the tweaking of algorithms and software response, completely hidden behind the final image. In this sense, this piece is particularly representative of how the process of writing code remains invisible behind usable and visible interfaces, contributing to a “system in which the intangible and the implicit drives the explicit.”¹²²

In this case, the implicit elaboration of the software guides the explicit manipulation of the programmer. This process remains hidden to make computational logic understandable for the user, transforming the friction between natural and computational logic into easy command and button. As the artist mentions: “the system doesn’t know that it’s looking at a city – it’s looking at the images and trying to find some sort of overlapping areas in these images. You can see for instance that it can draw a building, or a part of a building, but sometimes it will connect this to a tree for instance because in the images it has seen these objects, for example this big cube things and then this tree but it doesn’t know that it’s a different object. So, it’s taking apart reality that makes sense to us, but it’s also combining them in a way that doesn’t

¹²⁰ Gilles Deleuze, “The Painting Before Painting,” in *Francis Bacon : Logique De La Sensation*: 86, 89, 92, 93,94, 95, 96.

¹²¹ Chun, *Programmed Visions: Software and Memory*, 49.

¹²² Chun, *Programmed Visions: Software And Memory*, 19.

make sense at all in these dreamy cities [...] it's trying to make sense of an image without knowing what it's looking at."¹²³

The focus on the making process creates a visualisation of the contradiction and differences between computational and natural logic. Rather than hiding them behind easy commands to facilitate the use, the artist shows how these differences are at the core of the process, implying a dialogical relationship between the artist and the programme since both are contributing to the final artwork with a different 'understanding' of the cityscape.

As this research shows, the analysis of the artworks overlaps and expands behind the key points illustrated above. In the context of this project, the ethnographic sensibility takes the form of the elements at the core of the analysis of the selected cases. Interpreting the exhibition as a meshwork, it is possible to explore these perspectives looking at the way they are entwined and melt, rather than seeking a categorisation of these mutual dynamics. This approach is allowed by the identification of the exhibition space with an environment of expected use. Unlike the app and interfaces, the narration of the exhibition does not follow commercial aims but rather wants to engage an open discussion on the topic of coding and technology. Departing from Descartes' distinction subject/object, the group exhibition is a concrete example of how it is possible to think technology in terms of mutuality and dialogue.

¹²³ Van Leonen, interview.

4. CONCLUSION

Conclusive findings

At the beginning of the paper, I insisted on the interdisciplinary and hybrid elements of CCU research. The group exhibition *Hello World!* crystallised the core of this research with an overview of digital practices not to classify diverse media, but rather to explore the multiple possibilities and directions of this creativity. Starting from the assumption we are already living in a digitalised society, CCU displayed a variety of digital and generative art practices with the intention of encouraging a more proactive attitude to programming code and digital technologies we are using daily. Artist van Triest says during the interview for the exhibition: “Also, when we get more digital, and people are thinking about what is happening. It’s not – I don’t think it is the question: if we should or should not get more digital; because we are gonna get more digital, but the ‘way in which’ it is really important. So, how do we do that? What are the choices we can make? What are the effects of the choices we make? And, I think those are the important things to think about, and I hope, by works like these, to get people to think about it.”¹²⁴

According to this approach, the scope of this project was not to isolate a specific issue and try to unfold the complexity of the topic as a whole. Rather, the intention was to explore the mutual relationship between artist and software to see how art production can offer a starting point to question the daily use of these technologies in cultural and social terms. In the context of *Hello World!* exhibition, the artists visualise an

¹²⁴ Art van Triest, “Interview for *Hello World!*,” interviewed by Axelle van Whynsberghe and Costanza Tagliaferri, CCU Archive, October, 2018.

alternative approach to the binary opposition human-machine in terms of mutual relationship. While Vriens radicalises the consequences of relying on digital interfaces, van Triest challenges the incongruences between the physical and digital world, and van Leonen opens a dialogue with an autonomous system.

Despite the use of different materials and programme, a random element common to these creative practices puts the artist in a dialogical position with the tool, rather than in a position of command. In the final essay for *Hello World!* catalogue, Michiel Pijpe names as ‘emergences’ the irregularities and unexpected patterns rising from the interaction between the artist and the generative system.¹²⁵ Even when placing limitation to these self-regulating systems, the control gained by the artist always depends on the response of the generative system, which in part determinates the final outcome.

Pijpe asks how artists are dealing with the unpredictability of these generative systems in terms of limitation and potential on different levels of control and exploration. The starting point of each artist is the personal responding to this unpredictable and unknown of the world – trying to explain with an artwork how things are. Even when the result is impressive, however, the artwork often is just a visible representation of how things work, of something that already exists. Pijpe sees in the production of all these images and experiments the possibility of art of teaching something about how society is dealing with digital technologies. Looking at this multiplicity of practices and approaches is a starting point to give cultural meaning to

¹²⁵ Michiel Pijpe. “An infinite collection of images,” in *Hello World! Exhibition Catalogue*. Utrecht: Creative Coding Utrecht (2018): 36, 37.

technological innovation while facing different stages of this ever-growing digitalisation with a new perspective.¹²⁶

Philosopher and art critic Arthur Coleman Danto believes that is pointless to rely on a historical narration to read art according to a linear and progressive pattern, as it would be a mere chronological order. Referring to the pluralism of media and content of contemporary art production, the author remarks: “if anyone goes in a different direction, there is no longer a direction toward which a narrative can point.”¹²⁷ In Danto’s analysis, the history of art is not only the progression through time of the individual artists’ skills, but rather a narrative in which the production of works is entangled with the philosophical research on the nature of art with the spirit of the population where the work was produced.

Perhaps, this can be a starting point to think how a philosophical and materialistic approach sees the ‘new’. More than innovation or progression, new can be a different, turned, vision with different outcomes and unpredictability of discoveries and connections. Inspired by Metzger’s ‘Auto-Creative Art’ manifesto, Pijpe closes his essay asking: “is this multitude of possibilities – this uncovering of worlds – not the premise of technological progress that we have so eagerly sought? Is it not a possible answer to how we should face the challenges of ever-growing digitalisation?”¹²⁸

Although artists might have lost their role as guidance for society, through these generative artistic practices we can see the potential of this unpredictability, of this unknown, from a different point of view. The relationship between artists and machines is an example to visualise the processes behind this ever-growing digitalisation and automation, contributing to the development of technological innovation not only as a

¹²⁶ Pijpe, “An infinite collection of images,” 36, 39.

¹²⁷ Arthur C. Danto. “The End of Art: A Philosophical Defense,” *History and Theory*, vol. 37, no. 4, 1998: 128.

¹²⁸ Pijpe, “An infinite collection of images,” 39.

progression but also as a reflection on who we are and how we are transforming with the world. In Rancierian words, aesthetic forms are linked to a regime of politics based on the indetermination of identities and the mobility of society's structure. Looking at the variety of art today, the philosopher focuses the attention not on the material or media, but rather on the importance of understanding what art is today through a descriptive approach rather than a prescriptive analysis.

In these terms, Rancière speaks of provocative art. Instead of a radical form of protest, provocative art can be a form of discussion, of encounter and collective mobilisation bringing people together. Art production in its multiplicity can become a guide to reframe how we understand reality, stimulating the individual in terms of participation and contribution.¹²⁹ Recalling Berry's distinction between digital *intellect* and digital *intelligence*, looking at the multiplicity of the whole, a creative exploration of technology can create the condition not only to empowering human thinking as it was with pen and paper, but also stimulate a discussion and participation in new and proactive terms.¹³⁰ In perhaps a too naïve interpretation, one could suggest that *Hello World!* is an example of this interpretation of art. Combining a constellation of practices and approaches, the exhibition becomes a space to engage a discussion as an active and aware observer, rather than a passive user.

¹²⁹ Jacques, Rancière and Gabriel Rockhill, *The Politics of Aesthetics : The Distribution of the Sensible*, Bloomsbury Revelations. London: Bloomsbury Publishing (2013).

¹³⁰ Berry, "The Computational Turn: Thinking About The Digital Humanities," 8.

Images' References

- Figure 1. Second day Hello World! exhibition, CCU Archive for *Hello World!*, November 2018.
- Figure 2, 3. Screenshot by Saskia Freeke with Processing.
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- Figure 5. Sylvain Vriens, *Immer Geradeaus: The World on Autopilot*, trained Goggle Street views, 2017, for the Cabinet of Curiosities, CCU Archive for *Hello World!*, November 2018.
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- Figure 9. Donut by Art van Triest for the Cabinet of Curiosities, CCU Archive for *Hello World!*, November 2018.
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- Figure 12. Jasper van Leonen, *Neutral Cities Arnhem*, Pix2Pix with Arnhem Street views, 2017, for the Cabinet of Curiosities, CCU Archive for *Hello World!*, November 2018.
- Figure 13. Screenshot from the artefacts by Jasper van Leonen for the Cabinet of Curiosities, CCU Archive for *Hello World!*, November 2018.

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