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Grasping the future of the digital society

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ABSTRACT

Society is increasingly digitalised and connected, with computers and algorithms mediating much of people's daily activity in one way or another. The degree of digitalisation and its consequences are challenging to understand because most people lack first-hand experience of what digitalisation actually feels like. Digitalisation is abstract and difficult to grasp, which leads to a detached sense of the digital surroundings. In this paper, we argue that in order to grasp the nature and future of a digitalised society, an embodied understanding of digitalisation is needed. Such an understanding should utilise ways of knowing other than rational thinking, challenge existing narratives and move from preparing for the future to exploring novelty. We focus on the importance of a broader understanding of digitalisation within the field of education and discuss how a more diverse view is essential to empower people to take part in a digitalised society. We use the concept of 'digi-grasping' to analyse awareness and involvement in the digital world. By digi-grasping we mean active sense-making and existing in a world that consists of both a digital and a physical world. We argue that through 'grasping' the digital world it is possible to create an ethical and aesthetic attachment to society. Digi-grasping can empower people to understand and question the choices and motivations behind current digital structures and create new structures. It is thus an important approach to shaping the futures of digital society. We illustrate the concept with examples representing different modes of being and doing at the interface of the digital and physical.

1. Introduction

Digital technologies have become ubiquitous and part of everyday life. Things that would have been regarded as science fiction just a few decades ago are taken for granted, such as modern smart phones, global information networks or virtual reality. At the same time, societies are becoming ever more dependent on digital technologies and infrastructure. Banking, electrical grid management, health records and other personal information are increasingly relying on digital networks and databases. The trend is towards even wider use of digital technologies, with a great deal of hype around artificial intelligence and the promise of an infinitely growing and efficient digital economy. The three main sources of change in digitalisation have been said to be machine learning, platform thinking and crowd-based action (McAfee & Brynjolfsson, 2017).

The switch to digital has created a significant change in technologies by introducing a 'meta layer' of code. Digital technologies rely on code that can be altered, updated, fixed, hacked, stored and analysed without changing the physical machine itself (Berry, 2016; Ceruzzi, 2012). The programmable and reprogrammable nature of digital technologies, as well as the possibility to gather and analyse data, instils more agency into the digital technology. Furthermore, the flexibility and adaptability of code connects humans

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more closely to machines, creating new forms of aggregates between human and nonhuman actors (Berry, 2016).

Digital technologies are entangled in the structures of society in many different, complex, and even contradictory ways. The information society could even be seen as a society that is dependent on the computation of information, emphasising the role digital technologies have in society (Berry, 2016). Furthermore, Berry notes that the move to a computational information society can be seen as a shift from the previous digital era to a new post-digital world ‘in which the digital has become completely bound up with and constitutive of everyday life and the so-called digital economy’ (Berry, 2014, p. 15).

There has also been a large amount of debate over data privacy, security and ownership (Berry, 2016; Gangadharan & Eubanks, 2015). Attacks on different parts of the information network, from company-owned servers full of customers’ personal information to domain name servers critical for the functioning of the network, show the new weak points and risks of the digital age. Companies utilising digital networks and platform thinking are disrupting existing industries. Digital tools also offer new opportunities for organising grass-roots-level action and thus challenge existing public decision-making structures.

In sum, if one wants to be an empowered member of the digital society, there is a growing need to firstly understand what digitalisation — the umbrella term for the trend and impacts of the increasing use of digital technologies — means, and secondly to imagine alternatives to the current narrative. However, the degree of digitalisation and its consequences are challenging to understand because most people lack — or ignore — first-hand experience of what digitalisation actually feels like. Digitalisation is abstract and difficult to grasp, which leads to a detached sense of the digital surroundings. But since digitalisation is not going anywhere, knowing how to be and how to act in the digital world, as well as how to perceive it, are becoming necessary societal skills. The need to be able to comprehend and act in an increasingly digital world, or in Berry’s concept of a post-digital world where digitality is complexly coiled with the physical, is particularly significant in education. It is not sufficient for education to only teach software skills or even coding skills, but it must prepare students more broadly for the post-digital world. Furthermore, how the digital world is perceived (e.g., as a given vs. something that is produced and thus can be shaped) determines what kinds of futures are thought to be possible.

In this paper, we argue that in order to grasp the nature and future of a digitalised society, an embodied understanding of digitalisation is needed. Within education, this denotes a wider focus on digital practices than just technical software or programming skills. One way to achieve this is through approaching coding and the manipulation of the digital world through the concept of ‘digi-grasping’. Digi-grasping is active, embodied sense-making and existing in the interface between the digital and physical worlds. We argue that by paying more attention to the modes of being and ways of acting in the digital world, it is possible to create a stronger ethical and aesthetic connection between the digital technologies and society. Such a connection is essential for building inclusive futures and repelling disowned futures. Digi-grasping can empower students to understand and question the choices and motivations behind current digital structures and to create new structures. For this reason, we argue that digi-grasping is an important approach to broaden the futures of education and digital society in general.

In the next section, we define the key terms used in the paper and elaborate the theoretical basis for digi-grasping. We then give some examples of exploring the in-between of the digital and the physical, drawing especially from the domains of art and activism. We use the examples to illustrate different modes of being and doing in the digital world. In the discussion section, we position the findings in relation to the overall trend of digitalisation and suggest digi-grasping as a key capability in the present digitalised world and in reclaiming digitality and empowering the shaping of the futures of digital society. We conclude with a summary and suggestions for further research.

2. Theoretical underpinnings

The terms used to describe the phenomena of and impacts around digitalisation and the diffusion of digital technologies are often vague and ambiguous. It is thus worth defining the concepts around the ‘digital’ and making a distinction between digital as an aspect of a thing or technology, digitalisation as a phenomenon or trend, and digitality as a condition of the digital world. In this paper, we take a broad view of what is meant by digital and consider not only the technological or theoretical aspects but also the societal, cultural, and political aspects (Dufva & Dufva, 2016; Vaden, 2005; Williamson, 2015).

The term ‘digital’ has its origins in the Latin word *digitalis* and refers to digits. Digitality is something that is discrete in contrast to being continuous. In information technology, the term *digital* refers to the binary number system, which was adopted in the mid-20th century as a primary logic for digital computers (Ceruzzi, 2012; Steiner, 2013). The binary system and the logical framework built on top of it also entailed the ability to reprogram and update the machine without physically changing it, which could be seen as one of the most significant breakthroughs and characteristics of digital machines (Ceruzzi, 2012).

By digitalisation we refer to the actions of transforming various previously physical or analogue actions into digital data systems. The progress in digitalisation has led to extensive and diverse speculation about the future of society and culture. Digitalisation — often very loosely defined — is commonly referred to as one of the megatrends shaping futures.

Digitalisation is a key motivation for the concept of digitality. Negroponte writes in his 1995 book ‘Being Digital’ that the ‘change from atoms to bits is irrevocable and unstoppable’ (Negroponte, 2015), arguing that everything that can be digitised will be digitised. Negroponte defines digitality as a concept referring to living in a digital and digitised culture (Negroponte, 2015). Digitality thus refers not just to the philosophical mathematical system nor to the fundamental technological aspects built on top of a binary structure, but also to the effects digital technologies have on our society. These issues are often intertwined with technological inventions but do not always come as a direct consequence of them. For example, the rapid development of the Internet caused many theorists to proclaim that the Internet would democratise our society in unforeseen ways (Dreyfus, 2008; Morozov, 2014; Negroponte, 2015; Rushkoff, 2010). Another, related example is how digital technologies enabled the gathering and transcoding of

various signals into one universal digital signal now widely referred to as data. One digital system can be used to represent images, sound, motion, text, etc. — it is all just data. Moreover, thanks to the Internet it is possible to freely distribute and copy data without loss of quality and (almost) without cost (Dreyfus, 2008; Negroponte, 2015; Petzold, 1999). Thus, digitality can be seen as a more cultural and societal way of looking at the phenomena related to the ‘digital’.

In popular culture, these thoughts are echoed all the way from Gibson’s ‘Neuromancer’ (Gibson, 1984) to Star Trek’s visions of teleportation and holodecks. A great deal of post-humanist and transhumanist discourse has tackled digitalisation — the trend towards the increasing use of digital technologies — from various aspects, ranging from AI (artificial intelligence) researcher Hans Moravec’s and futurist Ray Kurzweil’s theories of downloading our consciousness onto a computer as a way to save humanity (1997, Kurzweil, 2005; Moravec, 1988) to Katherine Hayles and Donna Haraway’s more embodied arguments of digitality (Haraway, 2013; Hayles, 2001). These theories challenge each other in terms of the comprehension and interpretation of the nature of digitality; digitality is considered as a place where being is possible and the body is a mere vessel. Furthermore, these distinct lines of thought extend further, to the comprehension of being, where we ask whether being should be understood from the Cartesian dualistic standpoint as the separateness of the mind from the body, or whether humans can be seen as *embodied beings*, as Haraway suggests. In other words, is being a human binary or not (Guillaume & Hughes, 2011)?

One possibility for understanding these speculations is through seven metaphors (machine, organism, brain, flux & transformation, culture, political system, psychic prison, instrument of domination, and carnival) based on four paradigms from social science (functional, interpretive, emancipatory, and post-modern), all highlighting different interpretations of code (Dufva & Dufva, 2016). Digitality can be seen as the larger context for code, and thus might benefit from the same kind of analysis. For example, digitalisation is often perceived as a functional concept: an unproblematic key to future growth (Ailisto, Collin, Juhanko, & Mäntylä, 2016). However, digitalisation is also tied to intricate questions of equality, power, politics, culture, etc. In sum, the definitions of digital, digitalisation and digitality are often ambivalent and unclear. In this article, our notion of the digital world refers to this convoluted and multifaceted nature of digitality.

Although rational and explicit analysis of the concepts of the digital, digitality and digitalisation can be useful, it is not feasible in day-to-day life. Comprehending digital technologies through metaphors can be time-consuming and difficult, or at least, impractical in situations such as using digital payments at the cash register or cursing the slow Internet in the supermarket. Particularly in education, a more easily comprehensible, yet at the same time broader, understanding of digitality is necessary. Therefore, an internalised, embodied understanding of digitality is needed to help guide us through the everyday digital structures that humans inhabit. However, to move towards this understanding, we first have to define what is meant by embodied knowledge.

2.1. Embodied knowledge

In defining embodied knowledge, we refer to research that is based mostly on phenomenology. According to phenomenology, the way humans exist in this world is through bodies, and thus humans are restricted to a subjective view of our situated bodies (Husserl, 2013). This embodiment is often thought to contradict or be separate from digitality (Dreyfus, 2008; Kim, 2001; Negroponte, 2015).

Embodiment has a double sense, as pointed out by both Merleau-Ponty and later Varela: ‘[I]t encompasses both the body as a lived, experiential structure and the body as the context or milieu of cognitive mechanisms’ (Rosch, Thompson, & Varela, 1992 p. xvi; Merleau-Ponty, 1945). This notion highlights a crucial point: The body is an active participant not only as a place for our senses but also as a place where knowledge is formed. Craft researcher Kojonkoski-Rännäli emphasises Heidegger’s notion that, since humans are active bodily beings, existing in the world is realised through making, through doing-by-hand (Kojonkoski-Rännäli, 1995).

Merleau-Ponty uses the term *grasping* to point to an activity that is intentional but not necessarily conscious. It is possible to grasp something before knowing it; through the body, humans comprehend not only the spatiality of position but also the spatiality of the situation (Merleau-Ponty, 1945). The relevance of grasping lies in how it creates and shapes the knowledge of the experienced world through the body and embodied action. The body plays an important part in knowledge creation and creates knowledge that would be hard to gather otherwise (Merleau-Ponty, 1945; Dreyfus & Dreyfus, 2004).

The importance of embodied knowledge is that through several overlapping research strands like phenomenology, cognitive science, and especially embodied cognitive theory and enactivist theory, it shows how the mind cannot be seen as separate from the body or bodily experience (Lakoff, 2013), how the mind is built in interaction with the environment (Rosch et al., 1992) and how the mind can be seen to be situated in the whole body (2004, Noe, 2003).

By considering embodied knowledge in the context of digitality, we want to highlight the complex and ambiguous position that digital technologies have in everyday life. Embodied knowledge highlights how, as regards humans, digitality can be understood through being and doing in the interface between the digital and physical. It thus accentuates the complicated relationship between the body and digitality. As stated earlier, digitality is ubiquitous, and it pervades many (if not all) layers of being in modern societies. At the same time, the digital is invisible: humans are often not aware of the systems, their characteristics, their purpose, or the assumptions built into them, nor how these systems shape their behaviour. Dreyfus calls for the need to be clear about these processes:

‘not only are we transformed by the way we use our tools; we are not aware of how we are being transformed, so we need all the more to try to make explicit what the Net is doing for us and what it is doing to us in the process.’ (Dreyfus, 2008, p.137)

2.2. Embodiment and digitality

Digitality in itself, as an abstract and invisible concept, challenges and questions the possibility of embodiment in digitality. Ella

Brians considers the whole dualistic post-human debate in her article on ‘Deleuze and the body’. Do we see ourselves as minds that can be uploaded or digitality as part of the flesh? (Guillaume & Hughes, 2011). Both would allow for the individual to be free or to choose their own body.

Even if we leave the more future-oriented fantasies aside, the problem of digital embodiment remains essential. Dreyfus brings forward the risk-free aspect of digitality: Physicality and presence bring with them the risk of being vulnerable, which is not part of the digital experience. Thus, a digitally connected world is not one that has truly come together, because there is no commitment and action (Dreyfus, 2008). In a similar manner, Turkle suggests that digitality breaks physical interconnectedness and leaves us alone in our body-experiential world (Turkle, 2011), whereas Munster suggest that in digital the embodiment is not in the body, but rather lies between the body and the digital interface (Munster, 2006).

Digitality also influences everyday actions. For example, Claire Bishop has questioned the use of digital devices in art-making. Are we repeating practices from the ‘analogous world’ in the digital world, and not rethinking them for the digital world (Bishop, 2012)? In this way, the physical, embodied being bends because of digitality. Similar questions are acute in the educational context as well. Bishop’s question could equally be put in the art educational context, where art educators are struggling with the inclusion of digital devices and media (see e.g., Ettinger, 1988; Knochel & Patton, 2015; Shaw & Wagelie, 2016). Questions from ‘should we teach code in the art class?’ to ‘how do we use digital image editing software?’ and furthermore to considerations of digital and physical images present a small subset of the questions brought forth by digitality. These challenges are not exclusive to art education; similar challenges can be perceived all over the field of education.

2.3. The need for broadening futures

Many future scenarios assume the continuation of digitalisation. The increase in digital technologies is depicted almost as an inevitable destiny. This is especially true in descriptions of singularity and transhumanism. What is often left unexplored is the anticipatory assumptions behind these technology-driven future worlds.

In terms of three anticipatory systems described by Miller (2018), digitalisation is approached either from a preparatory system, where the focus is on preparing for the disruptions that will inevitably come from the continuing advances in digital technologies, or from a planning system, where the focus is on ‘colonising the future’ or creating the ideal future, depending on the perspective. Less work has been done from the perspective of the third anticipatory system, which emphasises complexity and unpredictability and focuses on broadening the range of possible futures and creating novelty. Thus, depictions of future digitalised worlds may end up being ‘used futures’ or ‘disowned futures’, describing a future that is outdated, not suitable for the current context or something that very few wanted (see Inayatullah, 2008).

In order to challenge anticipatory assumptions and increase the range of possible futures, it is important to both demystify digitalisation and approach it not just through rational thinking but also through ‘other ways of knowing’ (see Inayatullah, 1998). There is thus a need for a framework to help in approaching digitalisation and its impacts on futures from a human-centric perspective that takes into account the physicality of humans.

2.4. Digi-grasping

The idea behind using the concept of digi-grasping is that it acknowledges both the digital and the embodied being from a post-digital perspective. Digi-grasping can be understood as being and knowing in the space and interface between the digital and physical. It is not limited to considering just the aspect of being in the digital, or the use of the digital, but also deals with the ubiquitousness of the digital. Furthermore, digi-grasping treats the post-digital condition as an assemblage of phenomena, technologies and agencies that are able to dynamically transform and change. This perspective makes a space for digi-grasping to offer alternative insights into post-digital as well as allowing for a more empowered discussion of the post-digital. In this article, we use digi-grasping as a concept through which we can describe and analyse awareness and involvement in the digital world. In our definition, digi-grasping has different modes of manifestation, but in general, digi-grasping can be formulated as active and empowered sense-making and participation in an increasingly digitalised world that is not based on simply a rational understanding, but on an embodied understanding as well. It is worth noting that digi-grasping does not aim to define being in a virtual space, but is more interested in the physical world that is increasingly digitised.

In digitality, the notion of the body and embodiment are more contested: In fact, the body can even be denigrated to the level of merely ‘meat’, as in Gibson’s ‘Neuromancer’ (Gibson, 1984). Dreyfus points out that the downplaying of the body is nothing new and has happened before in western civilisation: through platonic philosophy and later through Christianity. He advises us to resist this temptation because to Dreyfus, the body offers a rich environment for knowledge-making and so denying it would be foolish: ‘... without our bodies, as Nietzsche saw, we would literally be nothing. As Nietzsche has Zarathustra say: “I want to speak to the despisers of the body. I would not have them learn and teach differently, but merely say farewell to their own bodies — and thus become silent.”’ (Dreyfus, 2008 p.143–144).

Dreyfus mostly refers to the problematics of the body in virtual reality and in manipulating digital objects, rather than addressing directly the amalgam of the physical and digital. But the underlying gist is the same: Embodiment is not only important for knowledge creation but is crucial to our being. How then to define the embodied presence within digitality?

Berry points out that in the post-digital world, digital technologies are deeply intertwined with human activities. Furthermore, Berry points out that these digital technologies should not be looked at as objects or end points of human actions, but as actors in constant communication with each other: nonhuman and human. Berry calls this constant stream of data ‘everyday computational’

(Berry, 2016). This ongoing interaction between humans and nonhumans and the digital and physical is also a key aspect of digi-grasping, since it emphasises the prevalence of digitality in our daily lives.

As mentioned earlier, Heidegger saw humans as actively bodily beings that shape our world through making (Heidegger, 2009). Kojonkoski-Rännäli has expanded on this notion and argues that through making by hand, we craft an intentional, emphatic and aesthetic connection to the world around us (2014, Kojonkoski-Rännäli, 1995). In this context, digi-grasping is used to define such making, sense-making and existing in the world as consisting of both the digital and physical.

This two-sided being and sense-making also refers to ideas about grasping. Merleau-Ponty defines grasping both as knowledge that precedes rational knowledge and as one's comprehension of the spatiality of both position and situation. This sense-making without rational knowing, as well as the comprehension of one's position and situation, are substantial in digi-grasping: Through it, digi-grasping defines skills that cannot be measured in terms of the more common digital talents, such as code skills, software skills or electronic skills. Digi-grasping can thus be used to express such knowledge of digital being that would otherwise be hard to quantify or make visible. We will later describe this knowledge more accurately through examples and as different modes of being and doing in the interface between the digital and physical.

3. Highlighting different aspect of being in the digital–physical world: five examples

As mentioned earlier, digi-grasping is used to describe the understanding of the world where digital technologies are ubiquitous. Thus, digi-grasping not only reflects competences related to digital technologies and neither is it merely a term to detail a theoretical understanding of digitality. Digi-grasping includes many of the qualities of both skills and a conceptual understanding of the digital, yet it also, as the name implies, emphasises a grasping — an embodied understanding and empowered agency — of digital phenomena.

In this chapter, we present five examples of the interaction between the physical and digital worlds. Each example is meant to introduce distinct qualities of digi-grasping so as to clarify the concept further. Our goal here is not to provide an exhaustive list of all the ways of being and doing in the boundary between the physical and digital, but rather to illustrate and develop further what digi-grasping can mean in practice. In the following chapter, we categorise the examples into different modes of being and doing in the digital world.

3.1. A drawing bot and an artist drawing together

How do we make the boundary and differences between the physical and digital visible? This is the key question from the point of view of digi-grasping in the first example: an art performance that explores what happens when a drawing bot and a human draw together. The performance consists of a drawing bot and an artist drawing on the same surface and mimicking each other. The drawing bot is a simple digital machine that, by means of motors and wheels, carries a pen across the drawing surface. The bot has a simple sensor system that is used to detect things near it. It can be programmed to avoid collision with the artist's drawing on the same surface, or it can be programmed to do something else.

Concerning digi-grasping, the DrawBot, which is a digital device in the analogue domain, brings out the differences between the digital and physical, not by explicitly stating them, but through experiencing the performance. For example, we can experience the actions of the robot and its presence, which can feel familiar but also distant. The key is not to completely understand the workings of the digital machine, nor the communication with it, but to raise awareness of the digital in the physical space (Illustration 1).

The example of a drawing bot conceptualises the differences between the digital and physical modes of being. This conceptualisation — through experience — may help us in becoming more aware of other 'bots' in the physical environment, and their relation to it. Art can thus be a substantial vehicle to bring forth questions that could not be otherwise articulated (Noe, 2015). Similar articulation and awareness-raising can also be achieved through different kinds of robotic systems, which are becoming more commonplace in education and hobbies thanks to phenomena like the maker movement.



Illustration 1. Tomi Dufva & Matti Vainio: Discussions with a machine.

The drawing bot also explores and illustrates the physicality of humans in a digitalised world. The human is seen not as a replaceable ‘meat machine’ or an updatable cyborg, but as a physical being that likely is going to remain ‘as is’ even after digitalisation. The performance can be used to encourage a more general discussion about the interaction between humans and ‘robots’, including a discussion on what is a robot and where, when and how we interact with them.

3.2. *AdNauseam: Raising questions about the explicated digital world*

The second example is a browser plugin called AdNauseam (www.adnauseam.io) developed to protect people against tracking and surveillance. AdNauseam does this by obfuscating user data (Howe, 2015). The premise is simple: The plugin hides ads on websites you are viewing, similar to common ad-blockers, but rather than just hiding the ads, AdNauseam also clicks all the links on the visited web page provided by the ad platform. By doing this, the plugin creates a plethora of data that is useless to the tracking services, since the aim of tracking is, after all, to categorise the user and their data. The goal of the project is not to go against advertising per se, but rather to raise awareness regarding tracking, surveillance and privacy in the digital realm.

AdNauseam sees the web browser as one of the primary ways we interact with contemporary society. As such, the browser represents a key tool for disobedience in society (Howe, 2015). From the point of digi-grasping, AdNauseam is an example of a raised state of awareness of the digitalised world and a playful — as opposed to oppressed — attitude towards it. AdNauseam takes a stance regarding people's citizen's rights and questions the constructions of the digital world. It uses increased awareness of both the workings and impact of digital technology — understanding how and why ad platforms gather data — to question and disrupt the invisible mechanisms of tracking. It is not necessary to explicitly understand the technical details of tracking to grasp the bigger picture that AdNauseam is challenging.

AdNauseam points out both the understanding and empowerment included in grasping. It is an example of comprehending digital structures and working towards changing or forming the structures to better suit one's own ideal. This comprehension and forming takes place in the abstract, since digital structures cannot be seen or touched in the same way as physical structures. Through playful, exaggerated obedience, AdNauseam demonstrates how one can also influence the future through existing structures, thus building hopefulness towards the future. Playfulness is also key to broadening the range of possibilities.

3.3. *I'm getting arrested: questioning or redefining the relationship between the digital and physical*

The third example is a smartphone app ‘I'm Getting Arrested’ ([I'm Getting Arrested, 2016](#)), the concept of which is straightforward: If you are getting arrested in a demonstration, you can quickly open the app and send a pre-formatted text message at once to multiple people, for example, to friends, lawyers or journalists. The idea originates from the Occupy Wall Street movement and has since been extended to other similar demonstrations where police action may be questionable.

The I'm Getting Arrested app is an example of how digital technology can increase agency or nudge power structures in the physical world. Here, the advantages of digital technology, as well as its ubiquitousness, are used to promote one's objectives in the physical world. Digital technology is used as a means to achieve something in the physical world that challenges existing power structures. If compared to the previous example of AdNauseam, the I'm Getting Arrested example redefines the relationship between the digital and physical from the physical point of view.

What is relevant from the perspective of broadening futures in this example is that one is not just aware and critical towards digitality, but sees it as a possibility for action, for example, by acquiring new forms of agency in the digitalised world. The example expands the notion of agency from being a ‘user’ to being a more active subject in the digital world, and in general brings forth the multiple possibilities for change and interactions between the digital and physical. The relationship between the digital and physical is not determined or one-sided, but rather complexly folded in various different ways (Berry, 2014; Munster, 2006).

3.4. *Platform cooperatives: using the digital world to create change in the physical world*

Whereas previous examples have embodied raising awareness and questioning the structures and mechanisms of the digital world, the last two examples emphasise transformation and creativity. The examples of platform cooperatives and creative coding show how, by grasping digitality, we can use it as an agent for change or as a tool for expression.

Platform cooperatives are an ideological, political and economic alternative to platform capitalism or the sharing economy (Scholz, 2014). Platform cooperatives differ from well-known platform companies like Uber or Airbnb in their ownership structure as well as in their mechanisms for distributing value. Whereas companies such as Uber operate according to conventional corporate principles and aggregate value to their shareholders, platform cooperatives are communal projects where the platform is created in cooperation with the workers, developers, and designers (Platform Cooperativism - P2P Foundation, 2015). The value captured and created by the platform is shared directly back to those who have also contributed to the platform.

Many platform companies operating under the umbrella term of the sharing economy are critiqued for the way they exploit their workers. In the case of Uber, for example, it is argued that the drivers are only users of the platform provided by Uber, not its employees. By offering a platform, Uber is freed from social and healthcare responsibilities and at the same time given a dictator-like ownership of their product (Bercovici, 2014; Stallman, 2014). A cooperative alternative to Uber, for example, could be a worker-owned platform that takes care of its drivers and benefits the workers and the app creators equally. Such cooperatives are starting to emerge as a response to the critique of Uber (e.g., the GreenTaxi cooperative).

From the perspective of digi-grasping, platform cooperatives demonstrate an awareness and questioning of the impacts of

digitalisation, but also an active intention to transform existing structures. As platform cooperatives seek to democratise digital economic models, such as the sharing economy, they simultaneously use digitality to change the structures of the economic system and create change in society. It might not be explicitly clear what the new system will be or how it will function, but there is a feeling, an embodied vision of what direction to take.

3.5. Creative coding: highlighting other ways of knowing through art

Where platform cooperatives emphasise the structural changes in political and economic structures, creative coding accentuates the digital as a creative asset. Creative coding could be described as computer programming where the aim is not in functionality but expression (Knochel & Patton, 2015; PBS, 2013). Creative coding can also be seen as a post-modern way of commenting on digital culture (Dufva & Dufva, 2016). The important aspect in creative coding is that it uses digital technology as a medium: It can be utilised as a tool or even as artistic material for expression. Creative coding projects can be political or simply aesthetic, but in any case, they blend the physical and digital together in imaginative ways.

Lauren McCarthy's 'Follower' is a good example of creative coding. Follower is a web service where you can request a follower for yourself. If you are chosen, the service provides a physical follower who follows you for a day by means of location data from your phone. By means of Follower, McCarthy wants to raise questions about attention and surveillance, as well as the relationship and meaning in and between them (McCarthy, 2016).

Creative coding highlights the concept of craft and doing-by-hand in the digital world. *Making* is one of the core components of existing in the world. Thus, intentional making, doing-by-hand, not only produces an artefact but also constructs a connection between the maker and the world they belong to (2014, Heidegger, 2009; Kojonkoski-Rännäli, 1995). Making is not just an activity to create an object, but an active participation in and tending to the world. We argue that creative coding is one example of making in the digital world, which can bring about an aesthetic and ethical relationship with it.

Parikka suggests that software art should not be thought of only as a visual representation, but as imperceptible intensities that fold and address the forces, relations, desires and regimes of practice within the digital world and contemporary world in general. In a Deleuzian sense, software art — and software — could be thought of as assemblages with affects, points of deterritorialisation and change (Zepke et al., 2010, p.121). Creative coding can be seen as the practice of software art, or from a broader perspective, art that uses the core of digital media — digital code and electronics — and blends them with other art-making forms and media. Creative coding offers thus a mapping of the post-digital world. In the educational context, creative coding could be seen as a practice that blends together experiential learning and critical thinking and conceptualisation of the abstract digital world. It thus can introduce 'other ways of knowing' and help challenge anticipatory assumptions.

4. Being and doing in the digital world

The examples in Section 3 demonstrate the variety of connections that humans have with the digital world. Basically, digitality can be seen as a ubiquitous presence in everyday life. Digitality both affects human beings and gives them new abilities for expression and for shaping society. Moreover, the relationship and interface between the physical and digital is malleable and affected by cultural, political and ideological drivers and trends.

As digitality has its origins in technology, it can be a common assumption that particular knowledge is required to comment on digitality. The aim of digi-grasping is to show how digitality can be embodied and grasped without a thorough, explicit and rational understanding of the technology. Furthermore, digi-grasping highlights how this embodied knowledge of digitality can be a source of empowerment and transformation. As such, digi-grasping is a significant notion in an education system that is currently being transformed by the changing needs of post-digital society. Digi-grasping could be used to arrange education to better comprehend the coiled and intertwined nature of digital processes. In this section, we describe how digi-grasping appears in different modes of being and doing in the interface between the digital and physical. These modes aim to demonstrate the awareness of the digital domain: As mentioned earlier, digi-grasping is not a measure of the rational knowledge of digitality but rather a concept for thinking about and analysing the embodied experience of digitality.

4.1. The everyday mystery of the digital world

The first mode of being describes a sort of ignorance towards the digital: Being and doing in the digital world is simultaneously taken for granted and not acknowledged. Digital technologies are seen as uncomplicated and something one can or must use in modern society. The utilisation of and interaction with digital devices and software are done without an awareness of the influence of the digital technologies. Such use can be fluent and effortless or annoying and forced, but the use of digital devices happens without a grasp of the digital infrastructure and systems around the digitality, let alone their influence on behaviour.

The ignorant mode of being in the digital world highlights various irritations and frustrations that digitality can present in daily lives: The video projector refuses to show the image even though it just did, the website is not loading, and the smart house with all the Internet-connected devices becomes a modern-day equivalent of a haunted house. It also brings attention to ignorance of larger issues: the collection and sharing of personal information without the person knowing or the inability to change or even comment on hard-to-use systems.

The way we adapt to digital technologies, the way we replace old methods with digital counterparts or the way in which we teach digitality, software or programming are of great importance. The invisible and abstract nature of digital coupled with seemingly easy

to use front-ends have already led to a situation where critical analysis is not encouraged, and questions about what lies behind the front-end are not even formed. For instance, many schools teach specific, and often proprietary, software to students, not being aware of the alternatives, or the ramifications or differences between proprietary and free and open source software. Furthermore, programming is being introduced into the curricula in many countries, but with no deep insight of the philosophical, political or societal effects of code.

One important point to notice is that technical knowledge in itself does not necessarily bring more awareness of the impacts of digitality, even though it can help in alleviating the ‘mystery’ around it. Rather, an embodied understanding of the underlying structures and dynamics of digital technologies — how they are connected and influence all kinds of aspects of our lives — is needed to break the ignorance.

4.2. Awareness of the digital world

The second mode of being demonstrates becoming aware of the surrounding and permeating digitality: being conscious of the presence of digitality in daily lives as well as an awareness of one’s presence in the digitality. This awareness creates a feeling of interrelation with the digital world. It is not so much a question of intellectual knowing but rather about embodied experience of how digitality permeates daily life. It could be difficult or even impossible to articulate or explicate the feeling of being and doing in the interface between the digital and physical, but such an articulation is not needed to grasp how digital technologies and digitalisation affect, in general, everyday life and being.

The drawing performance with a robot described in the earlier section is an example of creating a visual presentation of being and doing in the interface between the digital and physical. Interacting in a creative setting with a simple robot can raise awareness of the interfaces that humans share with the digital. The awareness may manifest itself in diverse ways: It is easy to humanise the robot and start to think of it in human terms, but it might also highlight how humans unintentionally adapt themselves to the needs of digital technologies by becoming more like robots. The performance thus may raise questions about the various modes of being between human existence and machine existence. The performance also exemplifies one aspect of digi-grasping: that awareness can emerge through experiencing and feeling without being able to articulate the relationship between the digital and physical explicitly.

Robotics are already finding their place in education, with a plethora of commercial products aimed at schools. Here, the drawing performance exemplifies a change to creating a more in-depth investigation into robotics and digitality through using these robotic kits in an alternative and creative way. For instance, students can assemble their drawing companions or try to draw with a robot programmed by someone else. Such simple exercises can bring forth a more graspable understanding of the post-digital world and the digital processes within it.

4.3. Empowered being

The third mode of being goes beyond awareness and shifts the focus from how things are to how they could be. The ability to grasp digitality enables one to outline and question the relationship with the digital world. What is the interface between physical being and digital being? Why is it the way it is? Could it be different? Kojonkoski-Rännäli proposes that intentional activity in the context of crafts creates not only knowledge but an ethical bond between the actor and the world (Kojonkoski-Rännäli, 1995). Similarly, we argue that intentional being in the digital can create comparable ties in the context of digitality. Intentional awareness enables the questioning of moral issues as well as creating a feeling of responsibility for the consequences of digitalisation. This process of questioning and taking responsibility can lead to alternative images of the preferred futures of digital society.

The two examples presented in the previous section, the AdNauseam plugin and the I’m Getting Arrested app, both convey the ethical bond between the digital and the physical. The AdNauseam plugin shows how raised awareness of the digital enables a questioning of how algorithms shape the user experience and ultimately creates an ethical responsibility to the digital world. Although the AdNauseam plugin could be analysed as an answer to a problem, it does at the same time convey a more embodied understanding and moral concern of the digital world. Since what one views or clicks online — the digital fingerprint — is valuable information and represents how one is defined by algorithms in the digital world, this is something that needs to be brought into discussion and reclaimed by users.

The I’m Getting Arrested app instead demonstrates how the digital world can be utilised to shape the physical world. From the digi-grasping standpoint, it can be seen as extending being in the digital realm: the feeling that digitality is something that belongs to being human and that it can be used to improve life. I’m Getting Arrested could be seen as redefining the interface between the physical and digital by extending the interface into both directions.

The third mode of being manifests agency in the place that lies between the digital and physical. Intentional awareness and challenging the existing or given assumptions of digital technologies enables more empowered participation in modern society. This empowerment then has the ability to extend and transform both the digital and physical domains of being and eventually shape development trajectories and lead to futures different from the current dominant vision.

Questions of ownership of data, privacy and free software should all be relevant in education. Issues from discussing the traits and challenges of tracking and digital fingerprinting, to the rights of an individual in digital society, should be raised and discussed in more detail. Or, as we suggest, they should be experienced and grasped. Merely discussing digital right issues might leave too abstract and distanced a comprehension of these issues. Actively participating in the digital society, for instance through the use of plugin or app, might give more agency and experiential comprehension of digitality.

4.4. Transformation and aesthetics

The fourth mode describes how through increased awareness and questioning, it is possible to reclaim agency in the interfaces between the physical and digital and to shape the direction of future developments. Whereas questioning in the third mode has brought ethical dimensions into digitality, intentional creation adds aesthetic qualities to it. The questions relating to digitalisation and the adoption of digital technologies are not merely moral or political. The digital world is a space in which humans spend increasing amounts of time and thus are associated with aesthetic values as well. It should be noted that the term aesthetic in our research refers to a kind of phenomenological forming of the connection to the surrounding world. As such, the concept of aesthetics does not denote any particular set of aesthetic values, but rather highlights a bodily and sensory mode of forming a connection to the world.

The last two examples in Section 3 portrayed two distinct aspects of creativity in the digital domain. Platform cooperatives focus on the transformational possibilities of digitalisation, while creative coding points to the use of digital technologies as tools and to digitality as a medium and material in artistic expression. Moreover, creative coding suggests a way of stipulating, mapping and deterritorialising digitality.

Platform cooperatives can be seen to directly deal with the construction of futures through rethinking economic structures. By aiming to democratise the digital economy and transform the ways in which the economy works in a digitalised world, platform cooperatives can be argued to have an intentional agenda ([Platform Cooperativism - P2P Foundation, 2015](#)). From the digi-grasping perspective, platform cooperatives could be seen to — to borrow a term from Heidegger — *tend to the digital world* ([Heidegger, 2009](#)). In other words, the existence and impacts of digital technologies and digitalisation are acknowledged and cared for.

Creative coding in contrast uses the foundations of digitality playfully and transforms them in a creative manner. Lauren McCarthy's *The Follower* can be seen from the perspective of how ubiquitous digitality is grasped and used in imaginary ways. The art work at the same time uses digital technology and comments on it. Furthermore, it illustrates a raised awareness of digitality and portrays it as a space for creation by playing with privacy, location and attention, all of which are important themes when discussing digitality.

The different possibilities for engaging with the digital world and transforming it are essential for contemporary education. Being able to demonstrate viable alternatives in an age where a few large companies with a monopoly-like status (for, e.g., Google, Facebook) control the digital world is of utmost importance. Moreover, giving students tools to grasp the post-digital world and to show how digitality does not only consist of abstract objects (in the forms of code and algorithms) or material (in the form of computers, mobiles, data-centres), but rather a fluctuating set of forces and potentials in an assemblage could pave a way for more critical comprehension of the post-digital world. Here, digi-grasping can be a useful tool to talk about and experience the digitality of the everyday embodied world.

The mode of creative being demonstrates how digitality can become a space filled with agency and how digitality can be playfully deconstructed and transformed. Increased awareness and experience of digitality enables an embodied understanding of and presence in the digital world. Thus, aesthetic aspects and ethical questions form an understanding of and agency within a combined physical and digital being. This can enable reclaiming the digital world and re-imagining its futures.

5. Discussion and concluding remarks

5.1. Reclaiming digitality

The increasing digitality and digitalisation of the world leads to a situation where digital technologies and digital constructs are profoundly embedded in our daily lives. In this paper, we have suggested that to better understand the reach and scope of digitality, a more embodied understanding of digitality is needed. The necessity of embodied understanding is significant for empowered participation in society and for shaping futures. Embodied understanding refers not only to a theoretical knowledge of digital technologies but also to a grasp of digitalisation as a phenomenon. Digi-grasping highlights the embodied aspect of understanding and can be used for structuring and imagining different ways of doing and being in the interface between the digital and physical.

As society becomes ever more digitalised and enters into a post-digital era where lives are ultimately bound up with the digital, as suggested by Berry ([2016, Berry, 2014](#)), the question becomes who sets the direction of the advance of society? Alternatively, who is capable of setting the direction, even? One of the premises of this article is the notion that as abstract phenomena, digital technologies are difficult to understand. When this intangible nature of digitality is combined with the increasing demand for productivity through innovative digital technology, the imbalance of interests between the dominant players — most of them corporations — and society at large becomes evident. For example, many digital technology companies entertain an overly optimistic faith towards the progress of digital technologies. This belief in the natural progress of digital technology to solve pressing problems often bypasses the societal, political and cultural aspects and opinions of the future of digitality ([Dyson et al., 2009; König et al., 1985; Koponen, 2010; Wajcman, 2014](#)). Understanding digitality through concepts such as digi-grasping can help to reclaim the discussion of digitality for society and democratic or even grass-roots policy-making. Furthermore, raising awareness of digitality can lead to more critical and balanced views of digital technologies, which can then create a space in which to question the dominant deterministic rhetoric of digital technologies.

5.2. Disrupting disruption

One of the characteristics of digitalisation, especially in the post-digital era, is its disruptive quality. From (illegal) file sharing (e.g. Napster and BitTorrent) and iTunes to current streaming services like Spotify and Netflix, digitalisation continues to disrupt media industries. The sharing economy persists in the shape of finding new economies to replace with digital versions: Airbnb is disrupting the hotel industry, and Uber has taken on traditional taxi services. Moreover, recent advances in artificial intelligence, mostly in machine learning, are expected to disrupt even more industries (Makridakis, 2017).

Rushkoff points out that even though many traditional industries have been replaced with digital copies, the underlying model of the economy has not changed. For example, Uber still looks after the interests of its shareholders. Furthermore, Rushkoff argues that all the disruption has simply taken neoliberal capitalism to its extreme: We are doubling down on the industrial age mandate of growth above all (Rushkoff, 2016).

However, from the futures standpoint, one could see the disruption as an open window for change. The question is therefore which direction to take. Digi-grasping can offer a framework for students and teachers for both approaching the hype on disruptive digital technologies critically, and for broadening the range of directions through making. For example, platform cooperatives are a way of rethinking the economy and the distribution of value, while the current digital economy has been a hyped-up version of the old, as Rushkoff stated. Furthermore, using creative coding as a method in education can bring an experiential understanding of the situation and point out new directions for the future. Understanding the basics of digital platform creation in the form of an art project, for instance, can bring about a more comprehensive perspective of the usefulness, deployment and application of the digital system. Becoming aware of the influence and impact of digital technologies and digitalisation could bring about more democratic directions for digitality.

5.3. Grasping digitality through making

As Kojonkoski-Rännäli states, making by hand is at the core of being human. Through making, someone simultaneously time manifests their being as well as constructing ethical and aesthetic connections to the surrounding world. Furthermore, not only does making create knowledge through experience, but the world is grasped through the act of making; that is, it is understood in a way that precedes rational knowing (Heidegger, 2005; Kojonkoski-Rännäli, 1995; Merleau-Ponty, 1945). These remarks about knowledge-building through making and existing in the world create a strong case for a more embodied knowledge.

However, these observations have previously been limited to discourses on the physical world. Through digi-grasping, we seek to extend the creation and use of embodied knowledge through making into the digital realm. As Dreyfus and Berry (2014, Berry, 2016; Dreyfus, 2008) state, digitality permeates our existence and sensed world in multiple and complex ways. Furthermore, Czegledy and Czegledy point out that a whole view of the human body is filtered through digital devices, whether it is measuring our heart rate or brain activity or analysing DNA samples (Czegledy & Czegledy, 2000).

Through examples of embodied digitality and different modes of digi-grasping, we want to demonstrate the means for discussing aspects of digitality that go beyond technical or intellectual knowledge. Through being and creating in the digital domain, we attain not only knowledge, or artefacts, but also moral and aesthetic connections to the digital world. The importance of such awareness becomes increasingly significant in the post-digital era.

Media education has for a long time raised concerns about both the increased use of digital media and the increased use of digital technologies (Kupiainen, 2005; Saariketo, 2015). One of the possible uses for digi-grasping could be to further structure the discussion. Through digi-grasping, it becomes possible to discuss and analyse digitality in a way that does not require technological expertise. For example, attention could be brought to ignorance of digitality and awareness could be raised through experiencing digitality. Furthermore, this awareness can lead to questioning and reshaping the relation to the digital world. In the same way that we train our ears to listen to certain sounds, we could train our body to grasp digitality through an explicit focus on what using digital technologies feels like. However, it is worth keeping in mind the differences between the digital and physical world: the digital world is discrete and fragmented, whereas the physical world is continuous and analogous.

Digi-grasping can extend the scope of media education into a more embodied view of digitality. Besides approaching digital technologies from the functional point of view, for example on how to use them or how to think critically about digitality, media education can use digi-grasping to help position people in the post-digital domain, where you exist in both a physical and a digital world. Through digi-grasping and the modes of being and doing, it may be easier to grasp the reach of digitalisation, or even to feel more empowered in the post-digital world.

5.4. Art as a foreshadower

In many of the examples highlighting the various aspects of digi-grasping, we have drawn from the art domain. This is because art can offer a more embodied experience of digitality. Art can be seen as a way of creating bridges between abstract thinking and experience (Parsons, 1987; Räsänen, 2000). Alternatively, it can be seen as an essential tool for gaining an understanding of the ways in which humans organise themselves (Noe, 2015). From the futures standpoint, art is not only a diagnostic device of society, but can also have a role as an antenna, sensing future social, cultural, economic and political shifts in society. Cubitt proposes that one of the core questions in thinking about the future through art is the definition of the ontology to be used when everything is increasingly digital (Cubitt, 2007). Art can be seen as exploratory and nomadic. Through making art, that is, through exploring and creating, one can gain an understanding of new domains, such as digitality. Furthermore, art exists in multiple domains simultaneously. It can

simultaneously be local and communal, as well as abstract and global, creating messages that can foreshadow possible societal, cultural or technological transformations (Cubitt, 2007; Czegledy & Czegledy, 2000).

In our example of the drawing bot and the artist drawing together, art acts in the ways mentioned above: It highlights the structures and differences of the digital and physical and at the same time proposes new ways to deal with digital technology. These ideas are not necessarily born out of rational reasoning, but through a grasped and embodied experience of the digital domain. As such, experiencing art merges the abstract into embodied experience.

Czegledy and Czegledy (2000) also point out that through digitalisation the image of the body itself has been transformed. From the experience of sickness to surgery, digital technologies and digital visualisation are used to present the image of the body back to the person. In this way, an understanding of the body is already merged with the digital. Art can then be seen as a way to reclaim and comment on the embodied experience. For example, the French performance artist Orlan, who designs her body with software and surgically transforms herself into a digitally created being, has stated 'This is my body, this is my software' (Czegledy & Czegledy, 2000). These sorts of artistic endeavours exemplify embodied digitality, and as such can raise awareness of the digital.

5.5. Limitations and further research

Digital technologies share a somewhat problematic relation to the body, which can be seen in popular culture as well as in research. Nevertheless, the importance of the body and embodied knowledge should not be underestimated. Further, studies that highlight digital technologies in everyday life, in physical being, are rare. The concept of digi-grasping can be used as a theoretical construct with which to discuss digital technologies in embodied knowledge.

In this article, we have discussed the theoretical underpinnings of the concept of digi-grasping and the modes of being in the interface between the digital and the physical. This article is thus conceptual in nature and would benefit from empirical validation, as well as from more examples. Further research could thus focus on applying the concept of digi-grasping. However, it should be noted that this article draws on the practical experiences of one of the authors in the field of media and art education.

With our article, we want to highlight the complex ways in which digital technologies manifest in society and influence futures. To gain a better understanding, we argue that besides rational knowledge, a more embodied knowledge of the digital, digitality and digitalisation is required. Through the embodied understanding of digitality, we want to show how digital technologies are linked and occur in everyday life and how these digital phenomena can be experienced and understood. With the use of the concept of digi-grasping, we offer a way to discuss more generally the different modes of being aware of the ubiquity of digital technologies.

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