Poetic Automatisms

A Comparison of Surrealist Automatisms and Artificial Intelligence for Creative Expression

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Abstract. Inspired by the recent controversy about art created by artificial intelligence (AI) algorithms and its successes in the art market, we are analyzing the use of automatisms as creative processes in visual arts. Without an attempt at exhaustiveness, we focus on two examples that mark two significant moments in art history: We compare surrealist automatisms and the automatisms used in recent AI artworks. Our interest is to understand the nature of the associated automatisms and the intentions and poetics motivating their use. The paper discusses the criteria of selection of which automatisms to analyze and locates them in their art historical context. To facilitate this analysis, we propose a framework to assess the poetic intentions and correlate them with the creative processes developed by the different artist groups. The overarching question motivating this investigation is to understand what has changed in our perception of the creative process and how it became possible for computational art to, today, occupy a seemingly uncontested place in the art market and discourse, after decades of heated controversy about its impossibility words.

Keywords: Artificial intelligence · Surrealism · Neural networks · Poetics

1 Introduction

Until not long ago it seemed more or less impossible that human creativity could be challenged by computers. While computing has entered nearly every aspect of our lives, the domain of artistic expression seemed to be one of the last bastions in which computers would not be able to replace human beings [7]. The controversy whether computers have a place in the arts and can possibly be creative unto themselves goes back to the time when computing just entered the imagination of people beyond the specialist circles in research centers, the military or big corporations. In the 1960s, even before access to any real computers was available to average people, the kind of thinking and potential the machines embodied, inspired several artists to employ computation-like procedures in their work. The question about creativity raised by this new style of work, in particular in these early days, became a heated topic, which mostly revolved around what it meant to create art, what it meant to be creative, and what the role of art should be in society. The reactions ranged from the hopes to found a new aesthetic, to Gustav Metzger's criticism

M. Wölfel et al. (Eds.): ArtsIT 2021, LNICST 422, pp. 359–378, 2022.
https://doi.org/10.1007/978-3-030-95531-1_25

that artists who engage in new computational media will be "eaten up by big business and manipulated by technology," [27], to the alleged sabotage of a computer installed to be part of the exhibition titled "Software," one day before the opening in 1970, so that the computer did not work [34].

Today, computational processes are a normal phenomenon across the entire creative field. Since many years, computational tools have supported the creative work of their users. For example, the painting and photography tool *Photoshop*, originally released in 1990, has become one of the most popular digital image editing tools. It has, for instance, been used by the artist David Hockney to create drawings [18]. In the last five years, a growing number of computational processes employing artificial intelligence (AI) have become available to automate tasks that used to be carried out by human users. Examples are tools using AI to automatically enhance photographic images (adjust, sharpen, resample, replace parts etc.) with synthesized information based on large amounts of images as training data for machine learning. And finally, there are tools that automatically create entire images and – for that matter – poems or sculptures, based on artificial intelligence algorithms. In this latter case it might be a matter of discussion if these automatic creation processes can be referred to as a "tool," since the connotation of the term "tool" is that it is an implement used by a human to do something, suggesting that it is still the human who is the creative force behind the product [44]. For the purpose of this paper, we will not go deeply into this discussion and adopt a rough categorization, according to which we take the first two categories, including software such as *Photoshop*, *ProCreate* or others, as tools comparable to a brush or other implements used to support artists in the process of creating artworks, which do not automatically create works. The last type delivers automated creation processes of partial or complete works. This line dividing automated creation from the support of human creation may not be perfectly sharp, but it allows us to see, in the latter type, that the activity of creating a work is controlled by rules and decisions of automated processes rather than by a human creator. As the process of creation of an artistic product is taken over, to a degree, by a machine that displays a certain amount of autonomy, without the human creator as the sole instance of creative decision making, we see ourselves confronted with the same question that has surfaced in the 1960s, when computers - or the inspiration of computers - entered the creative domains for the first time. In this context we understand "machine" as a complex device that is designed and set in motion to accomplish a certain task or produce a certain product [42]. Compared to the controversy of the 1960s, today, this question arises in a much more moderate form without the passion and radicalism that it had earlier. In comparison, earlier, when artists used computation-informed automatisms without actually employing machines to execute them, this question did not emerge at all.

1.1 AI in the Creative Process

In the last four years, artworks created by AI software have been exhibited in art shows and sold in art auctions. To circumscribe the timeframe of this development, we refer to a few events that mark the appearance and wider reception in traditional art press. In 2018, the Grand Palais in Paris had a show entitled "Artistes & Robots," which presented works of about 40 artists under the notion of "artificial imagination" to trace a development

that proceeds from automatisms of a more analogue kind, like Jean Tinguely's machine sculptures and other material incarnations, to an algorithmic form of art creation [34]. Other commercial galleries followed suit to embrace AI-generated art [33].

Also in 2018, the auction house *Christie's* sold for the first time an AI-generated art piece in a major auction [6]. In 2019, the auction house of the *Sotheby's* corporation also began selling AI-generated art pieces [36]. This is not to suggest that something being sold in an art auction is any kind of useful definition, but the fact that some of the largest established art auction houses are including AI-generated art in their business portfolios indicates that there is a growing acceptance, at least among a commercial art-audience. In the press about these two auctions, a new kind of controversy is surfacing, which no longer focuses on the question whether artistic expression is a uniquely human characteristic or whether it could be taken over by computational processes; the new controversy is about the question how autonomous the artificial intelligence systems have to be and how much human interference can be tolerated for the product to be a piece of 'AI-art.' The French artist collective *Obvious*, which was the pioneer in having their works go on auction in *Christie's*, was criticized for using "a straightforward application of an algorithm that has been available since 2015 and their pieces involved a large amount of human intervention – deciding when a portrait was finished and framing it like an Old Master" [28].

With the "admission" of automatically-generated artworks to the art market modifies the traditional notion of originality and the idea that one unique person, the artist genius, has to be unequivocally associated with the creation of an art piece for it to have value, another aspect of art-market value, the idea of verifiable property that confirms ownership, lineage of origin, and the fact that the value associated with a certain artwork indeed belongs to its owner, has become more important. One of the big hurdles of digital art to enter the art market through galleries, beyond festivals and exhibitions, was that digital artifacts could be infinitely copied, and every copy was indistinguishable from any other. This fact made it practically impossible to uphold the idea of one unique original that could warrant value. The introduction of non-fungible tokens (NFT) in the art market was one way to address this problem. The 'double spending problem' of digital artifacts is mitigated – just like in digital currencies - through a cryptographic record in a blockchain that verifies the ownership of a certain item and, thus, makes value attribution possible. The adoption of NFTs in the art market exploded in the last couple years, indicating yet another sea-shift in how artworks and their value is seen [9, 11]. An almost satirical episode in this story is the acquisition and subsequent destruction of a real artwork, once it had been digitized and an NFT had been created for it. A company operating a platform to calculate blockchain transactions purchased an artwork of the English artist Banksy, turned it into an NFT and then destroyed the original, which they considered disposable after its existence as NFT was warranted [29]. We may just interpret this as an artifact in itself, or the display of the art market as a purely commercial endeavor - but it shows that it is worthwhile to analyze the concepts of artistic creation and poetics associated with the automated creation of artworks and how they have shifted.

Different visions about automatic art-creation have circulated for a long time. If we step back from the current debate about artificial intelligence in the arts and look at art history in a slightly broader perspective, artists have had an interest in exploring

automatic processes as a means of art creation already long before computation entered the stage. We could take the engine of the *Academy of Lagado*, which was described in Jonathan Swift's 1726 book "Gulliver's Travels" as an early example of a 'computational' device for creative output [37]. But while Swift's engine is a thought experiment, other automatic processes have been actively conceived and used. An outstanding example is the extensive range of different automatisms conceived by the surrealists and can be interpreted as a continuous line of development in which today's AI processes mark the current endpoint. In this paper we will analyze these automatisms and the concepts of artistic creation and poetics inherent to them. Different artist groups or movements associated different intentions with the use of automatisms, and we are investigating how these intentions represent different ways of thinking about the process and purpose of artistic creation.

2 Computation, Art and Creativity: Human vs. Automatic Creation

The overarching question motivating this investigation is to understand what has changed in our perception of the creative process that, first, made it possible for computational art to, now, occupy a seemingly uncontested place in the art market and discourse, after decades of heated controversy about its impossibility and, second, what made it conceivable to discard the actual incarnation of an artwork in favor of its digital record of existence. So far, digital reproduction was simply a form of documenting artworks and it was generally understood that the perceptual experience of the piece is the real, original experience that is intended by the artist for the audience to have. So far, this real, original experience could only be hinted at by a digital representation but not substituted by it. We are familiar with a separation between the intellectual concept and the material incarnation of an art piece from the works of concept art of the 1960s and 70s, but this separation is different. The blockchain records just store information about the creation and successive transactions of the NFT, there is no information about the artistic concept or in fact anything pertaining to the thoughts, aesthetics, or materiality of an artwork. It is possible to correlate an image or description of the piece with the NFT, but this is again in the realm of documentation. What changed in the current relationship to the experience of an artwork that makes this paradigm shift possible, and what are the philosophical and poetic concepts related to this shift? While the scope of this paper is limited, we will present a preliminary framework and methodological considerations to approach these questions.

As we are still at an early stage of the wave of AI-generated artworks and NFTs, there is still a lot of speculation whether this is just a temporary fad or whether this is a sea-change of lasting impact [10, 19]. In particular in this moment, it is important to track and understand the transformations in the perception of the creative process that are responsible for these – maybe transitory – changes. We have a brief moment of capturing them in their raw state of emergence and see the discourse shaping around them.

Systematic research to develop and assess creativity in computational processes has existed since a number of years. These research endeavors tend to not make a claim

to generate valuable and appreciable art; the goal is rather to investigate the question whether computers can be creative at all and how to design such automated creative processes. Creativity, in this context, is not limited to artistic creation, but includes scientific problem solving, mathematics, engineering problems and other areas of creative activity. It is a complex of several methods such as pattern matching, idea generalization or contextual thinking, which are applied in numerous contexts besides art creation. The majority of computational creativity research has been more focused on having humans and computers be collaborators in the creative process rather than fully automating it [8, 29]. But while the scientists are more conservative, trying not to venture too far into the realm of art, it is artists themselves and businesspeople in the art market that seem to more readily embrace computational processes as valid and valuable sources of artworks. What is behind this change of mind and how does this relate to the processes of creative expression?

3 Two Moments in Time - Comparing Two Seemingly Radically Disparate Art Phenomena

To approach these questions, we will trace some key positions in the controversy about automatic processes in the arts and formulate an outline of the poetics of automatisms employed by different artists and artist groups. For the purpose of this paper, we will adopt a concept of the term *poetics* that defines it as the theory of form and the "creative principles informing any literary, social or cultural construction" [43]. The focus on the creative principles and the combination of aspects of the literary, social and cultural is suitable for our investigation, since the phenomenon we are approaching is characterized by a complex confluence of these areas. Considering the wide range of automatisms that have been devised by different artists and artist groups over time, traversing the multitude of automatism concepts since Swift's *engine* until today's AI methods, it is clear that it will be difficult to formulate a single concept of poetics that will be able to adequately represent the intentions and principles of all of these approaches. Therefore, we will begin with a consideration to select certain kinds of automatisms to be included in this analysis.

3.1 Selection of Artistic Automatisms

The types, intentions and usage scenarios of automatisms in artistic production is abundant and, for the scope of this paper it will be necessary to select a limited number of significant instances. This choice is by no means representative, but it is intended to support an understanding of the associated motivations and cultural contexts. As stated earlier, the *engine* of the Academy of Lagado is a theoretical concept inspired specifically by the combinatorial structure of language and its inherent linguistic principles of creating new meaning. The principle idea of this engine is simple combinatorial action, in which no logical or other heuristics are employed that would shape the outcome of the machine. In Swift's description, this selection process is done by the students and professors of the Academy. Even though we may consider this idea of an engine a close relative of the step reckoner conceived by Swift's contemporary, Gottfried Wilhelm

Leibniz, which is often seen as the first computer, we will keep the field of automatisms narrower and start significantly later in the history of automatism imagination.

An automatism that is much closer to the algorithmic nature of today's computers is Emmett William's poem entitled "IBM." It is a poem based on a principle he referred to as a game or "do-it-yourself poem," which he devised in 1956, without actually having access to a computer. The basic algorithm goes like this:

And now, back to the very beginning. Here are the rules of the game, vintage 1956:

1. Choose 26 words by chance operations – or however you please»
2. Substitute these 26 words for the 26 letters of the alphabet, to form an alphabet-of-words.
3. Choose a word or phrase (a word or phrase not included in the alphabet of words) to serve as the title of the poem.
4. For the letters in the title word or phrase substitute the corresponding words from the alphabet-of-words. This operation generates line one of the poem.
5. Repeat the process described in step 4 with the results of step 4.
6. Repeat the process with the results of 5.
7. Et cetera" [39].

In recursive application, the algorithm delivers a complex field of word and sentence transformations. At the time of its creation, computers were still very rare and expensive devices that were not available for artists to do creative experiments with them [17]. Only later, in 1966, Williams had the opportunity to use a computer to carry out the algorithm and named the result "IBM," in an "understandable tribute to the muse's assistant" [38]. What Williams specifically appreciated in the process of using a computer for this purpose was the "indefatigability of the computer," which allowed him to introduce several other dimensions of transformation that would have been hard to carry out manually. The purpose behind those was to "relieve monotony, and to thicken the plot" [39].

Williams' process is a good example for a certain type of use of computational processes, in which the machine is used for its ability to process large amounts or complex transformations according to different combinatorial systems, while the artist controls the process by adjusting the parameters and functional aspects of the transformations. In this case, the artist controlled which transformation rules get combined and the input into the system. As Williams describes, the input was established through chance operations that "reflect the bewilderment of an expatriate returning to the United States after an absence of 17 years" and adds that he "might have cheated" in the process of generating the seed-word lists [39].

In the "IBM" poem of Emmett Williams we can see a turning point where creative principles that are quasi-computational and inspired by the idea of computing, but that were not actually executed on a computer, slowly give way to principles developed with an opportunity to use computers to carry out the procedures. From his own description of the process we understand that the automatic process was intended to yield textual material with qualities such as a plot, and associative likeness (e.g. the "bewilderment of an expatriate"). Care was taken to shape the transformations in such a way that they deliver enough complexity for readers to imagine a plot in the lines of the poem and to provide associative hooks to guide their interpretation. We can see two main

strategies in the construction of the automatism: one is the aim to provide a remainder of meaningful structure by using sufficiently suggestive start-words, and the second is to have sufficiently complex transformations that are neither too simple to be immediately transparent nor too unstructured to make the results appear to be completely random and meaningless.

A group that never used computers but devised various forms of algorithmic procedures and automatisms is the French *Oulipo* group, the "Ouvroir de littérature potentielle," the workshop for potential literature. This group was founded on November 24, 1960, and became a heterogeneous assembly of writers, mathematicians and scientists, whose motivations to use automatisms varied somewhat between the different members. One of the members, Georges Perec, who became famous for his approach to constraint-based writing techniques, considered himself as "a writer, but of a rather unusual kind – one with no imagination to speak of" [1]. For Perec, the use of automatisms was a way of filling in the absence of imagination with more reliable tools; in his case, automatisms were a tool to support his own writing process, which means that he adhered to a collaborative relationship between human and automatic creation.

The *Oulipo* group was founded in 1960 by poet and novelist Raymond Queneau and the chemical engineer, mathematician and poet François Le Lionnais. Queneau's use of automatisms was directed at leveraging the potentiality of literary texts. When he was 21 years old, he encountered the surrealist movement and participated avidly in their activities. We can assume that his interest in automatisms formed during his work with the surrealists and then, extended by his interest in mathematics, lead to the practices of the *Oulipo.* Following the 'success' of the *Oulipo*, several other workshops emerged, dedicated to a variety of forms of expression, such as painting (*Oupeinpo*), music (*Oumupo*), composition and others, employing similar algorithmic methods. For our purposes, though, we instead turn toward the surrealist automatisms, which are conceptual precursors to the work of *Oulipo* and in distinction to which the Oulipists define their own creative practice.

3.2 Psychology and Concepts of the Brain

The surrealists employed an elaborate apparatus of automatisms in service of artistic creation. The movement formed around the French artist André Breton, who, with his publication of the Surrealist Manifesto in 1924, gave the official starting impulse of the movement. It evolved from the Dada movement and we can trace numerous connections between the art practices and ideas. Nevertheless, in the case of surrealism the concept of using automatic processes, their purpose and practice was a new concept. The automatisms were intended to appeal to the unconscious and free the imaginative energy from the restrictions normal life imposes on it. The beginning of the movement saw the opening of the Bureau of Surrealist Research, created to "gather all the information possible related to forms that might express the unconscious activity of the mind" [12]. This focus on research and a methodical investigation of the subconscious as an artistic practice geared to creative expression was a new phenomenon. The direct precursor, Dadaism, was rather a systematic defeat of any systematic approach and instead dedicated to forms of absurdism. Several members of the surrealist movement were active in Dada, several of their practices, such as collage and cut-up writing, are similar, and they

share the skepticism of rational logic that both movements saw in direct connection with the traumatic experience of World War I. Nevertheless, the notion of research and the attempt to theorize the practices of the surrealist movement distinguish it rather clearly from its antecedent [2].

Breton encountered the writings of Sigmund Freud in 1917, while he worked in the psychiatric center of a hospital, taking care of soldiers with mental distress from the battles of the war. From this work he described the "astonishing images" that he heard about from his patients [31]. The focus on automatisms as a way to free the subconscious mind and the imagination from the restrictions imposed by a rational and utilitarian society was the result of the combination of Breton's interests in psychoanalysis and in poetry.

The concept to use automatisms to bypass rational control of the mind and set the imagination free, and the importance the surrealist practices had in art history, make the surrealist automatisms a very suitable subject of comparison for this investigation. The contemporary counterpart, artificial intelligence algorithms, in a very similar way, take their origin from a theory about the functional principles of the human brain. It is worthwhile to compare both moments in respect to the history of artistic creation and conceptualization of the function of the human brain. Breton and Freud being contemporaries, Breton responded strongly to the theories of Freud and had a sense of their possible implications for imagination and creative expression. It took him until 1924 to formulate a "research agenda" based on these ideas, but nevertheless, we can say that the embracing of the scientific theories of the subconscious for artistic ends was rather swift. The embrace may have strayed somewhat from the scientific approach, for example, Breton may have erroneously taken Freuds free association technique as equivalent to automatic writing [13]. In the other direction, as we understand from Polizzotti's biography of Breton, Freud was somewhat uninterested in engaging with Breton's ideas about the subconscious and the role his ideas could play in liberating humans from the oppressions of their surrounding society. Even though Freud was the source of inspiration, he did not engage with Breton beyond a limited exchange of conversation. Later though, psychologist and psychoanalyst Jacques Lacan, was deeply inspired by both Freud and Breton. Lacan and Breton were friends, and Lacan even published some texts in the surrealist magazine *Minotaure*. Several of the early texts by Lacan appeared in the *Minotaure*, and in particular in consideration of the surrealist's efforts to create methods to access the unconscious and irrational, the proximity of Lacan's concerns is evident. In the text "Le problème du style et la conception psychiatrique des formes paranoïaques de l'expérience," which was published in the first issue of *Minotaure* in 1933, Lacan analyzes the experience of states of paranoia in respect to their stylistic potential and the potential of symbolic expressions. He considers the phenomena he observes as extremely productive in terms of poetic production and states that they exclude normal ethic and rational consideration in favor of a freedom that he describes as "imaginative creation." Lacan goes on the consider experience of paranoid states as a form of original syntax, stating that the knowledge of this syntax represents an indispensable introduction to understand the symbolic values of art, and specifically of the problems of style [22]. The mutual inspiration between Lacan and Breton evident and both state an indebtedness to each other's thinking.

In comparison, it took much longer for artists to embrace artificial intelligence algorithms as a meaningful tool of artistic expression. Some of the foundational concepts of artificial intelligence, in particular machine learning, i.e. the possibility that machines can learn and improve by themselves, also go back to findings in psychology. The book "The Organization of Behavior" by Donald O. Hebb, published in 1949, described the functioning principles of the so-called Hebbian learning process and which role neurons and the Hebb synapse play in it [16]. Hebb began to investigate learning processes in neuron networks already in 1932, when, in his Master's Thesis, he described the role of neurons in explaining reflexes and inhibitions. He produced multiple papers on this topic until he finished "Organization of Behavior." This work was the basis for Warren McCullough and Walter Pitts to work on a logical calculus, which mathematically formulated the learning behavior described by Hebb. Their 1943 paper "A logical calculus of the ideas immanent in nervous activity" presented the foundational concepts for the McCullough-Pitts artificial neuron, which, in turn, was the basis for any neural networks [25]. First implemented by Frank Rosenblatt in 1957, the perceptron was a first learning algorithm, consisting of a network of multiple artificial neurons. While this work was picked up very quickly in the engineering community, artists took until quite recently to embrace AI as a possible source of creativity – even though, we might assume a conceptual proximity between the fact that the perceptron was geared toward visual perception and image recognition, tasks not unrelated to at least the visual arts. For reasons of conceptual proximity, for this comparison we will focus on recent examples that have been exhibited in recent shows and the topic of discussion in the art press.

These considerations suggest that both the surrealist automatisms and neural networks are useful objects of analysis for the purpose of this study. Without ignoring or prioritizing certain automatisms over others, this selection will serve as opposing poles and endpoints of a spectrum of different poetic concepts in the use of automatisms for creative expression. This focus on AI, though, should not distract from the fact that the field of computational art is of course much larger and comprises a wide range of different approaches to the use of algorithms and creative expression than those building on concepts of Hebbian learning and machine learning processes. For the purpose of this article, we will focus on two moments in time, taking into consideration artworks as well as conceptual texts produced in this period. The first moment comprises the period of surrealism between the first manifesto, published in 1924, which marks the founding moment of the movement. It includes the second manifesto of surrealism, which was published in 1929 and considers examples of the automatic writing work done in this period, up to some of the cadavre exquis works, done collaboratively by Yves Tanguy, Jeannette Tanguy and André Breton in 1938. The second moment looks at a timeframe beginning in 2018 up to now, with the first widely discussed entries of artworks created with artificial intelligence algorithms into the traditional art market and discourse.

3.3 Criteria of Comparison

The historic context, the tools and procedures employed in the creative processes, and the personalities and societal embedding of the artists seem wildly different when comparing the surrealists with current AI-artists. With this difference, what can be criteria of

comparison that can be applied in a reasonable way and deliver outcomes that are meaningful? We are interested in particular in two aspects, the poetics and creative intent, and the surrounding discourse of the larger context. Since, in particular for the recent AI-art pieces, art market value has been a central area of discussion, we will include that aspect into the analysis of the larger discursive context. We cannot say that there is anything like a coherent movement of AI art currently, we rather have individual actors who are adopting techniques of creation that are rooted in AI, nevertheless, from some of them, the classic insignia of an art movement, specifically a manifesto, do exist, and we have rather consistently formulated theories about the functioning and the supposed creative principles leveraged with the described automatisms for both the surrealists and AI art.

To determine the poetics and formal qualities of the works produced by these groups of artists we will refer to the theories and manifestoes they have formulated themselves as a way of communicating their intentions and practices. Using the accounts about the creative principles of the automatisms by those who actively use them for creative ends seems to be more meaningful than to refer to any categorizations and stylistic patterns that have been ascribed to those groups by art historians, critics or other uninvolved observers. As Mary Ann Caws is arguing in the introduction to her anthology of surrealist painters and poets, the artist's own self-characterization seems to be one of the most meaningful criteria for such a comparison [5]. Even though we might be able to identify common stylistic elements among the surrealist works, and possibly some for AI-created art pieces, but the variety of AI artworks is such that there is not necessarily a meaningful common trait. Other criteria, such as group membership, are also not useful; Breton, for example, 'expelled' several surrealist artists in the second manifesto, stating they were not surrealists.

4 Surprising Differences and Similarities

4.1 A Collection of Automatisms

Some Surrealist Automatisms

To get a sense of the functioning principles of the different automatisms and to be able to assess and compare them, we will begin with a description of a selection of the main automatisms from both the surrealists and from AI art creations.

The surrealists have devised a rather large set of different procedures of different degrees of automation. Alastair Brotchie identifies 33 different procedures, which he calls surrealist games. He also mentions several "provocations" and more procedures that he does not examine more closely [3]. Brotchie does not categorize all of these procedures as automatisms, but we can find common principles that connect them to the definitions given in the Surrealist Manifesto and other descriptions of their application by several surrealists. The use of the term automatism by the surrealists needs further examination, which will allow us to identify what types or traits of automatisms should be primarily considered as part of this comparison.

In the (first) Manifesto of Surrealism from 1924 Breton describes an experience that prompted him to adopt a certain kind of procedure that later is referred to as automatic writing. One evening, before falling asleep, Breton encountered a phrase that came to

him without any apparent relationship to his situation or experience prior to this moment; he described it as "knocking at the window" [2]. Intrigued by its rare quality, he decided to incorporate it into the material of his poetic construction. And once he had done that, a sequence of phrases came to him so fast than he could not even write them down. Breton formalized this process in a section of the manifesto entitled "Secrets of the Magical Surrealist Art," which became the concept of automatic writing.

The procedure is described as follows:

> After you have settled yourself in a place as favorable as possible to the concentration of your mind upon itself, have writing materials brought to you. Put yourself in as passive, or receptive, a state of mind as you can. Forget about your genius, your talents, and the talents of everyone else. Keep reminding yourself that literature is one of the saddest roads that leads to everything. Write quickly, without any preconceived subject, fast enough so that you will not remember what you're writing and be tempted to reread what you have written [2].

The suspension of rational control is the main aspect that is to be achieved by this form of automatism. The formulation of this concept as a creative practice is influenced by several theories, Breton referred to Sigmund Freud's free association technique as a way of uncovering experiences and thoughts that have been relegated to the unconscious or repressed. He is also making a direct reference to Pierre Reverdy's statement that images are a pure creation of the mind, invoking the role of mental activity in creative expression. Another theory that was influential at the time and with which, we can assume, Breton was familiar given his interest in psychology, is Pierre Janet's book on psychological automatisms from 1889. Even though his ideas were published and in circulation, Janet gets mentioned only in the second manifesto of surrealism. Janet proposes a theory of elementary human activities, which are normally ignored in favor of higher forms of activity, such as acts of the will and decision, even though the simple activities are tremendously impactful on our actions and could serve to explain many of the more complex activities of humans. Janet coins the term psychological automatism for these low-level activities [20].

The automatic writing procedure is probably the most well known and most influential procedure of the surrealists. Along with it, automatic drawing, a technique very similar to automatic writing, with the difference that the activity consisted in drawing lines on sheets of paper and making what we might call "doodles." Another well-known automatism is the "exquisite corpse," which is based on the collaborative effort of several (minimum three) artists working together on one creation. The "exquisite corpse" exists as both, a textual exercise as well as an exercise in drawing, painting or collage. The idea is that the first collaborator writes down an article and an adjective, folds the paper such that the next participant cannot see what was written by the first, and then passes it on to the next participant, who contributes a noun, the next a verb, then another article and finally another noun. At the end the sentence is read aloud. The same principle exists with drawing, where the first participant draws a head, the next the body and the last the legs. This automatism is interesting to mention, because not only is there an unintended inspiration that emerges from the not consciously controlled collaboration of multiple participants, it also is a break with the idea that one artist is the sole author

of an artwork. The artwork is rather the result of a collaborative process, rather than the conscious creative act of its author. We could refer to this as collaborative authorship, but it becomes quite clear from Breton's descriptions that the automatisms are considered as quite detached from individual or even collaborative authorship – they are more akin to an unknown force that "knocks at the window." The artist serves, so to speak, as a medium that captures what has been presented to it from an unconscious instance. The surrealists did not directly employ this terminology and rather made clear that the processes enabled by automatisms are the "actual function of thought: dictated by thought in the absence of any control exercised by reason, exempt from any aesthetic or moral concerns [2]. While with the earlier versions of surrealist automatisms the artists took great care that no human intervention interfered with the results of the process (not even reread what was written in a session of automatic writing), later many artists turned toward a more collaboratively structured model, in which the results from an automatic process were the beginning of further, conscious creative work by the artists [3].

Artificial Intelligence Automatisms

In AI art, again, we encounter a range of different algorithms that are used in the process of creation. For the purpose of this comparison we will focus on a few principles that are significant for the underlying concept of AI art. The central process the automatisms of AI art are based on machine learning. Realized in several different algorithmic approaches, the foundation of AI arts are learning processes in which a large databases of examples were presented to an algorithm, which made inferences based on the data presented to shape the output similar the input data. The learning process in most of the examples of AI art is to feed examples of existing artworks to the machine learning algorithms and then use the trained algorithms to create new works based on the principles that were learned. For this purpose, a generative model is employed that can generate output that closely resembles the characteristics of the input (training) data. In the case of the artists we mentioned earlier, Klingemann and *Obvious*, a particular kind of generative modeling was used, so called generative adversarial networks, or GANs.

This approach to neural networks has been proposed by Ian Goodfellow et al. in 2014 as a way to transfer the successes made in deep learning models to distinguish complex data characteristics to deep generative models [15]. Significant progress was made in machine learning through improving deep learning models through techniques such as back propagation, a specific way of training a neural network, to learn how to distinguish complex features in data sets presented to the algorithm. This is referred to as discriminative modeling, as the machine learning algorithm differentiates between classes of data and labels them according to the categorizations it learned. Transferring these successes to generative models, which, instead of labeling classes of data, learn how to generate data that closely resemble the input (or training-) data, proved difficult. Generative adversarial networks presented an efficient answer to this problem. They consist of two types of models, a discriminative and a generative model, which compete with each other and, by way of competing, improve each other's performance. The generative model (generator) learns from the training data set what kind of patterns exist in it and then generates output that corresponds to these patterns. Its adversary, the discriminative model (discriminator) learns how to distinguish the output generated by the generator from the original training data. By competing against each other, both parts

of the adversarial network improve their modeling. Goodfellow explains the functioning principle with the following metaphor:

> The generative model can be thought of as analogous to a team of counterfeiters, trying to produce fake currency and use it without detection, while the discriminative model is analogous to the police, trying to detect the counterfeit currency. Competition in this game drives both teams to improve their methods until the counterfeits are indistinguishable from the genuine articles [15].

This means that the output of a GAN closely resembles its input data and produces subtle variations close enough to the original to be considered as part of the original domain. While the AI component in this process is based on Goodfellow's et al. algorithm and the various improvements that have been made to it since then, the main action of the artist who employs a GAN automatism to produce AI artworks, consists in choosing the training data and adjusting the parameters controlling the learning process of the GAN. It is clear that the choice of training data will significantly shape the possible outcome of this process. The particular way how the generator iterates through the probability space of its model creates a rather specific kind of distortion that has often been described as resembling paintings of the British artist Francis Bacon. This specific look has been described as the "defining look of contemporary AI art" [41].

AI art is not limited to visual output, even though these examples have received most public attention. To give an example of a language-oriented model we are looking at a recent example called Deep-speare, by Jay Han Lab et al. [24]. Based on training data curated from William Shakespeare's sonnets this AI implementation produces new sonnets in the style of Shakespeare. While the approach to use training data from existing artworks to produce new works that are very similar, the actual algorithms used for text production differ from those used for image production. Deep-speare uses multiple Long short-term memory networks, or LSTMs. In distinction to models like GAN, LSTM are specifically tailored to include time-based context into their learning process. This makes them particularly suitable for language-oriented applications, such as speech modeling and translation, handwriting recognition, analysis of audio and video data etc. In addition to multiple layers of artificial neurons, LSTMs comprise memory cells, which can store time-based information and take temporal context into account in the learning process. Deep-speare uses one LSTM to build a language model, one for a pentameter model, and one for the rhyme model. Shakespeare's sonnets are written in iambic pentameters, i.e. lines of ten syllables, consisting of five pairs of an unstressed syllable followed by a stressed syllable and the pentameter model learns this structure of poetic meter. The rhyme model learns the structure of Shakespeare's sonnets, which consist of 14 lines structured as 3 groups of four lines, the quatrains, and two groups of two lines, the couplets. The rhyme scheme of these possesses several variants, with a typical structure being ABAB CDCD EFEF GG. In the generation procedure the context of preceding lines is taken into context. Since the rhyme structure of the lines is important, Deep-speare generates lines beginning with the last word, which is adjusted so that it fits the rhyme scheme and then the line is generated building backward from the last word.

4.2 Poetic Intentions

The Program of Surrealism

From the analysis of the functional principles of the automatisms we get a sense of what the artists aim to accomplish with their use of automatisms, but to get a real understanding of their intentions it is useful to look at what they state about the poetic intentions themselves to really get a picture.

Drawing from the Surrealist Manifestoes we get the sense that the intention of the surrealists was to shift the human brain into a different state of mind that suspends considerations of utility etc. which normally govern our decision-making processes. The use of automatisms serves two main purposes: it is a way of producing perceivable traces, Breton tends to refer to "images," which, when externalized and perceived, put the human brain into a state of imaginative activity that goes beyond the normal responses; the second purpose is, by way of producing those traces that trigger mental images, they reshape the human perception of the world and the value sets that are brought to it.

About the first purpose, the particular qualities of the perceivable traces – we use this formulation to be inclusive of the range of different creative products of surrealists including text, images, objects, moving images etc. – Breton sates that they are as strange to the artist as they are to anyone else. He goes on to say that:

> …poetically speaking, what strikes you about them above all is their extreme degree of immediate absurdity, the quality of this absurdity, upon closer scrutiny, being to give way to everything admissible, everything legitimate in the world: the disclosure of a certain number of properties and of facts no less objective, in the final analysis, than the others [2].

The way this inspiration works is likened to a spark that jumps between the different images brought together by an automatism such as automatic writing: "a particular light has sprung, the light of the image, to which we are infinitely sensitive" [2].

The second purpose of the exercise of surrealism is summarized at the end of the first Manifesto, where Breton points out that surrealism is an expression of complete nonconformism, concluding the manifesto with the statement that "Surrealism is the 'invisible ray' which will one day enable us to win out over our opponents" [2].

AI Intentions

The French artist group *Obvious*, consisting of three members, also formulated a manifesto from which we can glean some insights into their ideas and intentions. In the manifesto the members of the group introduce themselves as "limited by their creativity" [14], which might explain the motivation to turn to machine learning automatisms to make art, which, as they state, can empower the natural creativity." Their mission statement says that they "wish to demonstrate that algorithms help us complete our understanding of how we function as humans and push us to outsmart our current level of creativity." With their work they intend to shed light on the emerging tools available and believe "that a new generation of creators will rise, one that will know how to build and manage algorithms that will help in an innovative process." The intentions we read from this text are predominantly educative, to introduce the audience to new

emerging tools for creativity and invite them to better understand how humans function. This statement resonates with some of the opinions associated with – in particular the early stages of – artificial intelligence research, that, treating human beings as symbol processors, would allow us to simulate and better understand the procedures of human intelligence [34]. We would assume that, in the case of *Obvious*, the idea is that by simulating creative processes, we might learn something about human creativity, which is also a common position in computational creativity research, a subfield of artificial intelligence research.

The concluding statement of the manifesto section explaining the intentions goes as follows: "This is why *Obvious* focuses on accompanying the emergence of benevolent and harmless ideas, by promoting alternative uses for it, and unveiling its true creative potential." The focus on benevolent and harmless ideas is in strong contrast to the radical statements of the surrealists, which expressed nonconformism and were motivated by an idea of a "war" against the limiting dominant structures of the contemporary society that would eventually have to yield to the forces set free by surrealism. A hint of a similar desire for change may be found also in the *Obvious*-manifesto, where it is stated that expanding creativity can help to "destroy our current mental boundaries."

In contrast to the *Obvious* group, Mario Klingemann does not have a manifesto and states that he rarely writes about his work; nevertheless, a few passages about his interests are available on his website, where he describes himself as an "artist, and a skeptic with a curious mind." His areas of interest, he says, are "manifold and in constant evolution." In a similar way as *Obvious*, he stresses a desire to understand: "If there is one common denominator it's my desire to understand, question and subvert the inner workings of systems of any kind. I also have a deep interest in human perception and aesthetic theory" [22].

In contrast to the visual artists Klingemann and *Obvious*, the makers of Deep-speare do not identify as artists but as scientists; their aim is to investigate computational creativity and how neural models can be employed in this process. Along with the difference in self-identification, the evaluation criteria and methodologies they use to determine the performance of their systems differ significantly. While the first two follow traditional art-context criteria for success, such as participation in exhibitions, critical response and the resale value of their works in art auctions, Lau et al. employ a precise method of assessing specific criteria of their system. A first round of evaluation is done by crowd workers, anonymously recruited online workers who get paid a minimal amount per task ($0.05 in this case), who have to determine whether a sonnet is human made or computer generated. A second round was done with expert judgement, in which a professor of English evaluated the sonnets in respect to their meter, rhyme, readability and emotion. Their findings were that their system is able to produce formal characteristics such as meter and rhyme well but lacks in terms of readability and emotional expression.

5 Discussion

The most significant distinctions between surrealist automatisms and AI automatisms pertain to the creative intent and the sources of inspiration. The surrealists draw from the human unconscious, seeking for experience traces that are hidden or repressed, but nevertheless exist and influence human behavior. They bring these to the level of perceivable

formulation by surfacing the traces through automatic processes insulated from rational control and then use them to inspire new forms of thinking to the audience of their works. The central focus thus is human experience; AI art engages – so to speak – with second hand human experience: it draws from a curated set of existing artworks, which, as traditional artworks created by human artists, are highly likely to express human experience, and uses them as input data for the machine learning processes. Through the analysis of those human-made artworks, the AI learns the traces of expressions of human experience as part of the patterns it processes, but not as a targeted expression meant to express a specific experience. Human experience a residue that, in an unspecific form, is contained in the output of the algorithm. Since the curation of the training data is one of the main influences an artist working with AI algorithms has, we can speculate that the use of artworks as training data in the cases we are discussing here, is either a form of self-referential statement about the creative process in the arts, or it is the attempt to "warrant" the art-status of the generated product: since the training data are art-historically sanctioned works, the resulting works should be equally eligible to be sanctioned as art; in respect to the Deep-speare system the choice of training data originating from human creation is in line with common practice in computational creativity research. In this area of research, machines are supposed to learn what human creativity is and, for that purpose, results of human creativity are presented to the learning algorithm. In both cases, whatever the machines learn will contain the inscription of the "secrets of the magical art" as Breton called it.

We can conclude, though, that in the cases where it is known to the audience members that the work was created by AI algorithms, the perceptual and interpretational stance of the audience toward to work is different. In the press about exhibitions of both Klingemann's piece "Memories of Passersby I" and *Obvious*' piece "La Famille de Bellamy," which both employ GANs and generate visual output that has been likened to the paintings of Francis Bacon, we found no comment that perceives them as violent or unsettling, descriptions that are very often attributed to Bacon's paintings. Famously, Bacon came to his style of painting seeking to express the "brutality of fact" [37] and developed forms of painting that could render a form of brutal realism. In particular in work that focuses on benevolence and harmlessness it would be a surprising aesthetic choice to use forms that indeed evoke brutality, violence and upheaval in the audience. This is a clear sign that knowledge about the creator – or creation process for that matter – plays into the interpretation the audience. Knowing that human expression and a direct relationship to what we would refer to as reality is only existing as a decontextualized and indirect form in the artwork, shapes the audience interpretation as potentially harmless.

Even though surrealist artists also employ methods in which they assume more of a status as an externally controlled medium that responds to or channels experiences that are not under their rational control, the connection to human experience and the knowledge about the artist enters the audience interpretation in a different degree. In creativity research this is often expressed as a question of autonomy: A work is considered creative when we can read a degree of autonomy in it. The lack of emotional expression observed in the AI sonnets of Deep-speare is an indicator of a similar phenomenon.

In their use of automatisms, it seems that artists using surrealist automatisms and those using AI-automatisms have the opposite problems: the surrealists try to keep rationally classified human experience away from their works to get to the "raw" content of unconscious elements of human experience; and AI artists are trying to somehow infuse aspects of readable human experience into their creations. Surrealist artists would probably not respond to research in learning, they rather respond to research in finding or encountering. Learned things are what those artists actively tried to subvert. The stated intention of the surrealists is very much about human experience that needs to be liberated, it is not about conscious learning and reproduction, but about the revelation of already inadvertently learned experiences. The radical approach of the surrealists resonates with the strong criticism that was brought up against computer art in the 1960s, when the first works of computer art surfaced, and which we see in Metzger's criticism of the combination of technology and art as an aestheticization of modern warfare and totalitarianism.

Nevertheless, when we wonder how it was possible that computationally generated art could now circulate in the art market without triggering a major critical discourse, we are relegated to two aspects: The first, and we may say the less interesting one, is the connection to novelty, the connotation of high-tech, of which the perception has fundamentally changed in comparison to the associations with the military industrial complex that was present in the 1960 and 70s; predominantly, though, we may conclude that it is also a business speculation aspect that plays a role in this. It is probably not by accident that the artists who engage in AI art do not come from traditional arts training, and some of them even have a business background. The group *Obvious* was also awarded by the business magazine Forbes in their annual prize of "30 under 30", a selection of particularly influential young entrepreneurs [40]. The subsequent explosion of prices and sales of the NFT market strongly indicates that the main motivation of activity in this sector is not artistic expression but financial revenue. Nevertheless, besides engineers and businesspeople who entered the market, also established artists discovered the NFT market as a source of distribution and revenue. The growth of this market was such that the amount of energy that is consumed by the blockchain calculations necessary for NFT trading became a subject of concern and criticism. Websites like "carbon.fyi" allow to calculate the carbon emissions related to specific, given addresses of the blockchain-based digital currency Ethereum [4]. Some artists, like French artist, Joanie Lemercier, began to engage in criticism and activism against the environmental effects of this stepped-up energy consumption. Lemercier, besides participating in protests, also started a project in which he called out the software company Autodesk for its environmental irresponsibility and hypocrisy regarding standards of sustainability and thoroughly documented the exchanges with the company executives [21].

The second, more interesting aspect, for the appeal of AI art may be rooted in what we just discussed: the connection to a trace amount of reality. With generative models AI becomes interesting as it connects to elements of surprise and the gesture of 'bringing up something from the hidden depths of *something* - in this case it is not human experience, but maybe the likeness to paintings like Bacons or old classics. But the connection to other alienation techniques as they were employed by, for example dadaists and surrealists,

is noticeable as a remainder of likeness of reality that makes the automated products appealing.

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