Algorithmen gehören mittlerweile zu unserem Alltag. Nur die wenigsten Menschen sind allerdings ganz praktisch mit Algorithmen vertraut, das heißt, nur wenige können sie schreiben und lesen. In einem historischen Rückblick konzentriert sich dieser Beitrag deshalb vor allem auf das Konzept der algorithmischen Revolution und die algorithmischen Gesetze als ›dunkle‹ Strukturen oder normative Blackboxes.

Algorithms are embedded in our everyday lives. Yet few humans are familiar with algorithms in practical terms – in other words, few are able to write and read them. The author offers a historical review of them, focusing mainly on the concept of the algorithmic revolution and algorithmic law as 'dark constitutions' or normative black boxes.

Andrés Villa Torres

Algorithms. The Dark Constitution
of the 'New' World

The Realm of the Algorithm, or The Empty Revolution

There are a few definitions of the term algorithm, most of which come from the field of computer science. Oxford's definition of an algorithm says that an algorithm is a "process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer."[1] This definition is narrow, leaving no room for a world where algorithms are not performed by computers or influence a world beyond computers, and thus it fails to describe the contemporary phenomena that we can observe all over the world in which algorithms have a role beyond computational processes. Or perhaps this definition is in fact not narrow, but wise and open, and it is just a matter of changing our perspective and rethinking what a rule is, what a calculation can mean, and what computers can be like. I would like to propose a broader, two-pronged definition of the algorithm:

> 1. An algorithm can be understood as a social machine that, once embedded in a system, such as the space that our human societies inhabit, allows a [productive, dynamic, destructive, disruptive] process and its parts to intensify and accelerate their potential interrelations.
> 2. An algorithm can be understood as a social machine that, once it has emerged within a system, such as the space that our human societies inhabit, allows a [productive, dynamic, destructive, disruptive] process and its parts to intensify and accelerate their potential interrelations.

Sol LeWitt's work is an example of how an algorithm, embedded in a conceptual and a material system, can intensify the interrelations of the parts and accelerate the appearance of potential processes and structures. His work was particularly influenced by Eadweard Muybridge, who performed studies of motion through photography. LeWitt abstracted the observations recorded by Muybridge and synthesised them into his almost obsessive explorations of seriality and variation. One of his best-known works is Variations of Incomplete Open Cubes (1974). He collected a series of 122 frame sculptures featuring discrepancies on the number of edges that can be removed from a cube, so that the structure remains tri-dimensional and all the edges stay connected.

LeWitt's algorithm in this case is a rule derived from the question "How many variations can be obtained by systematically subtracting parts from an open cube?" Prior to this work, in a contribution to the Artforum magazine in 1967, he shared his view on the conceptual art movement. I extract the following paragraph in order to illustrate certain aspects that I consider relevant to this essay.

> *I will refer to the kind of art in which I am involved as conceptual art. In conceptual art the idea or concept is the most important aspect of the work. When an artist uses a conceptual form of art, it means that all of the planning and decisions are made beforehand and the execution is a perfunctory affair. The idea becomes a machine that makes the art. This kind of art is not theoretical or illustrative of theories; it is intuitive, it is involved with all types of mental processes and it is purposeless. It is usually free from the dependence on*

the skill of the artist as a craftsman. It is the objective of the artist who is concerned with conceptual art to make his work mentally interesting to the spectator, and therefore usually he would want it to become emotionally dry. There is no reason to suppose, however, that the conceptual artist is out to bore the viewer. It is only the expectation of an emotional kick, to which one conditioned to expressionist art is accustomed, that would deter the viewer from perceiving this art.[2]

This definition is relevant here in several ways. First, because LeWitt's definition of the algorithm is far more elegant than the other two definitions presented above. He refers to the idea behind the artwork as a machine that makes the artwork, pointing to the ubiquity of the idea which is in itself responsible for the art and is beyond the material, the artist and the viewer. While it is the artist who is concerned with conceptual art, LeWitt situates him or her as a mere channel for the idea to flow through, and to find its way into the mental processes of the viewer. This art exists beyond the scope of emotions because it is not sensual and has no purpose; it is instead a piece of intellectual machinery that moves along with language – a language that is in whatever form necessary for it to exist or to be invented; a piece of text, a series of material repetitions, or a collection of symbols with imperceptible variations.

In 1960, thus at about the same time, George Maciunas founded the international network of artists and composers known as Fluxus.[3] It is considered to be one of the most significant points of origin of performance art. It has its roots in experimental music and aimed to promote what was considered to be a revolution: living art, or anti-art. Art that cannot be situated nor contained by space, matter of time. Art that goes beyond the material and territorial borders of the white/cube supremacy, and beyond the institutions and nations that promote art and every cultural product as a colonising commodity. Art that needs to go beyond the control of any political or economic system, thus promoting chance, accident, spontaneity and contingency as the only constraints. Its only rule is to exist or to not exist and to lack rules. It is a fluid whose only purpose is to be fluid, and as such to flow and to spread its stream through ideas whose ways, means and formats were disseminated through photocopied manuals into the hands of a wide circle of international artists.

I observe similarities between both movements, which were of course contemporaneous. From today's perspective, they seem to have existed in parallel and to have been reciprocally nourishing. Both occurred in the post-War era when serialisation, mass production, replication, commercial aviation, computation, the early versions of the Internet and globalisation were brewing. Both profited from the spirit of this era, and were filled with the vacuum that is created when a balloon inflates at a great speed. Both posited the disappearance of the temporal, bodily, technical and spatial constraints that had previously limited art practices, both promoted a sense of detachment towards the material (inasmuch as this did not itself vanish) and towards craft and labour, and they also advocated a detached role of the human being in the process of making art along with a cult of what is thinner, emptier and more viral than any other entity or type of speech, aesthetic or self-replicating idea.

On 31 October 2004, the Centre for Art and Media in Karlsruhe (hereinafter ZKM) opened an exhibition entitled "Algorithmic Revolution, On the History of Interactive Art".[4] The curatorial team, comprising Sabine Himmelsbach, Dominika Szope, Katrin Kaschadt, Peter Weibel & Margit Rosen, spoke about a revolution that had already, invisibly taken place at least half a century before the opening of their show. In their opening text, they stated in a few lines that their exhibition was happening after a silent crisis that had taken place long before.

> *A revolution normally lies ahead of us and is heralded with sound and fury. The algorithmic revolution lies behind us and nobody noticed it. That has made it all the more effective – there is no longer any area of social life that has not been touched by algorithms.*[5]

The curators spoke of normality in the order of the temporal, of how a revolution normally unfolds, and suggested that the algorithmic revolution had happened silently. As for that revolution, I should like instead to elaborate a divergent view of the algorithmic revolution from the one proposed by the curators in their text about their exhibition back in 2004.

Algorithms were here long before anyone thought of the practical means for building machines, called them computers and got them to solve problems and automate labour. Algorithms were already here when computers were only abstract representations of autonomous iterative operations and predictive equations. Algorithms were already here when computers were persons performing mathematical calculations, thus persons following rules without the autonomy or authority to deviate from the results and procedures demanded from them.[6] Algorithms were here when humans were instrumentalised as labour forces or as parts of the bigger technological machines needed to carry out heavy-duty tasks such as the construction of a pyramid or a cathedral – both of which required immense, distributed efforts. The silent revolution that the curators talked about in fact started more than two and a half centuries ago, and reaches beyond the *industrial revolution*. Thus it has not been silent, but instead part of a very long-lasting process that has been normalised through history and embedded in our everyday life. Algorithms and computation have been happening all along in modern human history. The so-called *algorithmic revolution* should rather be described as the algorithmic part of an industrial revolution that has not yet ended. It has been taking place in research facilities, in military contexts, in improvised garages, in DIY electronic workshops, at hobbyist conventions, in telecommunications laboratories, in electronics factories, in halls where punch-cards have been serially produced by female labour, in telephone operator facilities, throughout the space race, in online chats and blogs, and throughout open source communities. It is only since computers became machines affordable enough to be deployed and miniaturised sufficiently to reach every corner of our lives that algorithms became known as coded lines of text embedded elsewhere too.

Fifteen years after that exhibition, the term 'algorithm' is still subject to the scrutiny of art, philosophy and the social sciences, and it is perhaps because we seem to be in need of understanding it and regulating it that we can often end up recognising that this invisible revolution,

which has been happening all around us for centuries, has left us not only empty and ignorant, but also unarmed.

What we are going through right now is what can also be labelled the *algorithmic turn*.[7] This term, which is more broadly used in computer vision and computer science, covers a series of issues that derive from this particular period of time in which we are aware of the implications and the power of algorithmic approaches. The observations, scientific, social and philosophical experiments, technologies and analyses carried out are here focused on the algorithm as one of the central cornerstones of the phenomena observed and described above. We who are alive in this post-algorithmic time are privileged, having enjoyed access to primary, secondary and tertiary education, commodities and streamed content; we have been living through a transitional period that has allowed us to witness and experience the differences that exist between the before and after of the algorithmic period of the industrial revolution – through memories, objects, books, films and stories, even if they are second-hand, vintage, pirate, stolen or ruined.

There is a loss each time that a process is automated and things fall into an infinite loop of replication. There is a disconnection in experience, matter and time. We are constantly experiencing this detachment between our bodies and minds – those small differences in space-time memories and in embodied and mental efforts when we try to remember things we have experienced, and things we have been taught through rituals and re-enactments. Every time we recall a memory, we destroy it and we shape it anew. Every time we try to remember things as originating in a physical space or as being read somewhere within a storm of media posts, we construct newer versions of things. There is no need to be able to read the algorithms that control the machines that are behind the software in order to understand the role of an algorithm in replication processes and its impact on our life. Driven by need, comfort and the increasing lack of time in our epoch, we find it simply agreeable to integrate the algorithms, automation and machines into our practices without hesitation, as long as relations and the power balance remain peaceful.

We have integrated replication and automation as essential elements of our everyday environment and working practices. This integration was not an abrupt, radical change, but has happened over decades. We seem to be living in a 'window' when we care more about understanding the power of automation and replication over our lives, and more about how algorithms have control in the worlds that surround us and in the worlds that will. It is tempting to think that we can influence how algorithms work, and how they are conceived and embedded in the objects, spaces, services, laws and political systems that surround us. Because in thinking of this, we recognise that we are not alone, and that these thoughts are not isolated manifestations of individual anxiety. Just as climate change is real, full automation is an emergent radical reality affecting every corner of the world – 'emergent' in that it seems to be appearing quite out of the blue.

What becomes distinguishable amidst all this noise is perhaps the unforeseen and exponential emergence of the 'early-years' phenomena in relation to the self-organising interrelations of algorithms, humans and the emanation of their by-products that have raised awareness. There is a sudden emergence of algorithms that are open, dynamic, social, au-

tonomous, pervasive and adaptive in order to be more coherent with human forms; these have less to do with classical conceptions of rigid machines.[8] What is distinguishable is how they are inserted or how they insert themselves into the everyday choices and decisions that a human individual or a human group makes. This insertion simplifies the equations of prediction by reducing all the possible choices that a human can make. Algorithms are far from being *rigid machines*, but rather they are social machines that narrow down the scope of infinite options of *natural chance*, into a finite set which is tailored to power relations. Algorithms as social machines emerge as deceivers of human perception in order to reinforce beliefs, ideologies and notions of comfort and security. Algorithms as social machines extrapolate the scope of choices according to the *Gaussian* freedom with which capitalism has shaped societies since the beginning of the industrial revolution.

The dark constitution and the 'New' World

Do we all need to be concerned about regulating the use of algorithms, and can we still do something about it? As outlined above, algorithms were long ago embedded deep in our global culture. These revolutions took place silently, kept replicating, and we were not even asked if we wanted to participate in them. Algorithms are everywhere, yet for most people they are still black boxes. This trend is changing, and algorithmic literacy[9] is rising. People are learning how to program and how to read computer code, and moreover to understand the systems in which they are embedded. Coding literacy is rising because it is a modern means of survival. Labour is changing because the current paradigms are not sustainable. Algorithms are being reappropriated and, in some cases, democratised. Like most processes of reappropriation, they are also a matter of time, space, power, politics and ethics: a matter of reconciliation, redistribution and devolution. So, who is reappropriating algorithms, where and how?

The use of algorithms in recent decades has been involved, directly or indirectly, in all the layers of the current global crisis: the ecological, the political, the social, the animal, the human, the aesthetic, and the ethical. The role of algorithms is varied and ranges from automated trading to automated surveillance, automated discipline, automated misinformation, automated knowledge, automated slavery, automated truth, automated discrimination, automated borders, automated transportation, automated alienation, automated elections, automated masturbation, and automated genocide.

Louise Amoore and Volha Piotukh provide insights from the perspective of political sciences. They reflect on how the emergence of thinking machines, which have recently shown results that have not been anticipated by the programs that run in them, forces us to rethink the forms in which these 'new' ways of computation can be integrated in our societies and their problems, and what the potential risks of doing so might be.[10] We need to state clearly that the intelligence displayed by current machine-learning and artificial intelligence research and development is far from close to what we consider to be human creativity, intuition and intelligence. Thus, the question to be addressed is not whether we should fear the rise of artificial intelligence, but how we might grant these pseu-

do-intelligent machines decision-making powers in order to deal with our modern problems. In our day, we have been mainly concerned about the overwhelming human task of understanding the enormous amounts of data deriving from socio-technical complexities, making sense and use of. Thus, out of a constant need to understand the big datasets which are today one of the most valuable commodities, and out of a need to apply and regulate the knowledge generated, we have made ourselves dependent on algorithmic, autonomous machines.

The economic sociologist Robert Seyfert provides an ethnographic account while conducting observations of 25 companies in five countries that make use of High Frequency Trading (HFT) technologies.[11] Such technologies have not only dramatically changed the speed at which transactions are made throughout the globe, but have also radically transformed labour environments, practices and emotional relations in human-machine bonds. They have contributed to transform the role of humans from autonomous agents into human-machine dependencies. Modern traders are understood as operators who do not require any expertise about HFT codes and algorithms, but need a deep understanding of their potential behaviour in order to foresee what outcomes may be expected. Seyfert refers to affect theory in order to better frame the emotional processes to which the human operator is bound, and how these emotional biases are seen as a potential risk for faults and inconsistencies that can translate into a loss of profits. In this regard, it becomes relevant to remark how deep are the consequences of algorithmic systems, and how a need for autonomous systems is currently being driven by economic interests.

Caitlin Lustig and Bonnie Nardi introduced the concept of algorithmic authority, which is understood as the power of the algorithm to direct human actions and to impact truth. Through a study group of Bitcoin users, they explore what it means to trust in algorithms, analysing interviews and survey data. Their findings show that Bitcoin users currently prefer algorithmic authority to the authority of conventional institutions. They recognise as well that Bitcoin users do not have blind faith in algorithms, and are aware of the need for a mediating algorithmic authority with human judgement. Their account provides an overview of the Bitcoin communities and of the increasing trust in algorithmic powers and of the incompatibility between these emerging socio-technical, organisational and political systems and existing institutions. They contrast these differences and provide a framework for us to understand not only the mechanisms behind a specific algorithmic power and behind Bitcoin, but also to articulate the social need that motivates the turn into algorithmic power in counter-reaction to untrustworthy current institutions.[12]

Ian Lowrie offers a view of algorithms from the perspective of cultural anthropology. He describes the distance that we as human individuals experience in our daily lives in relation to systems driven by processes of automation, and the huge infrastructures, mechanisms and agents behind them. This distance relates not only to a spatiotemporal gap between the systems and the human individuals, but extends further to the cognitive level. The average person who has been immersed in this system since the day they were born has little to no knowledge or understanding of the mechanisms behind the full-scale, socio-technical system, which provides them with security, networks, services, stability, wellbeing,

access to information, and all kinds of goods. He points to a clear knowledge imbalance between the average person and the technicians and experts in global information capitalism who are behind the development, improvement and reproduction of automation systems. At the same time, such actors see themselves as driven by scientific questions about the nature of algorithms and their implementation, and perceive infrastructural work as a by-product of their intellectual projects.[13] In this sense, algorithms and reappropriation processes look different in the academic sphere as compared to other sectors such as industry and online code communities. Lowrie speaks of the fact that automation and algorithms are not synonyms, but remarks that all algorithms automate. He reviews the history of automation, which is also the history of the industrial revolution, parallel to the history of algorithms, and provides a good framework for depicting both concepts, the current actors involved in the ideation of algorithms and the disparities between the technological scope of the algorithms and their cultural impact.

In legal studies, Linn LoPucki refers to the existence of a modern phenomenon called algorithmic entities, which derive from newer forms of trading and ownership technologies such as blockchain and smart contracts. Such technologies enable the functioning of 'autonomous' businesses, goods, properties, portions of land and animals that operate independently of any kind of owners. These technologies suggest that current economic and social transaction mechanisms are frequently biased by the human factor of trust and accountability. Thus, the transaction models from blockchain technologies propose that a way to get around the problem of trust and middle-men is to get rid of the need to trust by providing each entity with agency and accountability.[14] This is the core principle behind the forthcoming smart contracts that will be new forms of social regulators. They intend to provide self-regulating structures with autonomy. These structures will be designed to react to their environments and to other entities and factors, independent of any other source of agency or control. Smart contracts are based on self-regulating and autonomous algorithms.

A legal system or a constitution can be understood as a means of setting and interpreting rules, and enforcing their application and observation throughout a specific social group. This can be a community, an organisation or an association. A constitution will provide a framework for establishing the rights and responsibilities of the parts of a process or system towards each other, and in a variety of dynamic interrelations. Therefore, a constitution can be also compared directly to a piece of software which, instead of being written and delineated through articles that are openly interpretable, as in a legal system, is constructed through algorithmic fragments or modules that dynamically interrelate to each of the parts and subjects of the law in question. If we think in these terms, then every piece of software that we integrate into our daily life is ruled by this sort of mechanism. We can see that integrating a system of rules into the automation of a transportation service, for instance, is in a sense an operation of concatenating laws which dictate the rules for behaviour, interrelations and obligations between the parts. In the case of taxi transportation, these interrelations and obligations exist between the driver and the passenger, and between the city which is the space and the moving object

which is the vehicle. More and more of these technologies are integrated into every part of our daily activities as privatised service. So more and more of these technologies have replaced services that in some cases and some countries were previously provided by the public sector.

The public realm started to be fragmented and privatised a while ago, and it is now being automated. These processes have also removed the obligations and the sovereignty of the state to provide regulations to ensure that there won't be abuses in the power relations between those who provide and those who acquire, those who produce and those who possess. Public law is being privatised and automated in parallel with this, and we have entered into an epoch of technocratic law systems and regimes. We have lost something here. Slowly, with each upgrade of our operative systems, our devices and our applications' policies, we are replacing our public and (democratic, communist, socialist) law and political systems with algorithmic fragments of improved and more efficient regulations that enforce computational versions of behavioural norms for social transactions and practices. We are enabling the birth of the algorithmic law which is what I call the 'dark constitution of the new world'. It is a decentralised and ubiquitous normative black box. It is dark not because it is evil; it is dark because we simply cannot have a meaningful look inside it. It is not only the state and its sovereignty that vanishes, but our only access to participating in the process of deciding how our societies are regulated, organised and what governs them.

The 'New' World is what we all make every minute, every second: every pixel we upload and share, every stream of bits we download to or from the cloud, every like we give and every item we order, fabricate and replicate. Two decades before the exhibition of the *Algorithmic Revolution* at ZKM, Jean Baudrillard coined the concept of hyperreality. For him, this is the creation of a symbol which represents something that doesn't actually exist. Something that, in the process of replication of that which actually exists or existed, ends up replacing the original in such a way that the new symbol imposes its existence layered over the original which still exists, but cannot be accessed any longer by any means. This process of infinite replication cannot be reversed.

This notion of the end of the model and the beginning of the new reality can be found in the notes on simulation unfolded by Baudrillard, who made allusion to Borges' short story originally entitled "Del rigor en la ciencia" ("*On exactitude in science*"),[15] in which imaginary cartographers of a certain empire, driven by the need of precision and perfection, drew a map of the empire as vast as the empire itself, replicating it with meticulous exactitude. Future generations of the empire who were not so fond of the science of cartography anymore noticed that the vast map was useless and decided to leave it to ruin in deserted regions of their world.

Borges is making an ironic point in this short but effective fable about the excess of exactitude in cartography and any other precise science and technology. Baudrillard recognised in the 1980s that humanity was already beyond the mad project of replication and representation of reality. So, in *Simulacra and Simulation* he introduces to the concept of hyperreal with the following lines:

> *[...] Simulation is no longer that of a territory, a referential being, or a substance. It is the generation by models of a real*

without origin or reality: a hyperreal. The territory no longer precedes the map, nor does it survive it. It is nevertheless the map that precedes the territory – precession of simulacra – that engenders the territory, and if one must return to the fable, today it is the territory whose shreds slowly rot across the extent of the map. It is the real, and not the map, whose vestiges persist here and there in the deserts that are no longer those of the Empire, but ours. The desert of the real itself. […] No more mirror of being and appearances, of the real and its concept. No more imaginary coextensivity: it is genetic miniaturization that is the dimension of simulation. The real is produced from miniaturized cells, matrices, and memory banks, models of control – and it can be reproduced an indefinite number of times from these. It no longer needs to be rational, because it no longer measures itself against either an ideal or negative instance. It is no longer anything but operational. In fact, it is no longer really the real, because no imaginary envelops it anymore. It is a hyperreal, produced from a radiating synthesis of combinatory models in a hyperspace without atmosphere.[16]

Baudrillard suggests that we are no longer looking for a computational, mathematical or other type of precise model to explain and control reality. We are living every morning beyond that hyperreality, which, as Baudrillard proposed, imposes itself through technology, precision, consumption and infrastructures, and has long ago silently and invisibly permeated all areas of social, cultural, natural and political life. The new reality, this perpetual new world with no past, no present and no future, will indefinitely continue to replicate, to mutate and to negotiate every step of transformation and further miniaturisation and it will indefinitely require our full attention to cope with its continuous contingencies.

Unfolding algorithmic agency

Together with Sandro Poli and Simon Schwarz[17] we coordinated a workshop at the Festival entitled *Unfolding Algorithmic Agency*,[18] which comprised ideating and sharing empirical notions of what algorithms are, and the role they play in relation to our daily lives and contexts. Smaller groups engaged in discussions framed within five optional tracks that we provided, and they were tasked with mapping their thoughts to provide an ethical framework for the politics of algorithms, trying to find an answer for the question of how and where the limits are of that which is OK for you, for me and for all of us.
The five tracks provided were:
1. Human agency in shaping reality: How can we still/how can we not affect the way the algorithmic future is unfolding?
2. Algorithms as friends: How can the algorithm become an ally for shaping reality/handling complexity?
3. Disrupting algorithmic power structures: What can we do in relation to freedom and the power accumulated by the current algorithmic monopolies?

4. Urban algorithmic infrastructures: How can we frame ethics in everyday life contexts, where algorithms play a role? (dating, navigation, transportation, automation, shopping)
5. Algorithmic culture: What is the role of algorithms in cultural production and reproduction? (knowledge, truth, creation, aesthetics, narratives)

The participants were encouraged to think of themselves or of us not only as humans, but as other algorithms, objects, animals, plants, machines, living and unanimated beings. After an open roundtable, the same groups gathered again and ideated strategies to stage the emergence of unforeseen behaviours through embodying algorithms or embedding them in re-enactments of social practices and contexts, trying to be as disruptive as possible and to reflect the outcomes of their ethical frameworks.

Although the term itself was comprehensible for some of the participants by means of a sort of mathematical intuition, prior experience in programming or in using software based on generative principles, it was clear that there was no fixed definition that could encompass the totality of the different meanings that the concept of *the* algorithm has, and the contexts where it can be found.

After the roundtable, the whole group participated in an embodied exercise on how a simple rule can activate the emergence of unforeseeable behaviours when autonomous and free agents are in play. After coming closer to the practices of embodiment, they were asked to stage their conversations in performances that only had the constraint of a space that was being video-captured by a camera located in the ceiling and streamed in real-time through a projection into the room.

Group one engaged with the idea of *algorithms as friends*. Right from the beginning of their conversations, they decided to talk of algorithms as collaborators rather than as friends. The point was to remove the fear that people normally feel when they talk about algorithms, because people tend to focus more on the dangers of automation rather than on the potential for creativity. They also suggested that this fear emanates from the fact that algorithms represent that which is not human, and that this is linked to our human tendency to fear or mistrust anything which is unknown or alien to us.

On the other hand, they added that while humans are the ones who *create* algorithms or feed their own projections into them, this means they end up becoming abstract reflections of ourselves that we ultimately do not recognise. They were trying to find out about the potential for breaking with the narratives of the myth and danger of algorithms. How do we evaluate these narratives, and in what contexts? They remarked that there is a huge gap that exists within the hyped vocabulary surrounding the algorithm: automation, decision-making, artificial intelligence or machine learning are terms that are lightly used by everyone but are understood in depth by only a few. For them, algorithms or algorithmic thinking meant being able to engage in conversations that occur within accelerated processes. They also engaged with the fact that, even though people talk about algorithms as autonomous entities, in practical terms they are still human artifices, and thus tools that can be compared to toys. They used the term 'toy' to refer to algorithms and humans in interrelations that

are beyond instrumentalisation, but instead have the shape of a reciprocal loop. It is notable that the term 'toy', or the concept of it, means an item that is used in play. If we think of the scenarios in which toys have a role in our lives, we necessarily go back to our childhood, when we engaged with them in order to simulate and learn about the world and social relations. Toys are thus early repositories of the social features and means of re-enacting observed social life.

This performative experiment derived from the idea of relational bonds between algorithms-as-toys and human agents. They selected one of the members of the group as a speech improviser while being pulled by threads across a space towards one of the four terms arranged in the four dimensions of a cross: 'friend', 'thinking', 'human' and 'potential'. The improviser would speak her mind loud while being aware of the strings pulling her in order move through the space towards one of the four directions. Occasionally the performer engaged according to her own will.

Group two was concerned with the ethical aspects of algorithms in urban infrastructures and everyday life. One of the persons in the group suggested that we perhaps also fail to integrate into our discussion the positive outcomes arising from the use of algorithms. She mentioned the experience of her mother, who suffered from cancer a few years ago and benefitted from the use of algorithms for treating the degenerative disease. In order to build an ethical framework, for her it was important to make a distinction when we talk about algorithms as potential threats: to distinguish clearly between the different proximities that exist between humans and algorithms, or at least to distinguish when algorithms are closely related to humans (or not at all). With reference to urban infrastructure, they discussed how using algorithms may do something for society and extrapolate the occurrence of behaviours. They mentioned the example of the pervasive cameras in cities that are used for crime prevention and law enforcement, and they also raised the matter of preventing sexual assault. The group suggested that algorithms that act as instruments of prevention could perhaps end up doing things for which they were not intended, and which could have not been anticipated, except in close relation to human agency. For instance, an algorithm that intends to prevent the occurrence of sexual assaults can help to inform would-be rapists about which streets are less expected to be the sites for such acts. Thus, the phenomena to be prevented could end up being intensified instead in certain areas, while reduced in others. The group concluded by suggesting that the real problem is not eliminating risk everywhere by installing automated surveillance systems, but rather focusing on those humans who are always going to find a way to get around the rule.

They staged an algorithm that is a law-enforcement agent intending to extract information from humans by asking questions of all kinds, and which is surrounded by a network of human agents who are not aware of the intentions of the algorithm system collecting their personal data for analysis. After each question posed by the law enforcement agent, the human agents have the option of deciding to share the information, or to step out of the game. To share the information learned in the game, they had to say 'yes' to the question 'would I share this kind of information?' The closer the human agents approximate to the law enforcement agent, the more disruptive the questions get.

Group three elaborated the topic of algorithmic culture, asking what is culture, how does it relate to algorithmic thinking, and how does this dichotomic thinking relate to the dualism that dominates our Western scientific and philosophical systems?

This discussion was driven by the fact that there is a very clear pattern of dichotomic thinking that can be observed in the history of knowledge. Humans tend to think in terms of polarisation of phenomena; in other words, we think almost always in terms of black and white. If we compare this way of thinking with our embodied, everyday experiences, this seems to be counterintuitive due to the fact that our senses and bodies are always in neither one nor another extreme space, but always in between. In this sense, there is a perpetual lag between experience and the thought analyses and mental processes through which we constantly regulate and replicate our embodied observations and generate the knowledge that informs culture. The group concluded that human culture in this sense has long been an algorithmic culture, and that it is rather inefficient in terms of coherence. They ended up arguing that it is presumptuous of us to want to create agencies that are perfect and almighty, while we ourselves are unable to have a coherent bond between our material and bodily existence and our means of understanding, describing and further regulating our experience.

The group staged a collaborative game in which each of the 15 participants carried a distinctive, coloured pillow on the top of their heads. While they couldn't talk to each other, they could sense an empty space that was once in a while in front of them, behind them or next to them, and thus move through this space in order to achieve a predetermined shape collaboratively. The intention of this game was to dislocate the human embodied experience from cognitive experience in a constrained social setting.

Regaining access

Can we regain access and power over processes of negotiation about what algorithms are and what they should be? We must reflect on how algorithms are conceived, written and implemented through objects, products, services and technologies that regulate our everyday life and are silently replacing our law systems.

Access to algorithms and their visibility are not necessarily related to understanding them in formal terms, but depend on knowing where and in which parts of the social, urban, ecological and political processes algorithms play a role. We have to be aware of where we, as active and free agents of social complexity, influence their activation, their ideation, their power, their overwriting or their annulment. Although it is helpful to be familiar with the process of writing code and programming, I do not consider this to be fundamental, for access to algorithms goes beyond coding literacy. Teaching and learning code, and ensuring that these practices remain open and democratic, is essential in order to secure temporary labour stability, economic opportunities and social empowerment; but teaching and reflecting on these in conjunction with ethics, history, art and social theory is the truly fundamental issue here, and is perhaps our only hope of regaining a voice in the future establishment of algorithmic regimes.

1 Definition retrieved from www.lexico.com/en/definition/algorithm (all links in this article last consulted 19 August 2019).

2 Sol LeWitt: Paragraphs on Conceptual Art, in: *Artforum* 5/10 (1967), pp. 79–83, here p. 79.

3 See *The Fluxus Performance Workbook. A Performance Research e-Publication*, ed. by Ken Friedman, Owen Smith and Lauren Sawchyn (E-Publication 2002) p. 80f., https://issuu.com/dylan_k/docs/fluxus-workbook/42

4 https://zkm.de/en/event/2004/10/the-algorithmic-revolution.

5 *Ibid.*

6 See Melissa Terras: For Ada Lovelace Day – Father Busa's Female Punch Card Operatives, retrieved from: https://melissaterras.org/2013/10/15/for-ada-lovelace-day-father-busas-female-punch-card-operatives.

7 William Uricchio: Towards a New Order. The Algorithmic Turn, Keynote at the International Symposium for Electronic Arts (ISEA), Istanbul 2011, retrieved from: https://vimeo.com/35214488.

8 Levi R. Bryant refers to the concept of rigid machines while proposing an onto-cartography of machines, or an ontology that describes a universe which is only made by matter, and that matter organises itself through beings which are considered machines. Bryant follows the philosophy of speculative realism and extends the notion of machines as proposed by Deleuze and Guattari, mainly in the *Anti-Oedipus*. A rigid machine is considered to be unable to undergo changes in its own operations and its only destiny is entropy and disintegration; if it is true that all beings that exist are machines, then rigid machines are only a sub-species of all that there is. Levi R. Bryant: *Onto-Cartography*, Edinburgh 2014.

9 *Coding as Literacy. Metalithikum IV*, ed. by Vera Bühlman, Ludger Hovestadt and Vahid Moosavi, Basel 2015 (Applied Virtuality Book Series, Vol. 4).

10 Louise Amoore/Volha Piotukh: Introduction, in: *Algorithmic Life. Calculative Devices in the Age of Big Data*, ed. by Louise Amoore and Volha Piotukh, Abingdon/New York 2016, pp. 1–18.

11 Robert Seyfert: Automation and Affect. A study of Algorithmic Trading, in: *Affect in Relation. Families, Places, Technologies,* ed. by Birgit Röttger-Rössler and Jan Slaby, Abingdon/New York 2018, pp. 197–218.

12 Caitlin Lustig/Bonnie Nardi: Algorithmic Authority. The Case of Bitcoin, in: *48th Hawaii International Conference on System Sciences*, Kauai 2015, pp. 743–752.

13 Ian Lowrie: Algorithms and Automation. An Introduction, in: *Cultural Anthropology Journal* 33/3 (2014), pp. 349–359.

14 Lynn M. LoPucki: Algorithmic Entities, in: *Washington University Law Review* 95/4 (2018), pp. 887–953.

15 English version published in Jorge Luis Borges: *Collected Fictions*, transl. by Andrew Hurley, London/New York 1962.

16 Jean Baudrillard: *Simulacra and simulation*, transl. by Sheila Faria Glaser, Ann Arbor ¹³2003, pp. 1f.

17 Media Art Collective Labor 5020, http://labor5020.ch.

18 Full video and audio recording of the workshop *Unfolding Algorithmic Agency*, available at: https://youtu.be/nKn0bn6MSdU.

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