<META>METHODS

Algorithmic Art Using the Metropolitan Museum of Art's Digital Archive

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Impetus: Algorithmic Art as a Medium

Set Theory is a branch of mathematics that studies sets or the collection of objects. This project, *<META>Methods,* is concerned with making sense of Big Data[1] by applying set theory to the cataloging and the creating of collections of information. When the world is viewed as a massive network, everything can be viewed as a data point, but also, when that data is collected, it becomes and can be viewed as part of a set. And what is inherent in any data point is the *metadata* that defines it and links it to subsets and supersets. *<META>Methods* is a research endeavor in algorithmic art using mathematical modeling of data in the programming language C++ in OpenFrameworks (OF). Using the Metropolitan Museum of Art's (the Met's) digital archive as a data set, the project also explores the idea of the museum as a medium and the potential for museum objects, collected together as a set, to be seen as a standalone body of work[2].

With a background in astrophysics, mathematics and finance, I draw constant inspiration from the concept of data and data processing. For my entire career I have, in one way or another, looked at Big Data, from historical interest rate fluctuations and their correlation to currency prices to radio frequency signals in galaxy clusters. I am fascinated by Big Data and the stories that can emerge from the process of analysis. By researching this field in the context of *creative coding*, these mathematical methods take on a new dimension. Statistical analysis can have new meanings and interpretations – ones that are intensely interpersonal and emotional.

Concept: Integrating Data Visualization and Conceptual Art

Through the exploration of algorithmic search, *<META>Methods* attempts to extract beauty and understanding from the superset of information. It looks, not at the individual (micro), but at the whole (macro) and seeks to find relationships, whether contextual, graphical or mathematical, by examining metadata. This project reimagines the idea of curating in the digital format and asks the questions: *can a collection of digital assets become an asset, or work of art, in and of itself? Is metadata the "paint" that we can mix together, through algorithmic search, to create new "colors" in our digital "canvas"? By applying mathematical theory to the analysis of a digital collection (set) of objects, what new relationships can be uncovered and what new art can evolve?*

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[1] An evolving term meaning any immense amount of unstructured, partially structured, or structured data that has the possibility of being mined for information.
[2] While ultimately these models could be applied to any data set, I chose the Met's digital assets because I was interning in the Met's Media Lab at the time and wanted to use their database as a test-bed for this research.

<META>Methods sits at the intersection of art and mathematics. Using two algorithms, a network topological structure and a Kohonen Self Organizing Feature Maps (SOM) model (see figures 1 and 2), I attempt to discover connections between the objects in the Met's digital collection, which is a data set consisting of about half a million art-objects spanning 5,000 years of human history. In order to accomplish this, I wrote a piece of software (add-on) in OF[3] called *ofxMetAPI*[4] that uses the Met's API[5] to pull data into the OF tool-kit. While the core output of this project is a body of work that is an exploration of my own personal artistic expression, the underlying software I wrote has, for the first time, given the global community of creative coders access to this data set (it is publically available and on the OF add-ons webpage[6]). This is, in and of itself, a significant contribution both for the development of OF and for the community of programmers who use these add-ons to create their work.

Figures 1 and 2: *(Left)* "*A schematic representation of a self-organized map. The color of the map encodes the organization of groups of objects with similar properties. The main feature of the SOM is that produces a nonlinear mapping from an m-dimensional space of attributes to a two-dimensional lattice of neurons.*"[7] *(Right)* "*Commonly used particle topologies: (a) Star topology used in gbest, (b) Ring topology used in lbest, (c) Von Neumann topology and (d) Four clusters topology*" *(Bastos-Filho).*
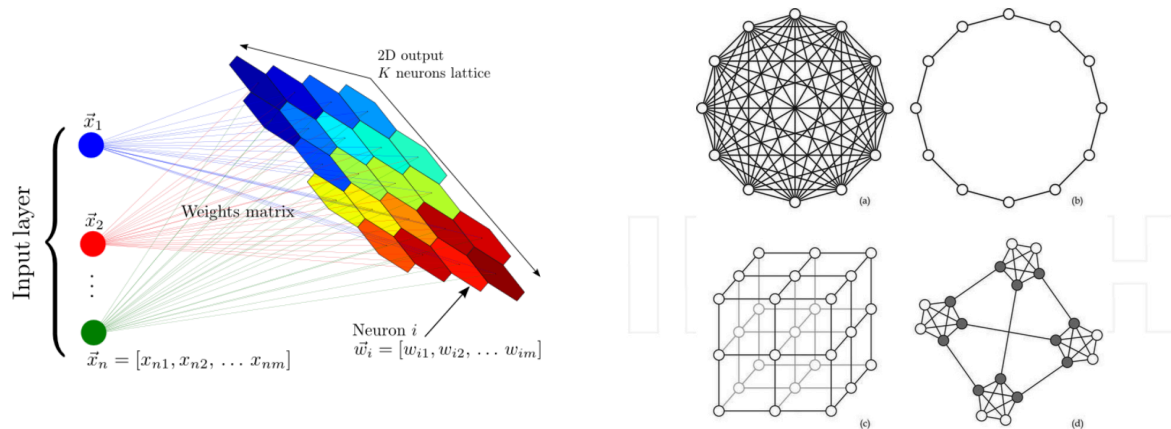
Three data visualization pieces ultimately emerged from this research project. The first piece, entitled *Translating Topologies*, was created using the star topology [n*(n-1)/2] on a set of 27 search terms. Using this set, and the corresponding metadata of the set, the topology was mapped by (1) sizing the nodes by the number of search results for each term and (2) weighting the connecting lines by the number of results corresponding to a search of any two nodes (see Figure 3). The second piece, entitled *An Ode to Sol*, was created using the SOM algorithm by using one search term, i.e. "woman," and

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[3] OF, or openFrameworks, is an open source toolkit for C++ programmers. See openframeworks.cc/.
[4] This code is available at https://github.com/reginaflores/ofxMetAPI.
[5] Application Program Interface.
[6] http://www.ofxaddons.com/categories.
[7] Carrasco Kind, Matias, "SOMz: Self Organizing Maps and Random Atlas," *MLZ: Machine Learning for Photo-Z,* Accessed May, 2015, http://lcdm.astro.illinois.edu/static/code/mlz/MLZ-1.0/doc/html/somz.html.

isolating the RGB channels for every image associated with the result. The resulting SOM was then mapped into 2D space such that each point in the space corresponds to an image. Then each point was connected by a distance function (see Figure 4).

Figures 3 and 4: *(Left) Translating Topologies. (Right) An Ode to Sol*

Figures 5 and 6: *(Left) Software user interface for creating 'Translating Topologies'. (Right) Manipulating order and randomizing the nodes to create 'Why Do I Hate Myself?'.*

The final data visualization piece, the capstone of the *<META>Methods* research project, is entitled *Why Do I Hate Myself?* (see Figure 7). It is an interactive, mixed-media piece combining performance, video installation, and algorithmic art. It uses the data and algorithms from the prior two pieces but, by combining data with performance, adds a level of artistic interpretation. This piece is intended to inspire an emotional experience for users because the video is an abstract account of my personal journey with body dysmorphia. The data visualization accompanying the piece was created using a unique set of search words that deal with concepts related to the female form. This piece was inspired by what I learned from my investigations into the metadata of the Met's database. Searching

with the word "nude," for example, reveals hundreds of works of art, through time and across cultures, of the voluptuous female form. I was inspired to use this idea to try to reimagine data visualization by using my own body and voice as an overlay to the data that defines me.

Other artists have reinterpreted data visualization. *Messa di Vocce*[8] by Zach Leiberman and Golan Levin, is perhaps one of the most well-known piece that combines performance and data visualization. *Why Do I Hate Myself?* is my own audio-visual narrative and my personal contribution to the field of data visualization. By combining data, algorithmic art, video manipulation, performance, and the interaction design toolkit within OF, I created an interpretation of a representation of data visualization. My key measure of success with this piece is whether it can elicit an emotional response from the viewer. How can we reduce Big Data "back to a human scale"[9]? We can do this by creating "alternative metaphors" and by telling our stories using "alternative narratives." We are all a dataset that is connected through a web of metadata, but what makes us unique are the stories of our lives and our own journeys through the subsets and supersets of information. Algorithms and mathematics are beautiful and can help us learn about our world, but ultimately it is our tragic and vulnerable humanness that can breathe life into the data that defines us.

Figure 7: *Excerpt from 'Why Do I Hate Myself?'*

Use Scenario: The White Box

Conceptually, this project was always intended to be an exploration of the creation of a piece of art from my particular point of view. Thus I envision this work as an exhibition and would ultimately see this project experienced in a gallery space. Nevertheless, *<META>Methods* is not to be simply *viewed.* It is to be *experienced,* to be literally interacted with.

Who:

The prototypical participant in *<META>Methods* is a contemporary art enthusiast, an art curator, a gallery owner, an art student or professor, a modern art critic or journalist, or an art collector. This person is well-versed in art history and, in particular, new-media art. He or she understands the often (and unseen) computational intensive "backend" that is involved in algorithmic art-work and new-media installations. This person is very much in the art "scene" and travels to international art festivals such as Art Basel[10], the Venice Biennale[11], or Frieze[12]. This person is highly intellectual and has an interest in conceptual art. While not solely intended for women, the piece may have a certain resonance with female users and certainly with anyone who has suffered from body dysmorphia.

Where:

The ideal venues for this exhibition would be a new-media art gallery such as Bitforms[13] Gallery or a space in a modern art museum like MoMA[14], Cooper Hewit[15], or the Centre Pompidou[16] in a show for emerging digital artists. This work could also be a part of an art festival that would be curated with other digital artists using code as a medium or whose work deals with the "digital self."

Experience:

The Wolfgang Tillmans[17] Architecture exhibit, *Book for Architects,* at the Metropolitan Museum of Art was a key inspiration for the design of the exhibit experience. *<META>Methods* is meant to induce an emotional reaction from the user. Thus, just as Tillmans' exhibit, *<META>Methods* should be set-up such that there are two distinct spaces that speak to the distinct static and dynamic "states" of the pieces. When the visitor approaches the exhibit space, she is immersed in a white room. On the left and

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[10] See https://www.artbasel.com/.
[11] See http://www.labiennale.org/en/Home.html.
[12] See http://friezenewyork.com/.
[13] See http://www.bitforms.com/.
[14] See http://www.moma.org/.
[15] See http://www.cooperhewitt.org/.
[16] See https://www.centrepompidou.fr/en.
[17] See http://www.metmuseum.org/exhibitions/listings/2015/wolfgang-tillmans.

right walls are the large black and white, static prints, *Translating Topologies* and *An Ode to Sol*. Opposite her, at the back of the room, she sees an entrance to another room that is totally black. The juxtaposition between the white and black rooms creates a visual journey for the viewer. She is drawn into the darkness like entering a cave or a tunnel. Upon entering the black room, she is disoriented as her eyes adjust to the absence of light, but it is in the black room that she encounters the piece *Why Do I Hate Myself?*.

The ultimate experience of *<META> Methods* occurs in the black room. *Why Do I Hate Myself?* is projected across the entire back wall of the room from a projector on the ceiling. In the middle of the room is a stand with a single iPad with which the viewer/participant/user can manipulate the data mesh and interact with the piece in two ways. First, as the user moves her finger up, down, left or right, four different video clips are shown. These four videos represent the emotions of anger, sadness, isolation, and acceptance. Secondly, the user can click on the nodes of the data mesh. The nodes have words written on them (pain, anger, woman, feminine, etc.), some of which, when clicked, reveal a video clip of a woman screaming in severe pain. The user begins to recognize that the data is inherently connected to the video and that she is controlling the sequence. Being immersed in a visual and audio journey through intense emotions controlled with the User Interface (UI), the user begins to feel deeply connected to herself and her own identity.

Evaluation: Metadata as Medium

In many ways, *<META>Methods* served to further my own exploration as a creative coder. The project was extremely successful in that. Through the months of research I completed my first OF add-on and spent time learning aspects of C++ that will only serve to further my development as an artist and programmer. While the first two pieces of the series, *Translating Topologies* and *An Ode to Sol*, may not be the most innovative and informational visualizations, they serve as proof-of-concepts for further research into data visualization and interpreting data-base metadata. The final piece, *Why Do I Hate Myself?,* is a personal story and thus challenging to evaluate conceptually. Yet the attempt to create alternative metaphors and modalities of interpretation should be recognized. The execution of the user interface could be further refined. The next area of research should be a continuation of the exploration of the user interaction with this piece.

Ultimately, I think that artists can create new works of art by using data-sets, and the metadata that defines the sets, as a medium. However, the metaphors of interpretation and the narrative that we

chose to explore are what differentiates a piece of art from a mathematical result. Further exploration into experiments in narratives and how to tell the stories of data in the most compelling way should be researched.

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