ALGORITHMS AND HUMAN EXPERIENCE

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Introduction

What does the term “algorithm” mean? How does it relate to art? Who are the artists that implement the concept of algorithms in their works? These are “simple” questions that I had at the beginning of this course. These simple questions have transformed into complex multi-disciplinary investigations of how humans experience the world—from the physiological function of the retina to ethical questions of surveillance and privacy. The role of algorithms in science, medicine and art has become part of our everyday life with the advancement of technology, requiring us to re-define how we look at terms, such as “image,” “body,” “reality,” “producer,” “viewer” and “life.”

In this paper, I will focus on the use of algorithms in art. How are algorithms used in visual art? How can we compare and contrast between algorithmic digital art and algorithmic analogue art? How do we re-define “art” in the digital age? How do we place the digital art within the postmoderm art discourse? In order to answer these questions, I will first provide a framework for the term “algorithm.” In order to investigate the similarities and differences between them, I will use the works of Sol LeWitt as examples of an artist who uses algorithms “manually” in his art, in comparison to the works of Jeffrey Shaw whose installation is representative of the use of digital images. Lastly, and most importantly, I will address how digital art has added another layer to the definition of art, and how it reflects our everyday life in the postmodern twenty-first century.

What is an Algorithm?

The term “algorithm” can be defined simply as calculation. Within a framework of visual art, algorithmic images can be defined as images produced by mathematical instructions. With the advancement in computer technology and its availability to the masses, the use of digital images in art seems to be common practice in the twenty-first century. For example, many contemporary painters utilize digital technology as a tool to brainstorm, plan and “rehearse” before they face a canvas. Sculptors also use computer technologies to engineer and simulate a final product. Although these examples illustrate some uses of digital technologies in art, a distinction has to be made here for the use of algorithms in the context of this paper. My discussion will be focused on images whose final products are produced through algorithmic process.

Jeffrey Shaw and His Works

Jeffrey Shaw (1944-) has been known as a pioneer in the use of interactivity and virtuality in his art installations since the late 1960s, and his works have been exhibited worldwide.[1] Shaw is also one of founding co-directors of the Center of Interactive Cinema Research (iCinema) at the University of New South Wales, Sydney, Australia, which was established in 2003.[2] His art installations have been heavily involved with computer technologies. For example, *Place: Ruhr* (2000) represents his recurring theme of interactivity and embodied experience by the viewer with the use of digital technologies. In his article, *Framing the Digital Images: Jeffrey Shaw and the Embodied Aesthetics of New Media*, Mark B. N. Hansen describes the experience:

[1] http://www.jeffrey-shaw.net/html_main/frameset-biography.php3
[2] Ibid.

> You are standing on a rotating platform in the middle of a 360° panoramic screen. Directly in front of you is an underwater video camera with a joystick interface, a monitor, and a microphone. This camera is connected to a projector, which brings to life a 120° frame within the larger 360° panoramic surface. By manipulating the joystick, you slowly move this 120° frame clockwise and counterclockwise and then, setting your sites on something you see in the image space, you zoom into the virtual landscape projected in front of you, entering one of eleven image "cylinders" that present panoramas of different sites in the Ruhrgebiet, the industrial region in Germany that has recently undergone the shocks of postindustorialization.[3]

According to Hansen, Shaw's *Place: Ruhr* creates a feeling of continuity between the virtual image space and the observer, blurring the "difference between physical and virtual space."[4] This embodied experience created by the digital media points to the notion of illusion, which artists and spectators have been fascinated with since the Early Renaissance. During the Renaissance, the notion of "perspective" was employed and developed as a tool in order to produce "realistic" images, creating an illusionistic space.

This trend continued into the Italian Baroque period, and the illusionism became a necessity for visual representation. The Italian Baroque sculptor, Gianlorenzo Bernini (1598-1680) created an illusionary space that invites the viewer into a simulated experience as a witness to a spiritual event. Bernini's *St. Teresa in Ecstasy* (1645-52)

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[3] Mark B. N. Hansen. "Framing the Digital Image: Jeffrey Shaw and the Embodied Aesthetic of New Media." From *Calculating Images Representation by Algorithm in Science and Art*. Sven Spieker (ed.), Winter 2005, handout, 1.
[4] Ibid.

in the Cornaro Chapel in Rome illustrates how the sculptor achieved a complete illusion by placing his sculpture within the setting of a theater stage, involving architecture, ceiling fresco, and natural light.

Achieving an illusionistic representation of reality also attracted painters of the Baroque. Italian Baroque painter Giovanni Battista Gaulli (1639-1709) was an assistant of Bernini and painted the fresco ceiling of Il Gesú in Rome. Gaulli's nave fresco*, Triumph of the Name of Jesus* (1672-85), represents a characteristic *trompe-l'oeil* by creating the illusion of a three-dimensional image, which tricks the eye of the spectator as a "real" experience. Bernini was also involved in this project as an advisor for the fresco, and one can observe how Gaulli has combined the elements of paintings, sculpture and architecture in his work.[5] These examples from Baroque period demonstrate the use of illusion created by the use of linear perspectives.

It is very interesting to note that the digital virtual reality created through computer technology is a transmutation of the concept of perspective that was formulated by Leon Battista Alberti (1406-1472) in the Early Renaissance.[6] In his article, *Modern Surveillance Machines: Perspective, Radar, 3-D Computer Graphics, and Computer Vision*, Lev Manovich suggests the "logistics of perception" as a key foundation in creating *visual nominalism*. Manovich defines visual nominalism as "the use of vision to capture the identity of individual objects and spaces by recording

[5] H.W. Janson and Anthony F. Janson, *History of Art* (New York: Harry N. Abrams, Inc, 1990), 560.
[6] Lev Manovich. "Modern Surveillance Machines: Perspective, Radar, 3-D Computer Graphics, and Computer Vision. From *Calculating Images Representation by Algorithm in Science and Art*. Sven Spieker (ed.). Winter 2005, 298.

distances and shapes," and suggests, "the linear perspectives is a technology of visual nominalism par excellence."[7]

So, what are some differences between these two kinds of "virtual reality" in terms of the viewer experience? According to Hansen, Shaw's *Place: Ruhr* stimulates "indifferentiation" between the viewer's "subjective" embodied movement and the "objective" mechanical movement. It is programmed for the viewer to move within the "panoramic space," which controls the movement of the images in front of the viewer.[8] This physical interactivity of the piece is an important distinction that one can make between Shaw's *Place: Ruhr* and Bernini's Cornaro Chapel. Although Bernini's Cornaro Chapel provokes a mental and emotional interactivity, there is no room for the viewer to move, change, nor control this presented reality. On the other hand, Shaw's *Place: Ruhr* provides the viewer the joystick to explore the virtual reality. It is also important to note that this freedom to explore is an illusion: Shaw's *Place: Ruhr* gives a false sense of freedom, an illusion of "control" for this virtual reality by the viewer.

Works of Sol LeWitt and Algorithmic Images

Another kind of embodied experience created through algorithmic images can be found in the work of the twentieth-century conceptual artist Sol LeWitt. The exhibition, *Sol LeWitt: A Retrospective* was organized and hosted by the San Francisco Museum of Modern Art in 2000. Floor to ceiling wall drawings were on display and filled an entire floor of the Museum, creating a space of embodied experience for the viewer. Like the digital algorithmic images that Shaw uses to facilitate interaction with the viewer, LeWitt's wall drawing pieces are produced based on sets of formulas written by the

[7] Ibid., 296.
[8] Hansen, 1.

artist. For example, the following is his geometric instructions for *Wall Drawing #366* completed in 1982:

> Black arcs using the height of the wall as a radius, and black arcs using the midpoints of the wall as a radius. The arcs are filled in solid and drawn in India ink.[9]

According to Weber, each wall drawing exists first of all as an idea, embodied by a set of instructions written by LeWitt, and each drawing is also documented by a small diagram, which gives a sense of how the instructions might be followed.[10] Another interesting aspect of LeWitt's wall drawings is the notion of blurred authorship:

> The actual on-site execution of LeWitt's wall drawings can be done by Lewitt himself (although this is now rarely the case), by a team of his trained assistants who traveled around the world on commission, or by teams of artists or others hired locally or recruited as volunteers to execute drawings for a particular exhibition. LeWitt has conceived several series of wall drawings specifically to be drawn by nonartists, and has been known to encourage owners to execute the simpler ones themselves.[11]

This points to an interesting parallel with Shaw's *Place: Ruhr* and reflects one of the consequences of LeWitt's use of algorithmic images. Weber explains that LeWitt has compared his algorithmic instructions to a musical score and as a result, his wall

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[9] John S. Weber. "Sol LeWitt: The Idea, The Wall Drawing, and Public Space." *Sol LeWitt: A Retrospective.* (San Francisco: The San Francisco Museum of Modern Art, 2000), 89.
[10] Ibid.
[11] Ibid., 90.

drawings, just like digital images, can exist simultaneously in different locations.[12] Although LeWitt's wall drawings can be sold and resold and painted and re-painted, an "image" does not exist until it is actualized through an "interface," a condition that applies to digital images as well. LeWitt's wall drawings symbolize the artist's approach to art production, which is driven by the notion of "idea." This approach has challenged the normal structure of private ownership of art object. In an interview with Andrea Miller-Keller, LeWitt explains as follows:

> Andrea Miller-Keller: *When you sell a wall drawing to a private collector or museum, what is it that you think you are selling? The idea? The plan?*
>
> So LeWitt: *Both are inseparable, but the plan can be used without it being bought. The idea may be comprehended by anyone seeing the plan.*
>
> AMK: *Are you selling the right to use an idea that is still yours (because authorship cannot be transferred)?*
>
> SL: *Ideas cannot be owned. They belong to whomever understands them. The piece takes a physical form and becomes an object. This object maybe possessed. "A work of art," says Gertrude Stein, "is either priceless or worthless."*[13]

This also leads us to another similarity between LeWitt's wall drawings and new digital media—availability of work to anyone who is interested in actualizing the algorithmic instruction.

> AMK: *You are very often traveling in order to share your work with anyone who is genuinely interested in it. You certainly have not reserved the*

[12] Ibid., 91.
[13] Ibid.

enjoyment of wall drawings for only wealthy collectors and museum. Your drawings have been done in many prestigious institutions but also in tiny towns and small universities across the United States, Canada, and Europe. To whom do you give permission to do your drawing?

SL: *Anyone who would follow the plan is eligible to try (in good faith, I would hope).*

AMK: *How would you feel if someone executed a wall drawing of yours without permission but with care to follow the instructions and in an appropriate site?*

SL: *OK.*

AMK: *Would you consider this an "authentic" LeWitt wall drawing?*

SL: *Yes. It would be authentic.*

AMK: *Would you consider such an unauthorized use of wall drawing instructions unethical?*

SL: *No. It would be a compliment.*[14]

This adds a new perspective of LeWitt's wall drawings in terms of its interactivity, which is also one of the important characteristics of new digital media art. For example, a London based company, Soda Creative Ltd., promotes new experiences through digital media through its Website, www.sodaplay.com. One of the features of their website is *sodaconstructor*, in which one can interact and create their models and moving characters. It is very accessible and open to anyone who is interested in the process. In addition, this interactivity makes the notion of private ownership and the issue of authorship blur and become more complex.

[14] Ibid., 92.

There is a similarity between LeWitt's wall drawings and digital images in terms of its physicality as well. Weber describes LeWitt's wall drawings as "ideas made manifest in a form that is material and visible in any given execution, yet potentially ephemeral."[15] These wall drawings exist only as ideas before their execution. Therefore, each drawing can be characterized as "a potential visual experience waiting to take place," one might think of a LeWitt wall drawing as "a materialized instance of an initially immaterial concept."[16] This is also one of the characteristics of digital images: digital images are not stored as "images," but rather "numbers" based on an algorithm, waiting to be actualized. Although LeWitt's wall drawings are executed "manually" by humans, he has eliminated the notion of the "artist's hand" as a defining component of "drawings" because the process of actualization is dictated by LeWitt's algorithmic instructions.[17] As a result, it questions the concept of "original," and its multiplicitic nature makes it even closer to characteristics of digital images.

New Digital Media and Its Place in Contemporary Art

I have discussed the similarities between LeWitt's wall drawings and new digital media. Now, what are the differences? What are the contributions made by the introduction of new digital media to contemporary art discourse? How does it transform the definition of art? Is new digital media a continuation of "traditional" mediums or a radical shift away from them? What is the driving force of new digital art?

One of the differences would stem from one of their similarities—interactivities. LeWitt's wall drawings can be classified as "interactive" in terms of its process. However, unlike the interactivity of new digital media, such as Shaw's *Place: Ruhr*,

[15] Ibid., 95.
[16] Ibid.
[17] Ibid., 96.

LeWitt's wall drawings do not require the physical interaction of the viewer, and there is no room for these wall drawings nor his instructions to be interactive. New digital media is capable of being "ever-changing" and malleable within the parameters of algorithms. In addition, digital images are always subject to "updating" and challenge the concept of the "finished product" as a commodity in the art world.

Another important difference would be the complexity of algorithms and the importance of "interface" used in new digital media. To represent a digital image, one has to have algorithms, and they are both technical and social. In his article, *Surveillance and Capture: Two Models of Privacy, Philip E. Agre* discusses the basic concept of algorithms. Agre explains, "This [digital] representation will be expressed within some mathematically definable representation scheme."[18] Although Agre's discussion focuses on the topic of surveillance, it also provides a foundation for the development of algorithms and new digital media in relation to data collection:

> …this research has focused on the element of data-collection; its question is what becomes of the data once it is collected. Yet, tracking schemes have another side: the practical arrangements through which the data is collected in the first place, including the arrangements that make human activities and physical processes trackable. As human activities become intertwined with the mechanisms of computerized tracking, the notion of human interaction with a "computer"—understood as a discrete, physically located entity—begins to lose its force; in its place we encounter activity-

[18] Philip E. Agre, "Surveillance and Capture: Two Model of Privacy." *The New Media Reader*. (Cambridge, Massachusetts: The MIT Press, 1993), 742.

> systems that are thoroughly integrated with distributed computational processes.[19]

Although new digital media is often associated solely with technology, it has also become a study of cultural and social phenomena and an investigation of human activities. The advancement of computer technology enables us to track, categorize, store and analyze human activities; as a result, one can utilize this collected data to develop more complex algorithms.

Under the sociotechnical condition of the twenty-first century, the issue of "interface" becomes a crucial element in the new digital media and a distinct characteristic that separates it from the "traditional" art mediums. In his article, *The World as Interface: Toward the Construction of Context-Controlled Event-Worlds*, Peter Weibel suggests the new media art "moves art from an object-centered stage to a context- and observer-oriented one," reflecting the shift from modernity to postmodernity.[20] Weibel observes this condition as follows:

> The description of the world in terms of interface and the acknowledgement of the non-objective, observer-objective nature of objects are corollaries of the endophysical theorem. The world interpreted as observer-relative and as interface is the doctrine of electronics interpreted as endophysics. The world changes as our interfaces do. The boundaries of the world are the boundaries of our interface. We do not interact with the world—only with the interface to the world. Electronic art

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[19] Agre, 743.
[20] Peter Weibel, "The World as Interface: Toward the Construction of Context-Controlled Event-Worlds" From *Calculating Images Representation by Algorithm in Science and Art*. Sven Spieker (ed.). Winter 2005, 363.

> should help us to better understand the nature of electronic culture and the foundation of our electronic world.[21]

Weibel defines endophysics as "a science that explores what a system looks like when the observer becomes part of this system."[22] This becomes extremely important when human activities are recorded, categorized and interpreted in order to transform them into another form and medium through algorithms. It not only becomes a part of the existing system of representation, but also places a great responsibility on the observer and programmer. Weibel points out that this "implies that the possibility of experiencing the relativity of the observer is dependent on an interface, and the world can be described as an interface from the perspective of an explicit internal observer."[23]

The term "experience" plays a key role in the new media age in terms of interface development and interactivity as well. In his book, *On Experience, Nature and Freedom: Representations Selections*, American philosopher John Dewey provides his critical analysis on the term "experience" and provides us a framework:

> There are, therefore, common patterns in various experiences, no matter how unlike they are to one another in the details of their subject matter. There are conditions to be met without which an experience cannot come to be. The outline of the common pattern is set by the fact that every experience is the result of interaction between a live creature and some aspect of the world in which he lives.[24]

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[21] Ibid.
[22] Ibid.
[23] Ibid.
[24] John Dewey, *On Experience, Nature and Freedom: Representative Selections*. (Indianapolis: Bobbs-Merrill Co, 1960), 160.

Dewey argues that an experience is constructed with patterns and structures because it is based on relationship and interaction between a subject and some aspect of the world.[25] The author explains that an action does not necessary constitute an experience unless the action and its consequence are joined in perception.[26] It is this relationship that constructs meaning, and to comprehend it is the goal of all intelligence.[27] Dewey argues that the range and content of the relations determine the significant content of an experience: in other words, an experience is "limited by all the causes which interfere with perception of the relations between undergoing and doing."[28]

Experience in Postmodern Conditions

Weibel compares and contrasts the main characteristics between modernity and postmodernity: the shift from the "closed, decision defined and complete system" associated with modernity to the "open, non-defined, and incomplete" system of postmodernity, from "the world of necessity to a world of observer-driven variables", and from "mono-perspectives to multiple perspective, from hegemony to pluralism."[29] Therefore, understanding the mechanics of "experience" has become very important under postmodern conditions.

In addition, the term postmodernism is associated with an art movement under advanced capitalist conditions[30]. It originated in the 1960s among artists and critics in

[25] Ibid., 160-1.
[26] Ibid., 161.
[27] Ibid.
[28] Ibid.
[29] Weibel, 363.
[30] Madan Sarup, *An Introductory Guide to Post-Structuralism and Postmodernism*. (Athens, Georgia: The University of Georgia Press, 1993), 131.

New York, and became a concern for European theorists in the 1970s.[31] For example, *The Postmodern Condition: A Report on Knowledge* by Jean-Francois Lyotard was published in 1979, questioning the notion of "the grand narratives," reflecting the idea that "progressive liberation of humanity through science, and the idea that philosophy can restore unity to learning and develop universally valid knowledge for humanity."[32] Postmodern theory questions and critiques the notion of universal knowledge and foundationalism.[33] Lyotard also questions the source of knowledge itself—"who decides what knowledge is? Who knows what needs to be decided?"[34] These are important questions one should ask within the framework of new digital media. Who decides what data to be collected and stored? Who knows what data to be analyzed and how it will be interpreted? How is data transmuted into algorithms to create images?

In order to answer these questions, one has to realize the postmodern conditions. How has postmodern theory affected the arts? One of the consequences was "the deletion of the boundary between art and everyday life"[35] As a result, it has also established the foundation for more "comprehensive modes" of art production—interdisciplinary approaches to art making. The notion of interdisciplinarity has become fundamental to the discourse of postmodern art production in relation to social, political, economical and cultural conditions. An interdisciplinary approach has becomes a crucial element in understanding new digital media as well. New digital media not only reflects this trend, but also promotes it in both form and content. It is apparent that as more technologies advance, deeper understanding of human beings is

[31] Ibid.
[32] Ibid., 132.
[33] Ibid.
[34] Ibid., 134.
[35] Ibid., 132.

required in relation to physiology, and psychology and sociology. What is a human being and how does *it* function? This becomes the question as we move onto the next technological innovation in which the interface will meld the notions of human and machine in the artificial intelligence paradigm.

Conclusion

Is new digital media a continuation of “traditional” medium or a break away from it? What kinds of frameworks are necessary to evaluate it? How can we change the current condition of disconnection between critical and historical discourses within new media art? Are we already in the “post-” media age? Is the “post” in post-media age the same “post” as in the postmodernism? Those three “simple” questions I asked in the introduction transformed into more complex and multidimensional ones. Moreover, these questions are going to be continuously updated and changed as technology improves in ways affecting our everyday human condition.

Understanding new media art as a contemporary art medium remains a study of human beings rather than machines. The study of new media contributes to contemporary art discourse just as the studies of traditional mediums have. What is it that I want to communicate through digital images? How does the use of new media change my thought process and art production? For what reasons do I want to use digital images over oil painting? New media art provides artists new options to communicate and express their intentions, and its possibilities seem endless with the future advancement of technology. Further research needs to be done in terms of politics of new digital media in order to reveal structures and mechanics of industry, funding, professionalization of new media artists within postmodern art discourse.

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http://www.jeffrey-shaw.net/html_main/frameset-biography.php3