Functional Embrace

Intimacy and Isolation, Connectivity and Corporate-futurist Rhetoric

by

Eric Rieper

ABSTRACT

Functional Embrace is a reflection on technology's ability and intentions to facilitate intimate social exchanges. The exhibition features three collections of work that employ the interactions and surrounding language of contemporary Internet services and digital devices to produce both moving and conceptually critical experiences.

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For my Mother and Father,

to whom I owe my resolve.

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CHAPTER 1

INTRODUCTION - FUNCTIONAL EMBRACE

Functional Embrace exists as a series of experiences and conceptual alternatives to current commercial technology and devices. In working with digital media over the years, the more time I spend with it, and the more drastically the economy of Internet changes, I arrived at a point where I felt I had to address the very medium itself; more and more I've grown to feel that it is both impossible and in some ways irresponsible to try and get your viewers to simply "ignore" the technology producing a piece of digital art— something that had long been a core goal of my work.

Initially, *Functional Embrace* was born of two separate ideas: the means in which technology renders facsimiles of "real life" objects and experiences by digital methods, and, the life changing, emotive, anonymous experiences I had with early Internet that made me believe in the power of digital tools to truly be a medium that moved people— beyond the spectacle of sheer technical achievement.

In exploring the idea of facsimile as created by technology I sat with a few basic examples: popular photo sharing service *Instagram* produces a facsimile of a tangible photograph, which is in and of itself a facsimile of real life. *Facebook* produces a facsimile of social interactions, personal relationships, and identity (displayed both through visual representation of physical presence and textual descriptors.) Video games exist almost purely as a facsimile of an environment, a sport, or some other experience

for consumption as entertainment, and in some cases as an alternative to participating in the real-world counterpart of what they are depicting.

After working with this idea for a while it became apparent to me that the facsimiles I was most interested in exploring were those of social exchange and engagement. This, coupled with thoughts about the power of my *own* exchanges on early Internet, lead me to arrive at the concepts of *Functional Embrace*, each explored in different ways, across multiple collections of work.

CHAPTER 1

INTRODUCTION: COLLECTION OVERVIEW

The following brief overview was presented on the exhibition statement available to viewers at the gallery.

> *Wake Up With the World* is a collaborative experience. An iOS app used as an alarm clock, when you wake your GPS coordinates are translated into musical notes and joined with those of every other person waking up at the same moment as you. All these notes are combined and the song you wake to is composed of the presence of everyone else doing the same.
>
> Each participant becomes a unique instrument in the composition, taking one of four roles: lead, bass, chords, or percussion. As more people join the length of the composition increases, as does the tempo of the music and the root note that the song is based off of.
>
> The *Functional Embrace* installation of *Wake Up With the World* chronicles and displays the activity of participants across the duration of the exhibition, condensing one week into one ever expanding composition.
>
> The *Embrace Objects* (12”x12”x12”, Acrylic, Spandex, Custom electronics) reveal their relationship with the participant as they choose to engage with and approach the sculpture. *Embrace Object 1 (Arousal)* contorts and reaches out to meet with the viewer. *Embrace Object 2 (Fantasy)* displays its beauty from far away, glowing a vivid pink, but as the participant grows closer that desired quality extinguishes.
>
> *itconnects.us* directly connects anonymous participants— represented by the movements of their mouse cursors and expanding mesh connecting them, allowing for new forms of communication and exchange.
>
> *h-o-ld.me* connects participants with one partner and gives them the ability to reach out to one another. The act facilitates people consensually engaging in the same physical gesture— holding hands with one another via internet mechanisms.

This summary provided users with a functional outline of the systems in place. I elected to not include a complete description of the conceptual framework, firmly believing that the discovery of a concept brought about by a contemplative experience is substantially more powerful than being told what something means or how to feel about it.

It is my hope that through making the names of the pieces available, and the chosen rhetoric for their descriptions, that just enough of a lens to view the work through was given— in a way that was unobtrusive, that allowed viewers to both participate in the immersive experiences of the systems and appreciate their poetics, but also invite them to look beyond their primary experience and critically consider that immersion and all facets of each piece both individually and as a whole.

Ideally such a prompt should not be necessary, and perhaps it is the true failure of an artwork to be wholly unable to communicate any of the intents of the artist in the absence of a verbose description. I intended to minimize my theoretical lens and my presence as artist when presenting these works, and hope the largely unprompted consumption of them was still a very communicative experience for my participants.

CHAPTER 2

INFLUENCES

In various ways, the *Embrace Object* sculptures were perhaps most inspired by both the commercial product design of Apple Computer (Figure 2) and simultaneously the minimalist sculptures of Donald Judd. Despite being most drawn to conceptual art and works that very concretely "say something", make some kind of assertion, or invite its viewer to consider a particular set of ideas, I've always found suprematist painting and minimalist sculpture interesting for a different reason: their pure emotive capabilities. I think, in many ways, this is also a big part of the thought that goes into the design of modern day personal electronic devices.

Donald Judd's sculptures are often "simple" objects which invite a personal, private, self-reflective engagement (Figure 1). In their minimalism every aspect becomes that much more pronounced and impactful. By containing as little visual stimulus as possible the viewer becomes hyper-sensitive to the object's qualities, and in a way, finds themselves more vulnerable to them. This is a very powerful relationship— one that I think manufacturers of consumer electronics hope to inspire with their objects and the rhetoric they use to promote them— a kind of personal relationship with a device itself. A tool that you have feelings about.

Fig. 1 Donald Judd *Untitled (1969)* and *Untitled (1968)*

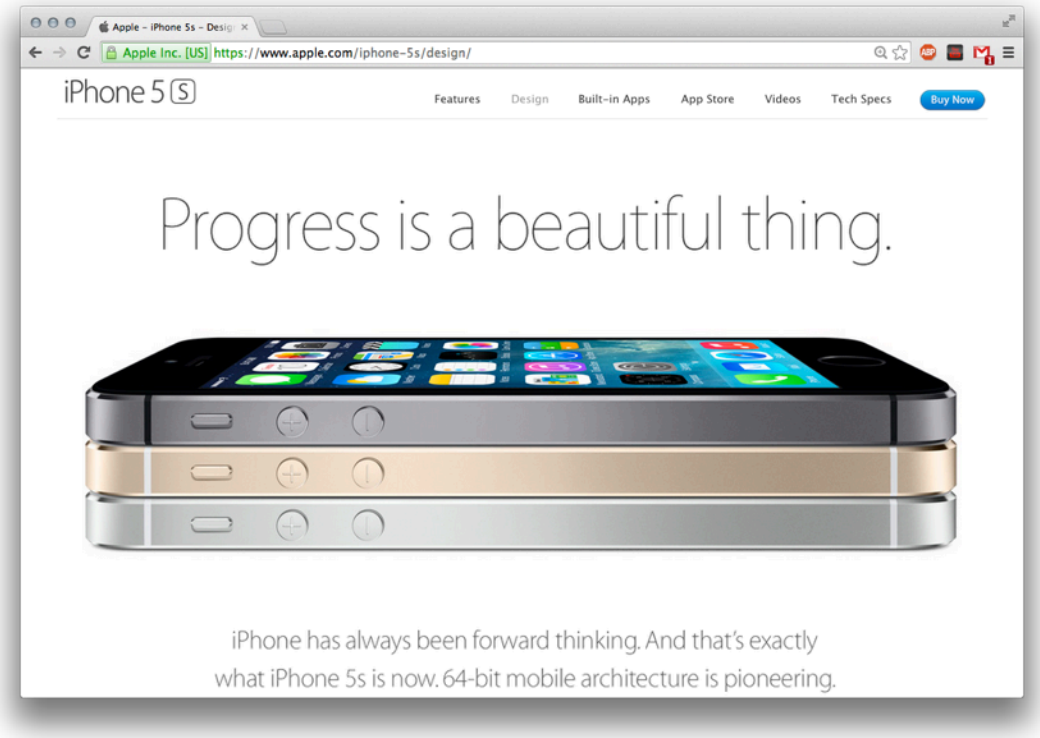

Fig. 2 Apple Computer iPhone 5s website

These sculptures were also, in a way, inspired by *Snoezelen* designed objects and rooms. Snoezelen, an eponym for what is more broadly referred to as "controlled multisensory environments," are spaces (and devices) intended to soothe, emote, and stimulate, through their aesthetic properties, that are primarily used as therapeutic tools for various developmental and disorders issues of mental health (Staal et al. 2005). The ability for an object or environment to be so evocative as to have therapeutic properties deeply interests me. To craft a mechanism with the sole intent of healing or quelling an emotional need or mental distress was, to me, beautiful in many conflicting ways.

The creation of *Wake Up With the World*, *itconnects.us*, and *h-o-ld.me*, were each very inward, reflective pursuits. To try and name tangible influences for any of them would be difficult as they were personal explorations of ideas inspired by my own feelings and own observations of the new corporate Internet, its language and its promises, and my feelings of isolation despite (or perhaps because of) their services and products. These pieces exist, in a way, as the outcome of my own attempt to craft therapeutic experiences that are, at the same time, highly critical of their own existence.

CHAPTER 3

ISSUES OF CONTENT

Being born in New York, then having moved to multiple different states in my childhood, when asked the question "Where are you from?" or trying to define a location I most identify as "home" I often find the most appropriate answer to be "The Internet." Being lucky enough to have access to a computer at a very young age, and figuring out how to dial into BBS and local Internet Service Providers, I found myself with access to something incredibly powerful, vast, and touching. The Internet of my youth was one built upon personal agency; networks were owned and operated by their very users, there was a substantial lack of both government and commercial oversight, it was the norm to both maintain anonymity and simultaneously socialize with those anonymous strangers in a virtual space. It granted me a kind of access and social freedom that was lacking in the small cities I wound up living in, if not a kind that simply cannot be reproduced anywhere *but* in that virtual space.

There is a sort of vulnerable wonderment that comes with interacting with an anonymous stranger. Often consisting of only text BBS posts, Internet Relay Chatrooms, and private instant messages, there was a raw intimacy to these exchanges. There was also a purity to them; an interaction devoid of any physical representation via "Profile Pictures" or "About Me" sections is left unperverted, leaving only the exchange itself. Because use of these systems was entirely participatory (in that one elected to be present

on them) there was a sense of consensual agreement that came with using them; you *chose* to directly communicate with someone and they *chose* to directly communicate with you. Using these systems in the mid 1990s through early 2000s felt actively empowering— because of their user-operated nature, freedom of information, new avenues of political dissent and action such as Electronic Disturbance Theatre's *FloodNet* (a collaborative Denial of Service tool used to create virtual "sit ins" first deployed April 10th of 1998 in solidarity with the Zapatistas in Mexico (Museum of Arte Útil.), but also because of their new forms of art that combined all these elements and existed entirely outside the institutions of a conventional, codified art market.

The World Wide Web we have today bears little to nothing in common with the Internet of my childhood. What was once a diverse and prismatic space has now largely been corralled into a small handful of corporate services: Facebook, Youtube, Tumblr, Twitter. Internet now, seen as a hugely viable income stream to corporate players, has been slowly rendered a near uni-directional mechanism— a means for the assertion of content foisted by those companies, and for the end user, a means of consumption— all the while surrounded by the same language that hopes to evoke the utopian ideals of early Internet: "connected," "social," "progressive," "personal," "democratic."

It was my intent to produce experiences and objects that both evoke the vulnerable, emotive qualities of the Internet that so shaped who I am today, but to also do so in a way that, either through tonality or surrounding rhetoric, can reveal themselves as critiques of current commercial tech paradigms.

CHAPTER 4

AESTHETIC ISSUES - WAKE UP WITH THE WORLD

The connected globe, a favorite iconography of tech companies, is often presented to show the reach and potency of their service or product. The *Facebook* profile for Mark Zuckerberg has for months, as of this writing, displayed a world map with individual nodes connected to one another— those connections spanning thousands of miles.

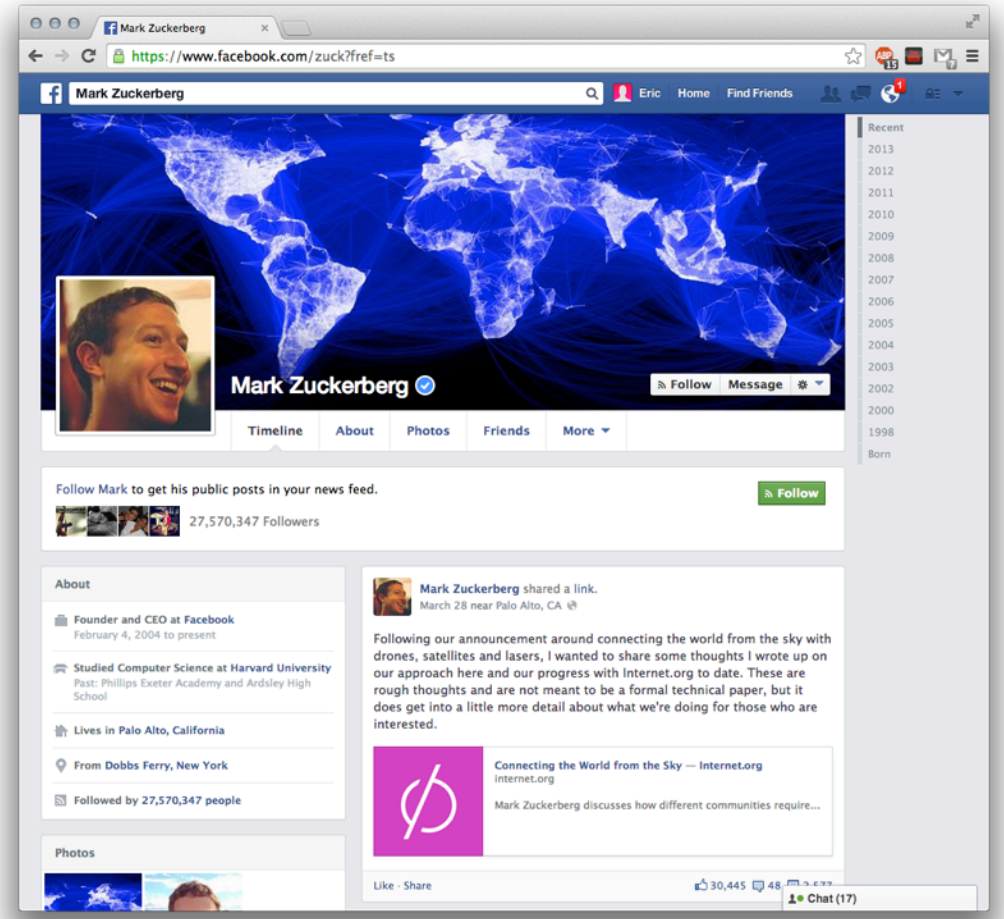

Fig. 3. Mark Zuckerberg *Facebook* profile

This is a powerful image. It's also a ubiquitous image now, but I think the rhetoric of those connections, when framed either entirely out of the context of technology, or framed within the age of the ungoverned, personal, early Internet, is a deeply poetic symbol of exchange and engagement. Now however, those same connections can be seen to symbolize the plotting of revenue streams, a map of conquest not unlike one charting territories bested in a war, or the spread of a viral epidemic.

Wake Up With the World plots its participants on a simple 3D globe with connections drawn between one another. On a field of soft dark gray they sit on a rotating sphere— individuals represented as dots, colored with the bright unnatural pink used throughout the works in the exhibition, with white lines directly connecting one person to the next (Figure 4). Small plain text reads "YOU ARE WAKING UP WITH" followed by the number of concurrent participants. When waking alone there is a certain sadness to being told "YOU ARE WAKING UP ALONE." and seeing your place alone on Earth (Figure 4). This verbiage, and that of the hyperbolic "Wake Up With the World" itself, is important to me because it mirrors a kind of frenzied dependency on connectivity that I think many commercial social networking websites hope to inspire. You are not, ever, waking up "alone." I wake in Brooklyn, New York surrounded by thousands of individuals all of whom I could engage in different relationships and exchanges with. I wake up "with the world" every day. Despite this, products and services can often be seen telling us that we are lonely, that we need to add more friends, add more content, establish more connections— all to serve the interests of the services and their

advertising partners, in a way that leaves the user in a constant state of striving for some sort of unattainable goal that will calm their feelings of isolation and lack of connectivity.

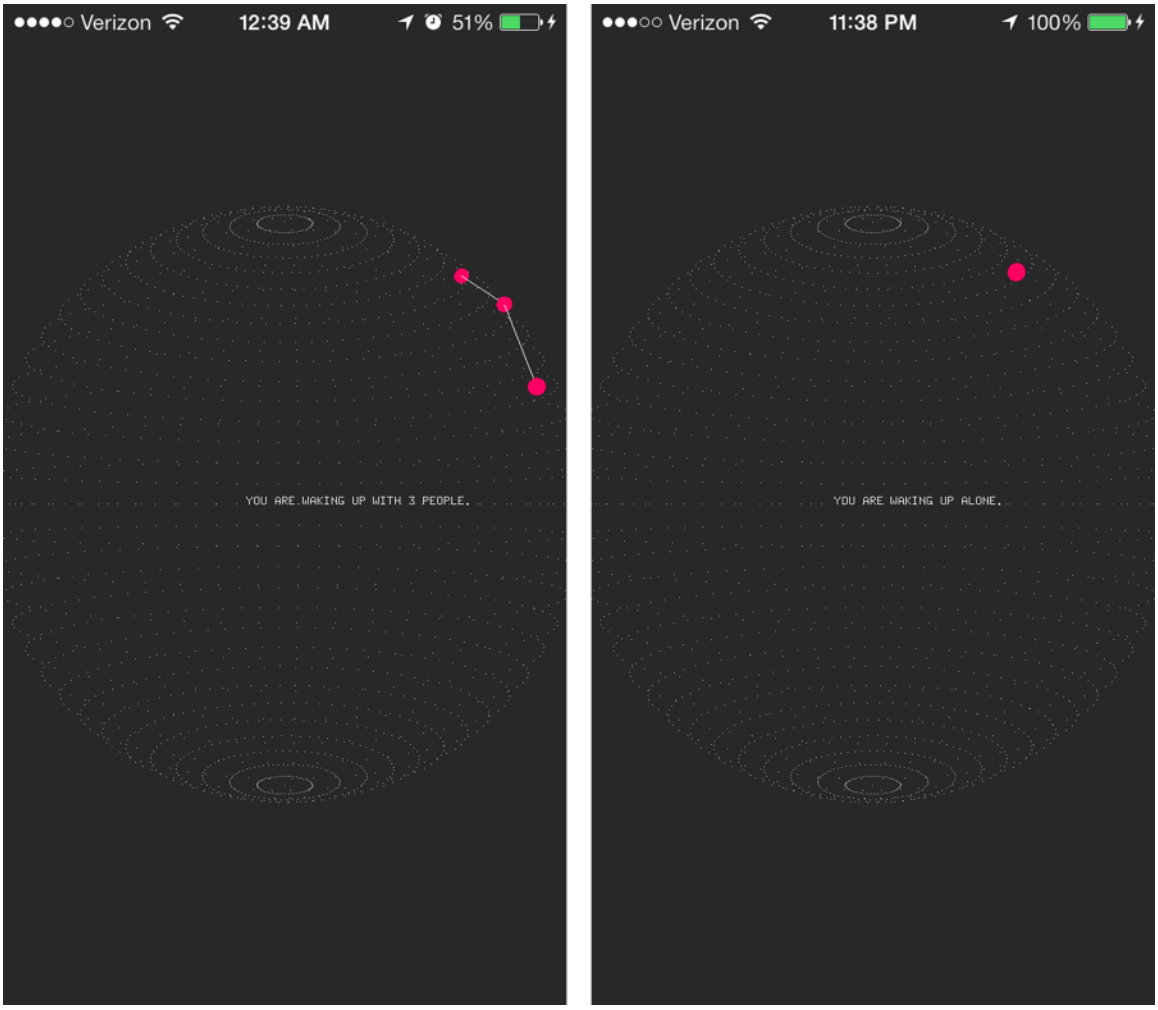

Fig. 4. Waking with three participants, waking alone

The music composition of *Wake Up With the World* evolved over the course of a year's work, but similarly hoped to present both sides of the *Functional Embrace* concept. The music has a deeply resonating beauty to it that can be moving, but also can be seen as remarkably sad. The song is locked to a major scale (as opposed to minor which tends to evoke a darker mood) but through the crafting of its instrumentation and processing is at times deeply haunting.

The corresponding gallery component of *Wake Up With the World* was shown as a projection on solid black curtain (Figure 5). With the projector ceiling mounted out of the way, I provided enough physical space for people to stand in front of and observe the rotating globe while listening to its ever changing song (something that proved to be very mesmerizing) and a social space that allowed for real world exchange, embrace, and communication (Figure 7). A long strip of vellum paper was placed on the window so, at night, the center panel of the curtain would be removed and the image would now be projected onto the diffused light of the evening cityscape— visually compositing the piece of art back onto the world which was producing it and making the work visible from the street below (Figure 6). This diffusion created by the vellum also mimicked UI elements present in Apple Computer's iOS 7 (Figure 8).

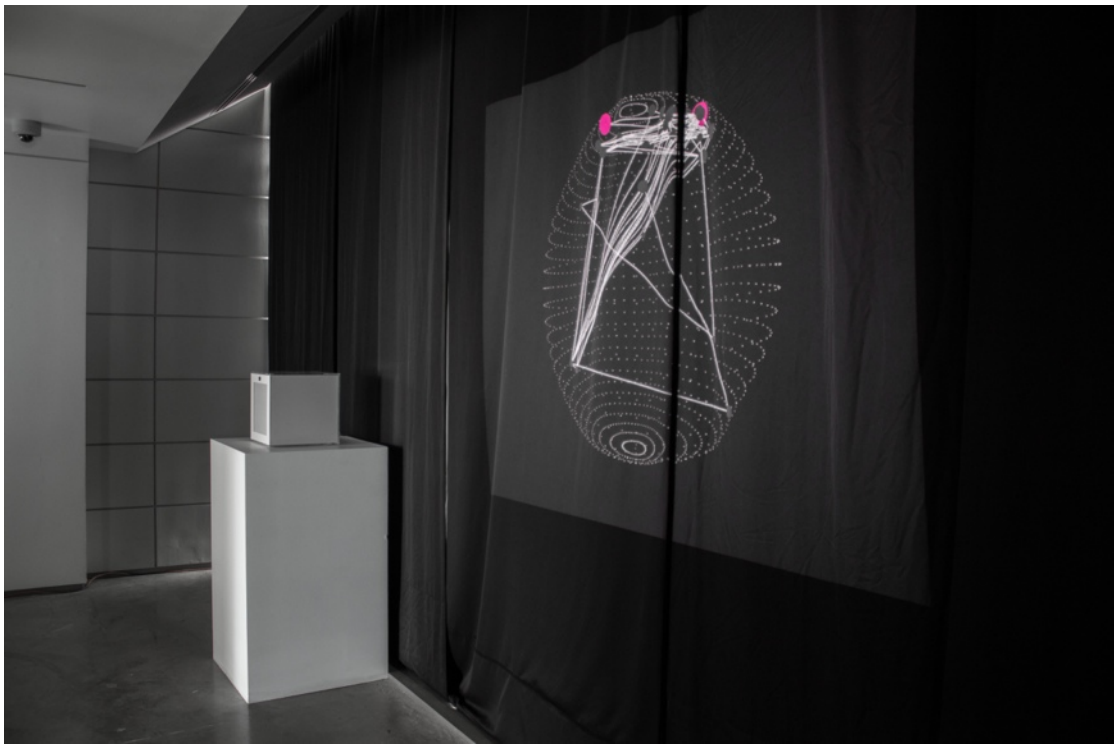

Fig. 5. *Wake Up With the World* interior gallery projection

Fig. 6. *Wake Up With the World* as seen from building exterior at night

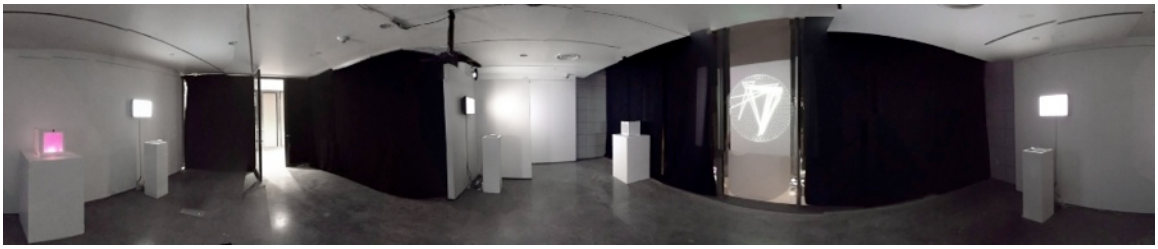

Fig. 7. Gallery layout 360 degree panorama with curtain panel removed

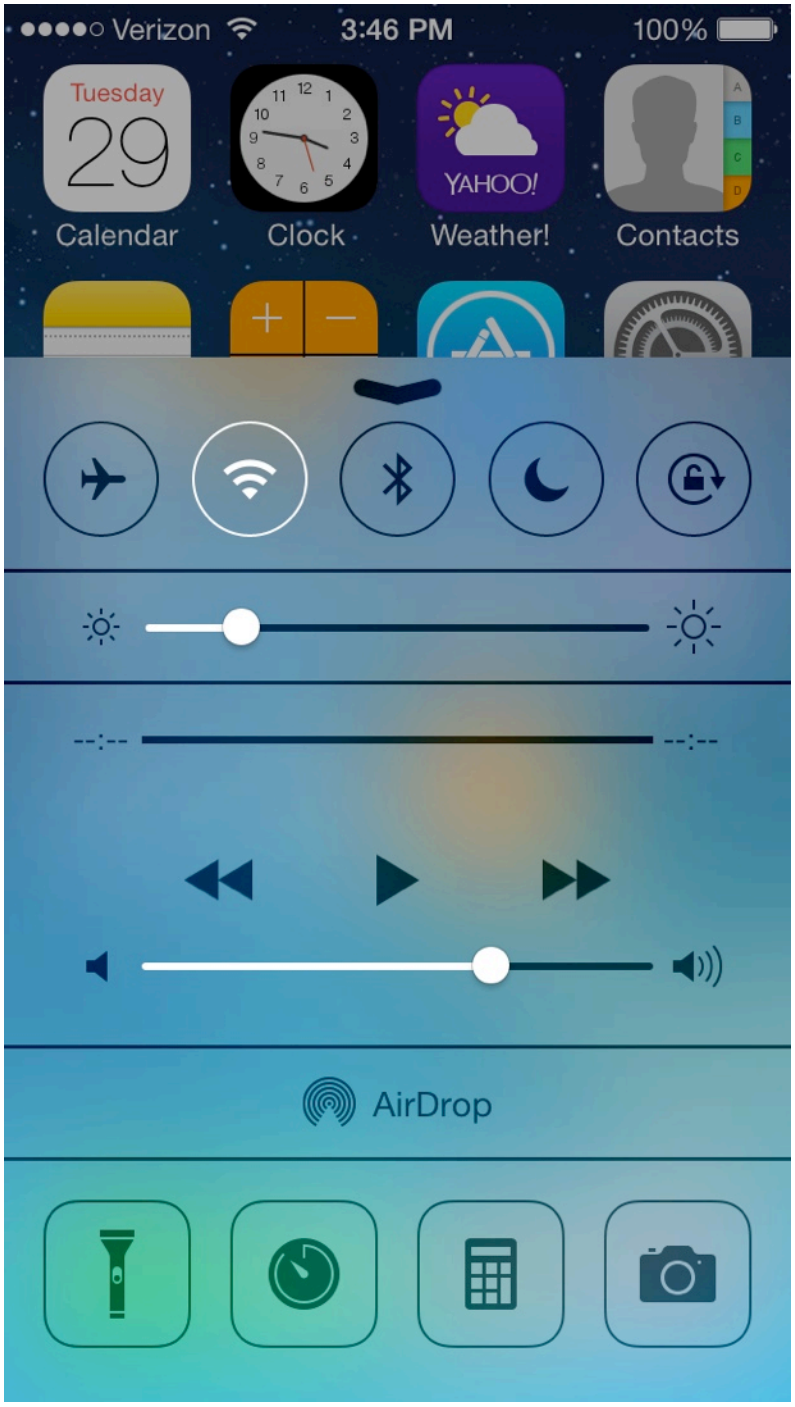

Fig. 8. Apple Computer iOS 7 diffusion effect

CHAPTER 4

AESTHETIC ISSUES - ITCONNECTS.US

The *itconnects.us* and *h-o-ld.me* websites both place users in what is essentially a great, white, empty void. This void hopes to exist as metaphor for the ideal void of a virtual space (and in some ways mirror the ideal void that is the "white cube" gallery convention) unaffected by any kind of imposing commercial presence. The exchanges that happen in these voids are pure, leaving *only* those exchanges, the users themselves, and their very minimal visual representations.

itconnects.us employs the same sort of connected-mesh-network iconography as seen in *Wake Up With the World*, however this time, it renders those connections tangible by directly attaching them to the participant's mouse cursor, and the cursor representations of all other connected participants (Figure 9). This makes the connection something tangible, malleable, and a very direct visual metaphor that asserts implications about the relationship and consent between participants. Because of its ability to be manipulated, participants can work together to do with that "connection" what they like. Some may see it as a tethering, being dragged by a stranger, others may see it as a tool with which to try and form together and attempt to produce geometric drawings. The connection, when considered symbolically— beyond the mere functionality of the website, greatly magnifies certain interactions— in particular, abandonment.

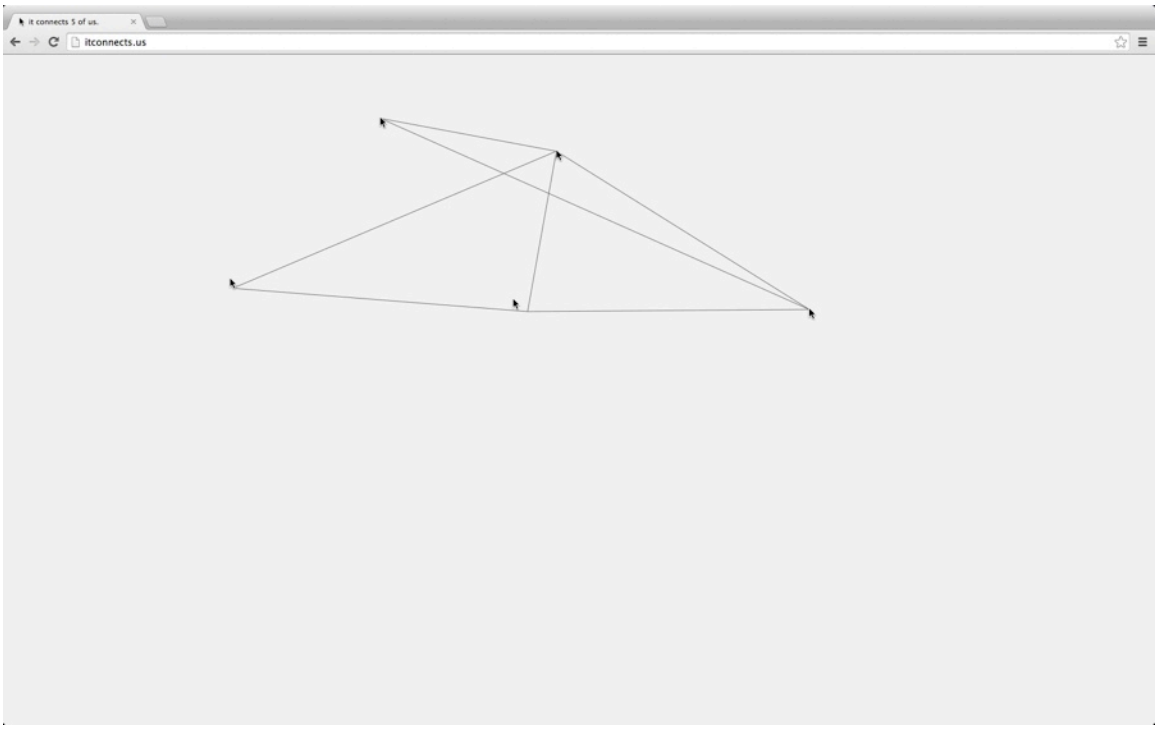

Fig. 9. Five participants on *itconnects.us*

One of the most potent experiences I've had in participating in *itconnects.us* was early on when I was joined by one single anonymous participant. I found myself interacting with this other person— communicating, playing games, moving together, dancing together. After 10, maybe 15 minutes, they disappeared from my screen. I felt a very real sense of loss and isolation when this happened. Our connection was tangible, this person agreed to be connected to me for a substantial period of time, and then, suddenly, chose to leave me.

CHAPTER 4

AESTHETIC ISSUES: H-O-LD.ME

h-o-ld.me places participants again in an empty white void. In this case they are represented by faint, grey, rotating squares. They may recall a kind of animated version of Kazimir Malevich's *Suprematist Composition: White on White* (Figure 10).

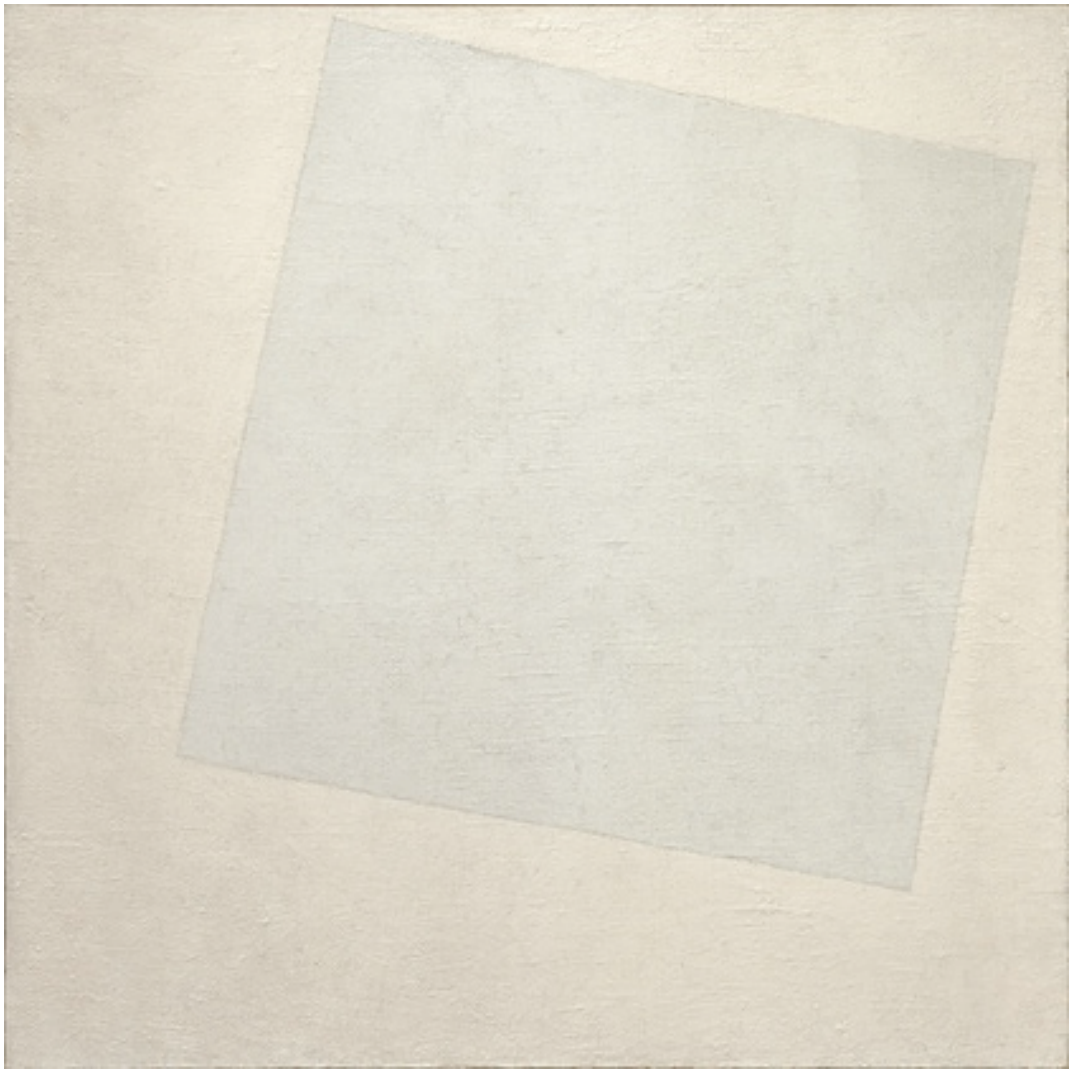

Fig. 10. Kazimir Malevich *Suprematist Composition: White on White* (1918)

Given the ability to hold down their mouse cursor and extend a line from their representation toward the other participant's, I built the interaction in a way where the user has to "fight uphill" to reach out— the extension of that reach moving very slowly, but upon the releasing of the mouse, retracts back toward them much more rapidly. This minor functionality gives the participant a feeling of truly committing to the act, making it an entirely intentional, conscious effort, and when met with another participant also reaching out, a very real sense of consensual agreement to form the embrace with one another.

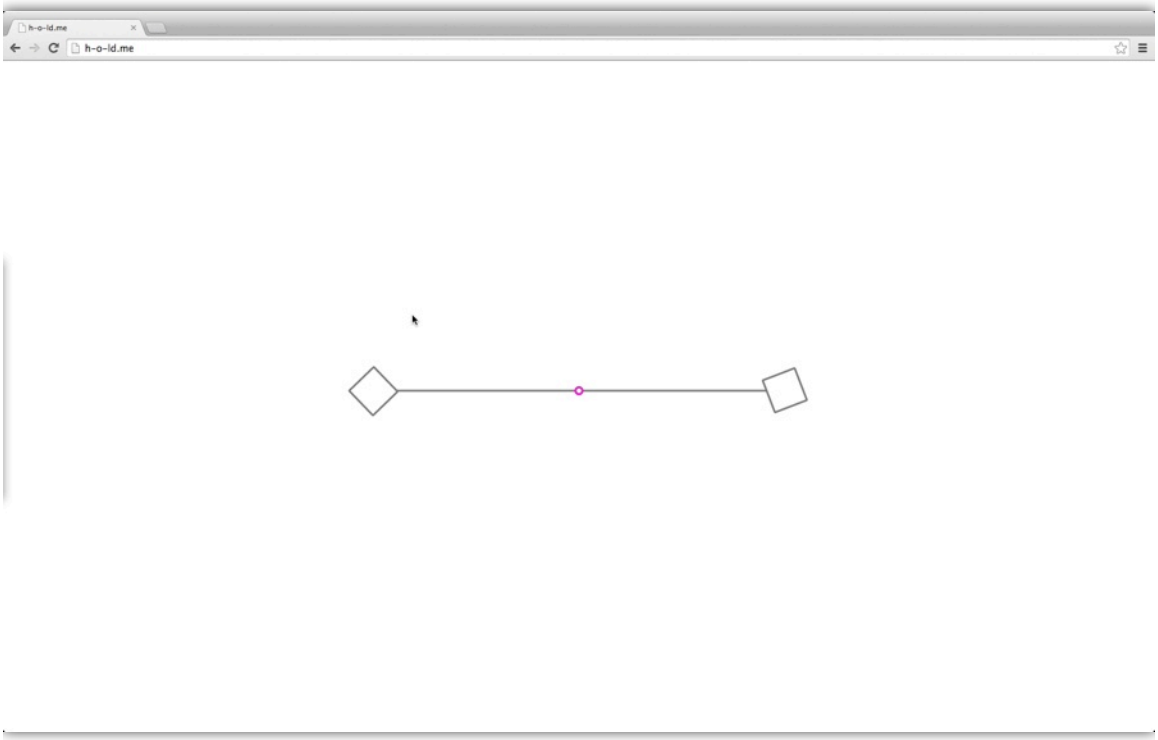

Fig. 11. *h-o-ld.me* participants mid-embrace

It was my hope that by substantially minimizing visual representation of both the participants and their interaction that, after some time, the participant would think not about the composition on the screen or the technologies behind their production but, realize the fact that they are physically engaging in the same exact gesture as another, anonymous person— perhaps seated anywhere on earth. Often, many pieces of interactive digital art don't consider the actual act (physical or otherwise) of interfacing with and manipulating the device which produces that interaction. The means are overlooked in pursuit of the end. Ideally, once looking beyond the simple line drawing and pink circle of connectivity on the screen (Figure 11), participants will recognize that they are, in a very real sense, physically holding hands with one another.

Here too a kind of desire is forged. To leave your "hand" extended out but have your partner refuse to "hold" it left participants with a sense of longing, anticipation, rejection, rendering them vulnerable and, as described by one participant, feeling "needy."

CHAPTER 4

AESTHETICS: WEBSITE ADAPTATION FOR GALLERY EXHIBITION

Because the browser based projects were initially conceived to be experienced in the privacy of ones own home I wanted to take special consideration for their adaptation as gallery pieces. Both works, still simultaneously accessible from any outside computer on the internet, had two terminals placed in the gallery. The two pieces each employed a different means of separating participants so that they weren't fully aware of whom they are interacting with.

itconnects.us separated participants by *space*, placing each computer at opposite ends of one wall so that participants couldn't readily see the person they were interacting with in their peripheral vision (Figure 12). *h-o-ld.me* separated participants by *boundary* — placing each terminal on opposite sides of a dividing wall (Figures 13 and 14), positioning a physical barrier between them which enforced the anonymity of each participant and, also allowed, to some degree, the replication of the intimacy of participating in these experiences in a private, isolated environment.

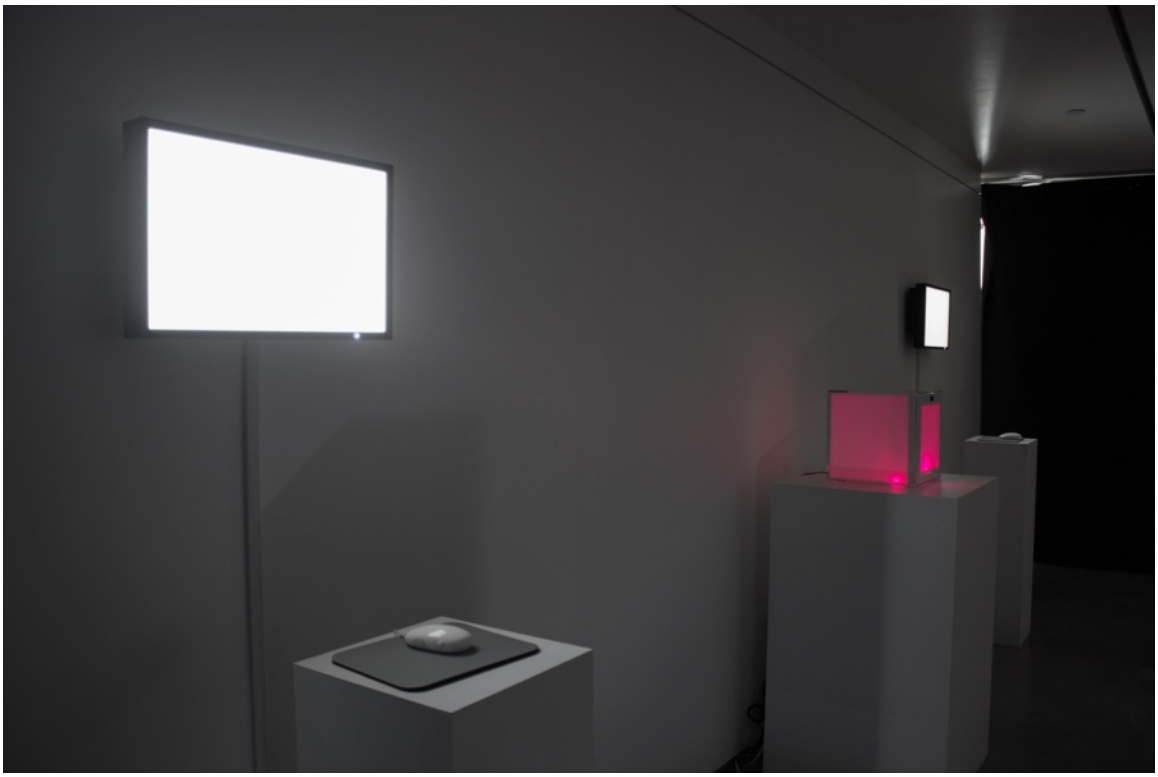

Fig. 12. Placement of *itconnects.us* computers

Fig. 13. *h-o-ld.me* as separated by partition

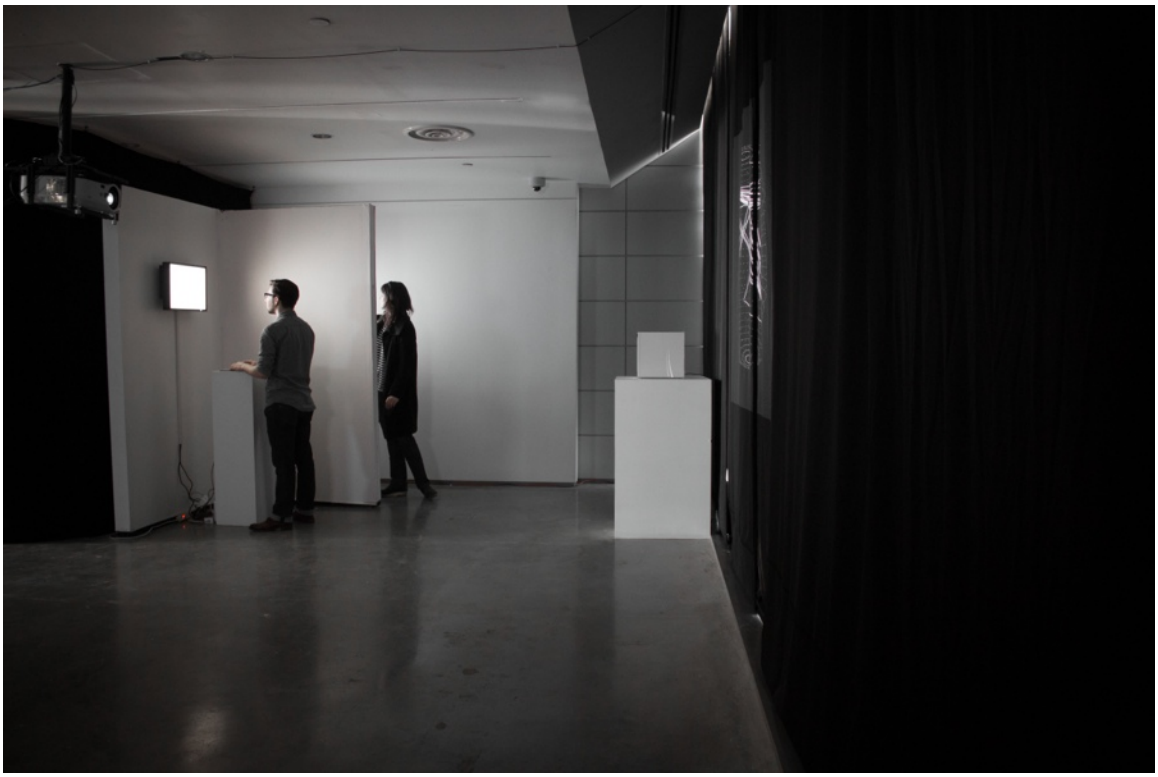

Fig. 14. Two participants with *h-o-ld.me*

To acknowledge that participants were interacting with a *device* I chose to display these pieces on computer monitors, wall mounted flush in the gallery, rather than as projection. The works were shown with mice sitting atop grey fabric mouse pads (the same shade as the Spandex used in the *Embrace Objects)* placed on 1'x1' pedestals. This precious display of the mouse consciously made it an element to be considered—elevating it to a kind of art and fetish object. The monitors were mounted higher than one would normally mount, say, a painting on a gallery wall. This was done so that the participants had to look *up* to view the piece, thus, losing sight of the hand that was manipulating their mouse. This invited a more direct connection with the pieces and, hopefully, a greater enforcing of immersion into the voids that are their worlds.

CHAPTER 4

AESTHETIC ISSUES - EMBRACE OBJECTS

The earliest prototypes of the *Embrace Objects* were fully covered in Spandex (Figure 15). Due both to my lack of technical ability in what essentially amounted to upholstery, and the aesthetic of a "soft" sculpture working against the sort of things I was increasingly interested in them representing, I decided against "skinning" the entire form.

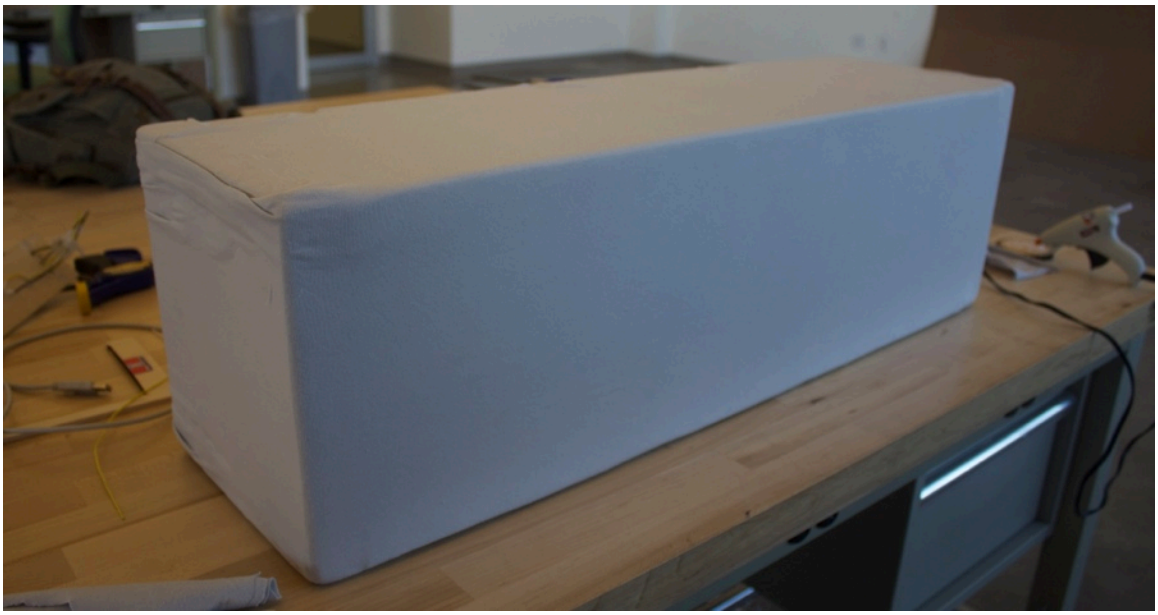

Fig. 15. *Embrace Object 05*

I then thought I would produce the *Embrace Object* frames in wood using a very heavy lacquer finish. Through conversation and testing I found that the wood brought far

too much organic texture to the objects. Ultimately, after more material tests and 3D modeled renders (Figure 17), I decided to fabricate them from acrylic plexiglass— an outer shell of 1/4” thick clear and a nested inner cube of 1/4” thick glossy white. (Figures 18 and 19) This hoped to directly evoke the industrial design and materials of contemporary consumer devices and simultaneously exist as a pure, white, untouched form— not unlike the voids of the browser based pieces, the simple square representation of participants in *h-o-ld.me*, and the “white cube” ideal of the gallery itself. These new forms were most directly inspired by the aesthetic of Apple Computer (Figure 16). It is my hope that viewers can see these objects as a kind of “alternative-present fiction” of a product one would find at an Apple Computer store adjacent to a row of other various iDevices.

Fig. 16 Apple Wireless Mouse and Apple Mouse Pro

Fig. 17. *Embrace Object 1 (Arousal)* acrylic render test

Fig. 18. *Embrace Object 1 (Arousal)* as exhibited

Fig. 19. *Embrace Object 2 (Fantasy)* as exhibited

CHAPTER 5

TECHNICAL ISSUES: WAKE UP WITH THE WORLD IOS, REMOTE SERVER, AND GENERATIVE AUDIO

Wake Up With the World consists of four major parts: the generative musical composition created in the *Pure Data* visual patching environment, the iOS app for participants to use as their alarm clock, the remote server to manage connections (and cache them for gallery implementation), and separate desktop app for the gallery visualization. The server, written in Node.js, is hosted on a remote VPS (Virtual Private Server) which allows me to code and run whatever software I'd like— unlike regular shared web-hosting which generally only supports webpages. Node.js is a highly adaptable and extendible platform that can be coded to take the role of static web-server (such as Apache,) producer of dynamic content (such as PHP,) database (such as MySQL,) and much more. My implementation of the Node.js server uses the Socket.io add-on package which allows me to establish a direct and instantaneous connection between the participant and the server, letting me instantly broadcast in both directions: from participant to server and from server to every connected participant. In the server code I implemented some readouts that can be monitored over an SSH connection (Figure 20).

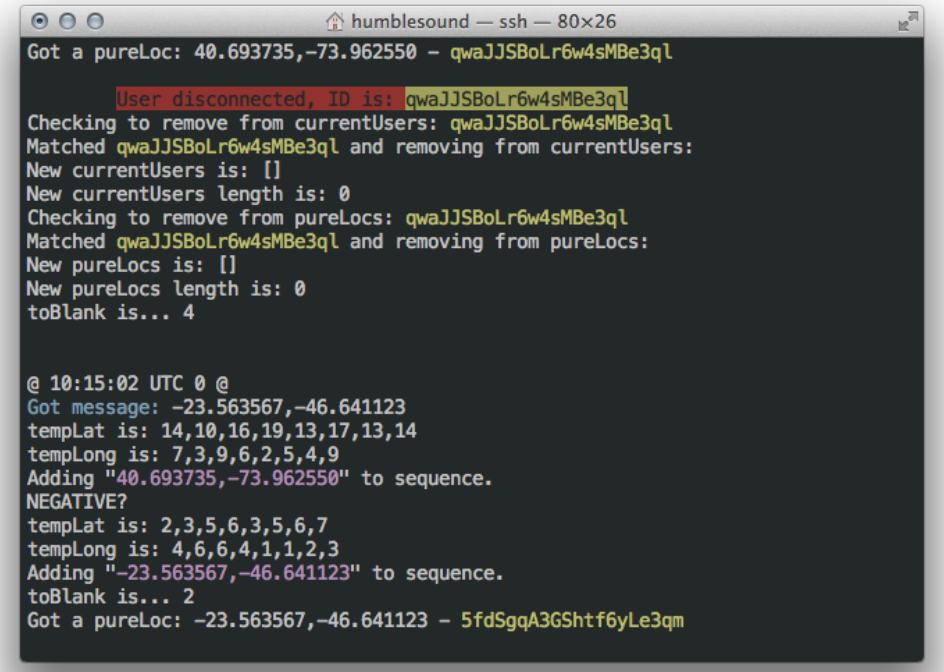

Fig. 20. Monitoring *Wake Up With the World* server with OSX Terminal SSH

The Socket.io component of Node.js is intended for use in, and thus has immediate support for, web browsers. However, in order to allow the Objective-C coded iOS app to connect to the server I employed the open source *socket.IO-objc* library.

Once the participant launches the app their GPS coordinates are accessed. It is periodically updated to provide a more accurate reading. When the participant's alarm goes off their device establishes a direct, socketed connection to my remote server. Once the connection is established the raw GPS digits (ex: 40.693735,-73.962550) are transmitted to the server via a message I refer to as "pureLocs" (as seen in Figure 20). The remote server takes these incoming numbers and does a few things: stores them "as is" in one array so that they may be used in other ways, in other places, but also, converts them to numbers to be used as note values in the musical composition.

My treatment of the numbers is as follows: I first multiply the coordinate (say, latitude: -73.962550) by 10,000,000 to ensure that, regardless of the number of digits in the reading, I have exactly 8 whole number digits to work with (which correspond to eight of the total 16 notes a participant contributes.) In our example, this now gives us "-739625500" to work with. From this point the value is treated as a string. I remove the negative sign, taking note of it for later and crop the reading to its first 8 character substring— "73962550." The way I chose to do my notation in the Pure Data composition is that participants' readings are dealt with as only *positive* note changes *up* from the root note. This allowed basic operations to be done much more simply and logically, but in order to do so, I had to deal with "negative" latitude and longitude readings some how. My solution was as follows: every digit of a "negative" latitude or longitude would be represented directly— the 9 in our "-73.962550" would be transmitted exactly as is: **9**, however, *positive* coordinates would have their digits effected. Each separate digit of a positive reading would have 10 added to it, so, the 6 in "40.693735" would be converted and transmitted as **16**. A complete example:

```
Raw participant location:   40.693735, -73.962550
Latitude note sequence:   14,10,16,19,13,17,13,15
Longitude note sequence:   7, 3, 9, 6, 2, 5, 5, 0
```

Each instrument is stored as a separate array so, now that the note values have been processed, the server looks through how many active participants there currently are and determines which of the four instrument specific arrays to place these new values into. In order to "silence" existing notes in a playing measure (essentially flushing out old

values for participants who have left) the number 99 was designated. This means that when there are three participants and one leaves, the part of the instrument specific array occupied by that person will fill with “99s” which, when received by the Pure Data composition, knows to be ignored by the sequencer. In the Figure 20 screenshot you can see a readout of the part-removal-logic as “toBlank is...” followed by a part number.

Once all of this processing and updating has been done on the server side, two separate messages are pushed out to all current participants: one with the prepared, converted note values and one with all of the raw GPS locations. This allows the iOS app to simply take the incoming values and do with them what is needed. The note values are received and then “sent” to the Pure Data music composition as four lists of digits, and the raw GPS locations are presented to the OpenFrameworks based visualization to plot participants on a globe.

Because the visualization was composed in OpenFrameworks (which is a C++ based framework) there were hurdles to integrating it correctly and being able to pass data to its methods from the main native Objective-C code of the app. Ultimately, rather than directly communicating digits to the OpenFrameworks methods, I chose to have the app write its received values to a JSON formatted file on the device which can then be periodically read and parsed by the OpenFrameworks component. This is not the most effective way to do this kind of multi-language communication, but because I only needed to read and write these values every few seconds, it in no way negatively impacts the performance or functionality of my piece.

The synthesis is produced by the *libpd* iOS adaptation of Pure Data. This allows me to create my composition in the visual editor (Figure 21) of Pure Data and allows that very same file to be compiled into the iOS application.

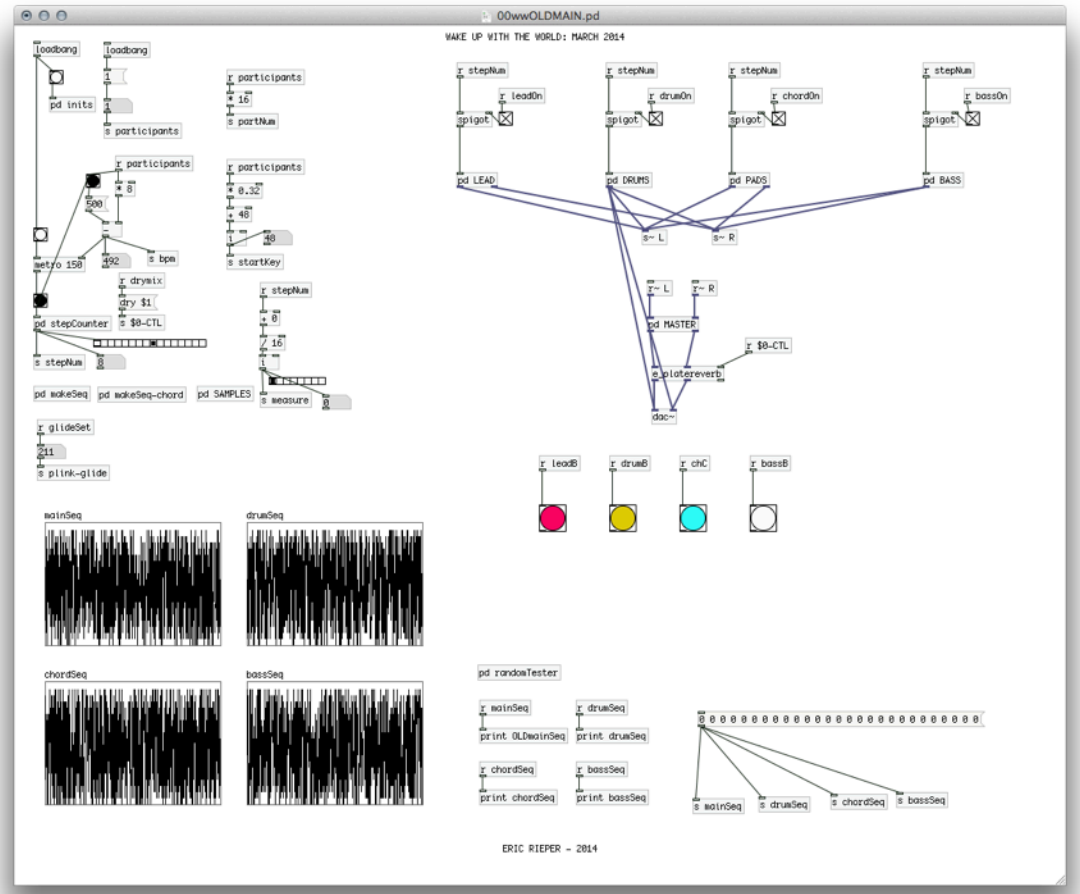

Fig. 21. Master Pure Data *Wake Up With the World* patch

This master patch receives the note sequence information and number of participants and stores them to be played played back in the composition. As seen in Figure 20 most of the components (timing mechanisms, separate instruments, note logic, etc.) are contained in their own individual sub-patches.

Additional expressiveness is brought to the composition by not just directly playing the notes as they were received by the Node.js server. Each instrument has different logic states and parameters to determine things like: if a note will be played, which of the possible instruments for that role will be chosen, and properties of that chosen instrument.

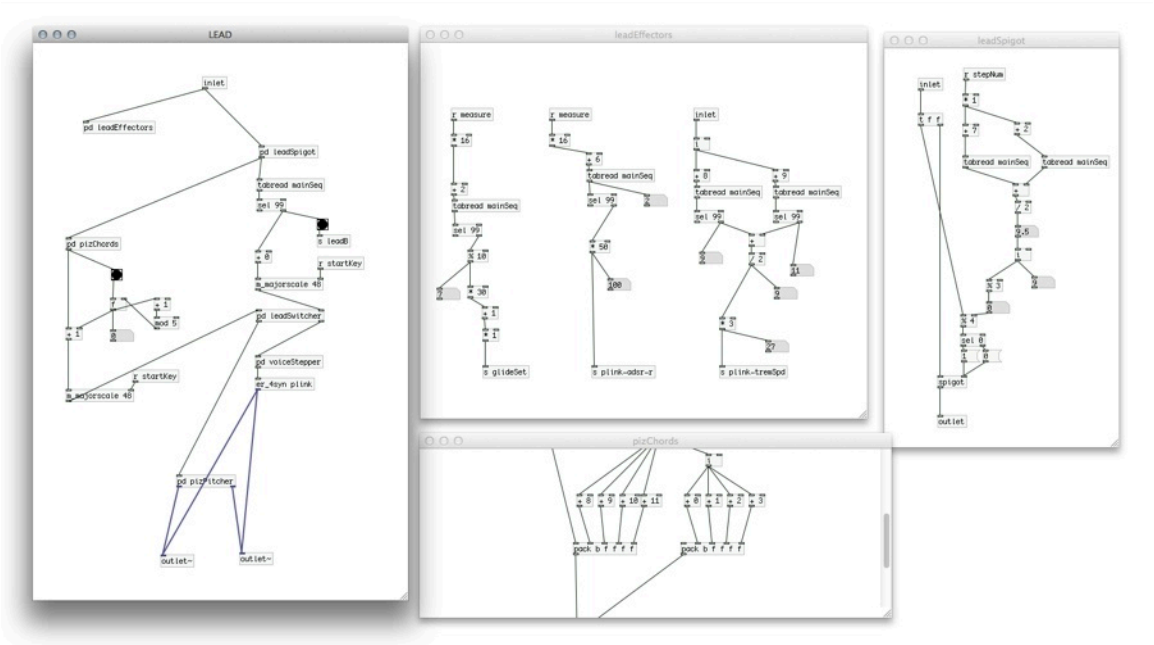

Fig. 22 Pure Data *LEAD* sub-patch and logic sub-patches

Figure 22 shows the main sub-patch for the “lead” role in which you can also see the “leadEffectors,” “leadSpigot,” and “pizChords” sub-patches displayed beside it. This role can be heard as either one of two instruments— a single note synthesizer melody or bursts of four note offset chords of sampled pizzicato violin. In the “leadEffectors” sub-patch you can see the value of the third note being used to set the *glide* parameter of the

synthesizer, seventh to set the *release* of the volume envelope (ADSR), and sum of ninth and tenth used as a basis to determine the *tremolo* speed. The "pizChords" sub-patch builds alternating chords out of the 9th, 10th, 11th and 12th values and 1st, 2nd, 3rd, and 4th. The "leadSwitcher" sub-patch looks at the sum of the 8th and 10th digit of this participant's contribution and and uses it as the basis of selecting either the pizzicato violin or synthesizer to be heard.

Each instrument has different systems similar to these. The percussion role can become one of five different sampled drum kits, the "bass" synthesizer has its parameters modified in different ways, and the "pad" role becomes either a slow building synthesizer pad or chords of piano and sampled voice— all effected differently. Making these decisions based on one value (or combination of values) within the entire *measure*, as opposed to changing on every single *note*, helps to define and differentiate each participant with their own unique sonic voice.

CHAPTER 5

TECHNICAL ISSUES: WAKE UP WITH THE WORLD GALLERY IMPLEMENTATION

While I was drawn to the idea of the gallery implementation of *Wake Up With the World* being a direct representation of what was happening at that very moment on the app, I soon realized that the great periods of silence I was predicting (because, I thought, I would have a very small user-base— likely only composed of fellow students and faculty of Pratt) would mean that the piece would essentially be dormant for large periods of the day— completely silent. My solution to this was, rather than playing and displaying only currently connected participants, I would instead cache all activity over the length of the exhibition to build a continually expanding composition.

Because the gallery component of *Wake Up With the World* would be running on a computer, rather than a mobile device, it afforded me the ability to do some things differently, more simply, and the opportunity to add additional features such as the pulsing of participant nodes as their specific notes played. The visualization would be written entirely in C++, as it is built on OpenFrameworks, rather than an Objective-C based application that *implemented* an OpenFrameworks *component*. This also meant, rather than coding a direct integration of the music composition via LibPD, I could run the OpenFrameworks visualization and Pure Data environment simultaneously as separate applications. In order to communicate between the two I chose to use the OSC

protocol— this allowed me to very simply send messages both from the OpenFrameworks application to Pure Data and vice versa.

The server was written first to only deal with the instant, socketed connections required by the iOS app. My solution for this new gallery component stemmed from my time spent working with parsing JSON in OpenFrameworks. Until this point the remote server was only accessible via a Socket.io connection at specific port. I chose to also implement a more conventional HTTP web serving of files and add a function that dynamically generates a JSON formatted file of all archived participants when requested. Like the Socket.io arrays, two JSON files would be produced— one for the pre-formatted note values and one for the raw GPS locations (Figure 23). These files are requested by the gallery program periodically and update accordingly.

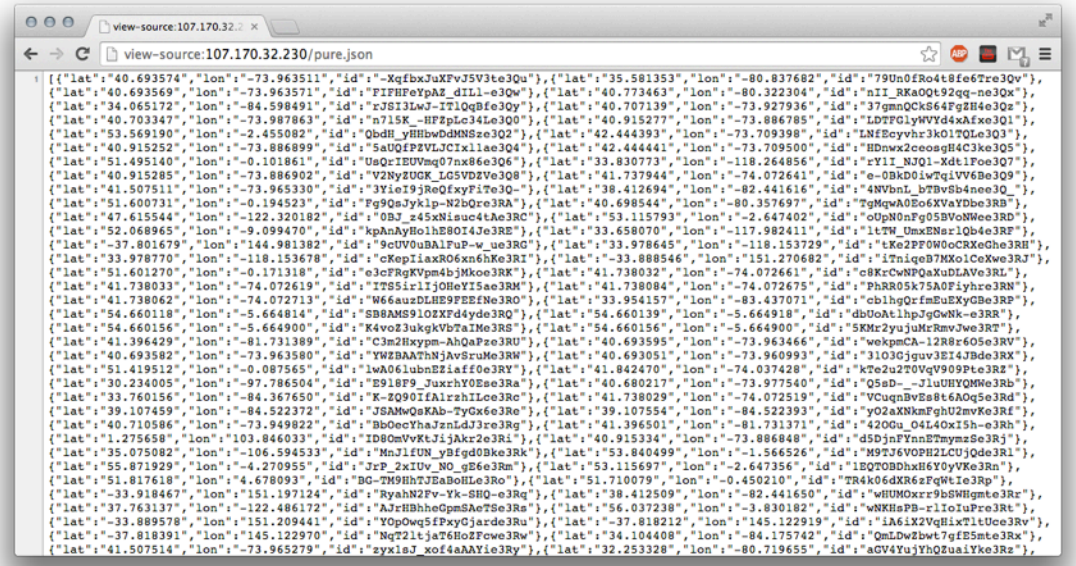

Fig. 23. Gallery raw GPS locations JSON file

Ultimately, because of a an article featuring the piece on Creative Applications Network posted the morning of the opening (http://www.creativeapplications.net/openframeworks/wake-up-with-the-world-collaborative-musical-waking-experience/) and many other following articles highlighting my piece because of it, I ended up having a sudden, large, and diverse user-base. This may have “allowed” me to display the work showing only current, live connections as I initially proposed, but I do think the piece is much better served by differentiating the gallery component from the primary, private, intimate experience of sharing your waking moments with the iOS app as intended. The resultant, incredibly dense mesh of the hundreds of participants (Figure 24) began to form a sort of new visual geography with land masses built solely from participants’ connections.

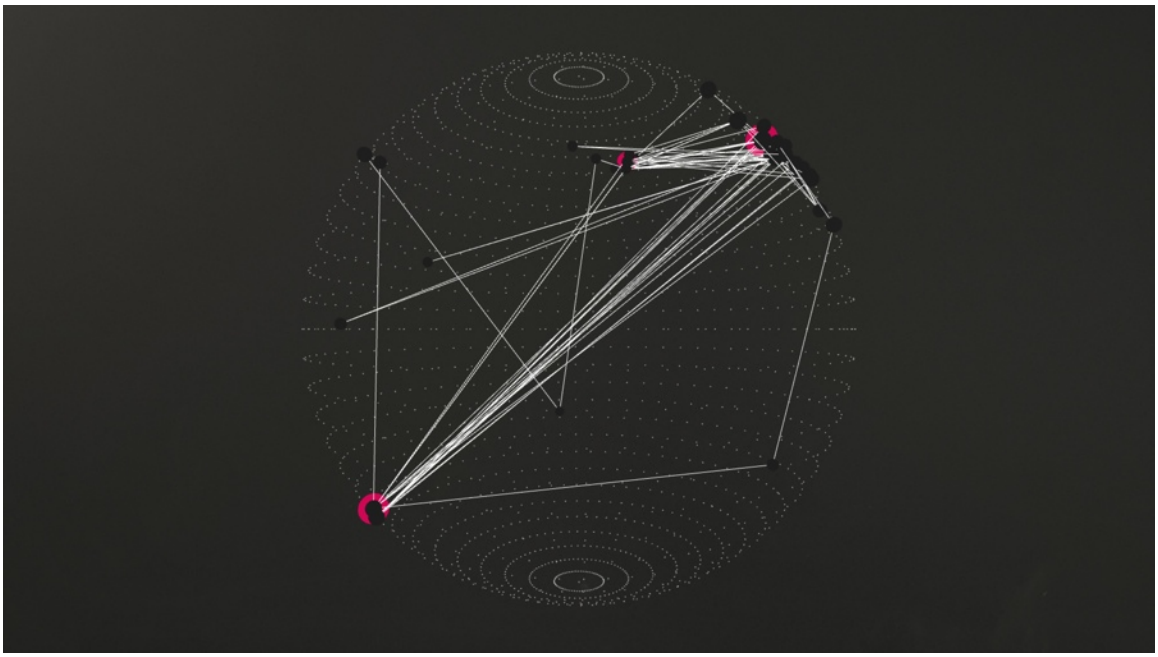

Fig. 24 - Gallery visualization April 19th, 2014

This sudden popularity, however, required some reconfiguring to be done. Because of my (apparently very low) estimate of the number of participants, the way I had written the music composition did not scale well beyond 50 people. The tempo would have been in the multiple-hundreds of beats per minute and the root note pitch would be set to an incredibly high frequency— entirely non-musical at that point. However, because the gallery component ran the visualization and the audio synthesis separately, it allowed me to easily change values in my scaling algorithm to accommodate the new unprecedented numbers.

The synthesis fix was relatively simple but, come the second day of the exhibition, a new problem was discovered. When I came into the gallery the morning after the opening, for some reason, despite leaving it running through the night, my visualization application had shut down. It then also refused to launch each time I attempted to run it. After a bit of scrambling and debugging I discovered that there is actually a hard-coded limit to the length of messages in the OpenFrameworks implementation of the OSC protocol. Initially I changed this message buffer parameter to two times its limit. By the third day of the exhibition I found that this was still far too small for the messages I was sending and ultimately chose to run it for the rest of the exhibition at 20 times the original value (Figure 25).

```
void ofxOscSender::sendBundle( ofxOscBundle& bundle )
{
    # pragma mark OSC BUFFER
    //static const int OUTPUT_BUFFER_SIZE = 32768;
    static const int OUTPUT_BUFFER_SIZE = 32768*20;
    char buffer[OUTPUT_BUFFER_SIZE];
    osc::OutboundPacketStream p(buffer, OUTPUT_BUFFER_SIZE );

    // serialise the bundle
    appendBundle( bundle, p );

    socket->Send( p.Data(), p.Size() );
}

void ofxOscSender::sendMessage( ofxOscMessage& message )
{
    # pragma mark OSC BUFFER 2
    //static const int OUTPUT_BUFFER_SIZE = 16384;
    static const int OUTPUT_BUFFER_SIZE = 16384*20;
    char buffer[OUTPUT_BUFFER_SIZE];
    osc::OutboundPacketStream p( buffer, OUTPUT_BUFFER_SIZE );

    // serialise the message
    p << osc::BeginBundleImmediate;
    appendMessage( message, p );
    p << osc::EndBundle;

    socket->Send( p.Data(), p.Size() );
}
```

Fig. 25 Updated 20x buffer sizes in ofxOscSender.cpp

CHAPTER 5

TECHNICAL ISSUES: ITCONNECTS.US

The browser based *itconnects.us* and *h-o-ld.me* both have their own Node.js servers that both serve the webpage and establish live connectivity through Socket.io. The earliest prototypes for both projects were roughed out in Processing so, when it came time to translate them to an actual browser experience, rather than writing pure HTML5 Canvas code, I leveraged the Processing.js HTML5 Canvas library for a direct adaptation.

The behaviors of *itconnects.us*, in an attempt to mirror the responsiveness and smoothness of an actual computer cursor, required some consideration. Ideally, with the socketed connection, I could push an unlimited amount of data— constantly sending and receiving cursor position updates every single time one was moved. This, however, means transmitting messages incredibly frequently. Sending so many messages means there are a few distinct issues to address: from the participant— the *latency* of their connection to the server and the *speed* of their connection could possibly effect the "integrity" of the data that gets sent out to the server. On the other end, sending this much data *from* the server *to* the participants would scale incredibly poorly. Because any user would be able to send, and thus require the pushing of, cursor updates at sub millisecond frequency, that means if multiple people were moving their cursors at the same time there would be a constant stream of multiple updates fighting to be pushed out at one moment.

I arrived at two main solutions for these issues. In my testing, I found that my server could handle an unrestrained *incoming* stream of data— this meant that I could leave the participant-to-server transmission code unrestrained— pushing a new update on every single ".mousemove" Javascript event. On the server side though, rather than then immediately pushing that update out to every other participant, I implemented a timer that collects updates and transmits them every 40 milliseconds. In testing, I immediately saw the drawbacks of this new, infrequent, update cycle. It caused the cursors' movements to become less and less smooth as I increased the length of the update timer. My solution for this issue was to take the drawing of the cursors "out" of the HTML5 Canvas code, render them as actual elements on the page (each being given their own element to move around freely,) and implement CSS3 Transition to smooth the motion. Despite easing the value changes, I found that some users initially had issues with the HTML5 Canvas drawing at a reasonable frame rate, so by taking the cursors out of the Canvas alone made the motion much more "lifelike". In the end I was very pleased with the responsiveness and tactile feel of the system.

With the motion approaching something that looked as "real" as the users' own cursor movements, the last thing implemented to further push that "reality" was to detect the participants' operating system. On the loading of the webpage the OS is detected using Javascript's "navigator.appVersion" property which provides an array of information about the participant's browser. The code then looks in that array for the presence of either "Mac" or "Win" and changes which image is to be loaded to the cursor appropriate for the participant's system.

CHAPTER 5

TECHNICAL ISSUES: H-O-LD.ME

h-o-ld.me was intended to be an exchange between two individual anonymous participants. My Socket.io implementation of both *Wake Up With the World* and *itconnects.us* essentially broadcasts all messages to all present participants at the same time. In order to create a "space" where only two participants exist I implemented the "rooms" feature of Socket.io. The metaphor of a "room" in which people enter is precisely what the function does.

I first outlined the logic of how the placing of a participant would work:

1. **If there are no rooms (and thus no participants):** create and join a new room
2. **If there is one room:** check to see how many participants are in this room
   a. **If there is one participant:** join them
   b. **If there are two participants:** create and join a new room
3. **If there are multiple rooms:** go through each one to check how many participants there are
   a. **If there is one participant:** join them
   b. **If there are two participants and not all rooms have been checked:** continue checking the next rooms (3)
   c. **If there are two participants and all rooms have been checked (all rooms are full):** create and join a new room

In order to manage and keep track of all of this I created an array that includes information about all participants— including which room they belong to. Upon the creation of rooms they can be given a "name." I produce a 16 character random identifier for each room which helped me insure that my room placement logic was working

correctly in checks; I found this much more helpful than simply numbering the rooms with an incrementing counter of 1, 2, 3, etc... as, eventually, participants would leave and rooms would be “recycled” or dropped.

Lastly, to ensure that participants are only paired with other *active* participants, I implemented a timer to check if any actions have been taken by that user in 10 seconds. Both mouse *movement* and the holding of the mouse *button* are considered in this check. If the 10 seconds go by indicating that the user is no longer active, they are disconnected from the server and “leave” the room they were in. If they were in that room with someone else, that person would see their partner disappear from the screen. If the participant then moves their mouse they will re-join the server and be placed in an appropriate room.

CHAPTER 5

TECHNICAL ISSUES: EMBRACE OBJECTS

Embrace Object 1 (Arousal) was one of the first components of *Functional Embrace* that I had prototyped. The sculpture required some form of linear motion to extend out against the Spandex skin of its front face. I initially looked into solenoids, threaded rods, pistons, and other mechanisms before finally settling on a rack and pinion gear system, with an appropriate gear ratio, driven by a high torque servo motor.

The components for the gear were laser cut from basswood, a platform was fabricated with a dado in the middle as a track for the rack to run in, and the servo was positioned and bound to a post with E6000 adhesive (Figure 26).

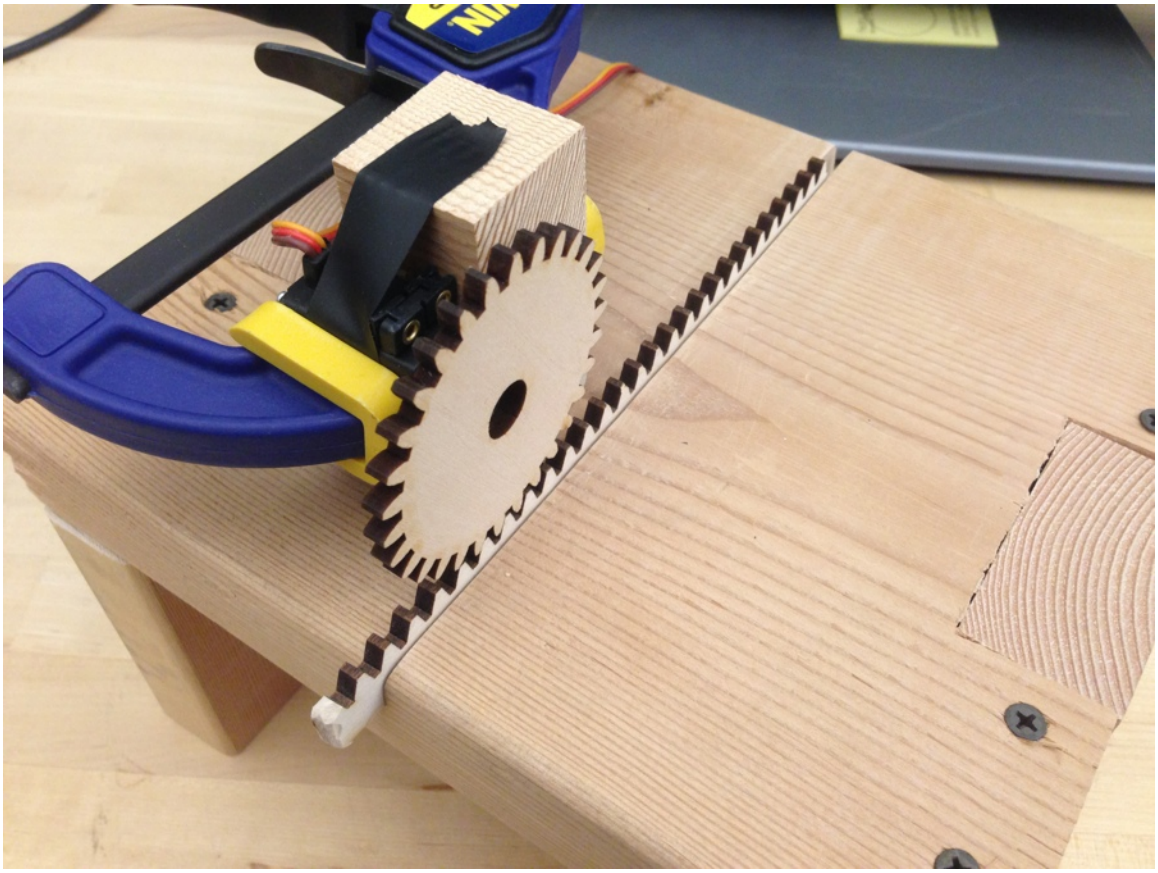

Fig. 26. *Embrace Object 1 (Arousal)* rack and pinion internals

The front face of the *Embrace Objects* needed to be removable to allow for adjustment and any possible repair and, simultaneously, appear as seamless as possible. *Embrace Object 1 (Arousal)* also needed its face to be held on very firmly as there would be outward force pushing against it as the sculpture reaches toward participants. The face of *Embrace Object 2 (Fantasy)* was placed on using a hinge made of extra-strength adhesive tape. Ultimately, I chose to use a series of high power magnets placed around the edges of the face for *Embrace Object 1 (Arousal)* in a way that left room for the platform to be slipped in and out. (Figure 27) This allowed me to have the front secured

all the way around its perimeter with a very strong bond, but, by twisting rather than pulling at it, would be somewhat easily slipped on and off if needed.

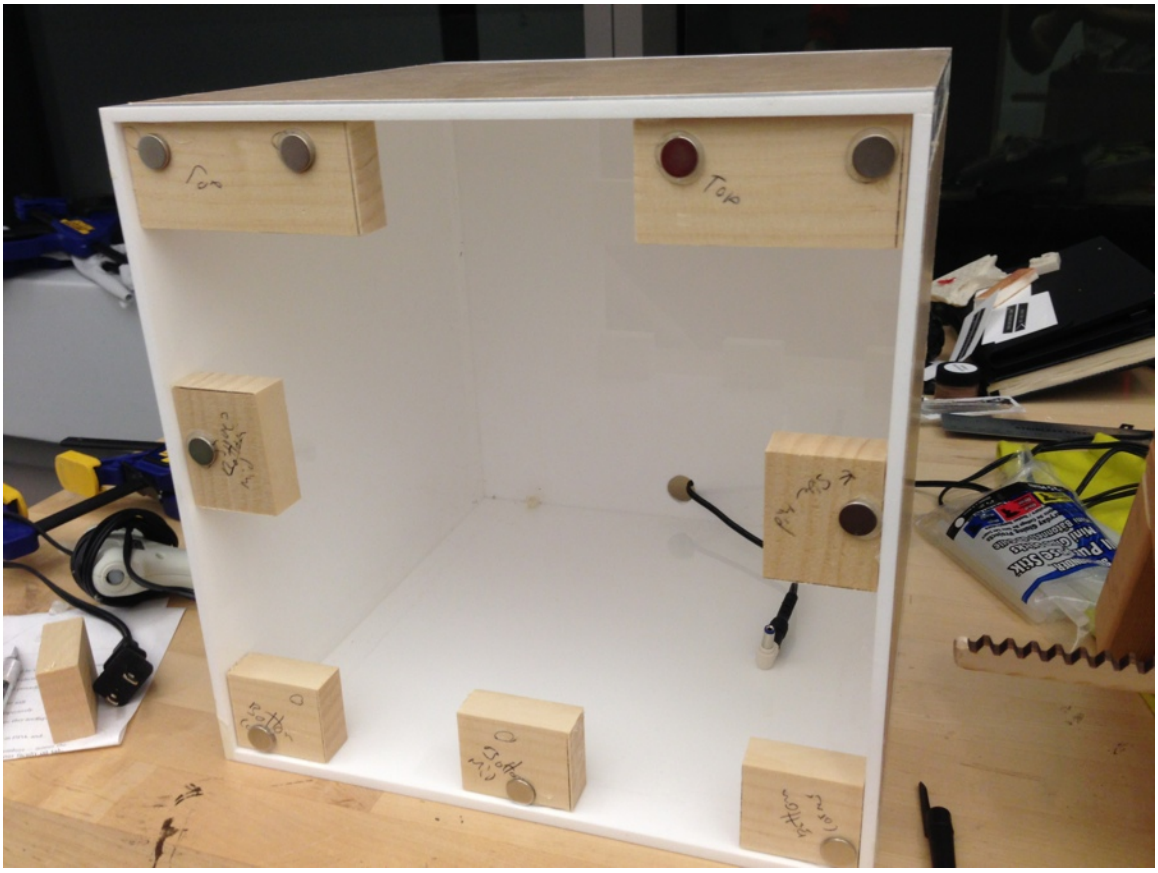

Fig. 27. *Embrace Object 1 (Arousal)* magnet arrangement

The early prototype *Embrace Object 05* used the raw depth information provided by a Microsoft Kinect sensor translated by a computer to drive its motors. The *Embrace Objects* for *Functional Embrace*, I thought, must exist as self contained entities— no external computers, no peripherals.

There are many types of proximity sensors available, all employing different techniques and all with their own unique properties. Many distance sensors feature two

elements: one to send a signal out (be it infra-red light or an ultrasonic pulse) and one to receive it. Because of this, many of these sensors have what appears to be two "eyes." It was very important to me to not overtly anthropomorphize the *Embrace Objects*. By building something that appears to have a set of eyes it becomes a kind of "creature"—one that appears to be constructed with the intent of always, and directly, physically mirroring a living being. I very much wanted these sculptures to exist as clean, minimal, product-like objects when left alone but only through interacting with them do the participant and sculpture develop a kind of living, empathetic relationship. Because of this I settled on a Maxbotix Ultrasonic Range Finder which requires only the face of one single black plastic cylinder to be exposed. When placed in the center of the sculptures' facades, these small black circles evoked the camera lens of a mobile phone. I had previously worked with the Maxbotix "LV" series of sensors and found them to produce erratic readings. For the *Embrace Objects* I chose sensors higher up in their product line — the "HRLV" series. These sensors were much more reliable but that was in part due to their built in filtering which produces 100 milliseconds of delay. While the motion I got from these sensors was substantially more accurate and smoother than that of the "LV" series, I do feel like the mere 100mS delay was detrimental to my ideal experience participants would have with these sculptures. There is something uncanny, unnerving, and very powerful about having the entity instantly and directly mirror your approach. This seemingly minuscule delay, however, may make it feel more like the participant is manipulating a device that is then reacting to them, rather than having a 1 to 1 direct

engagement with it. I will be looking into further optimizing these sensors or possibly using something different altogether for future exhibition of the *Embrace Objects*.

Embrace Object 2 (Fantasy) required a pink glow— ideally one that as closely matched the shade of fuchsia used in the other projects as possible. Pink LEDs alone are somewhat rare. They are available, but, they also tend to be quite dim and produce a much softer, almost pastel, shade of pink. Because of this I chose to drive eight RGB LEDs split into two bundles of four (Figure 28). RGB LEDs are essentially three separate LEDs in one housing which means an increased power draw. However, my shade of pink required only the red and blue components and the sculptures were to be driven by 12v AC adapters that provided more than enough power for the LEDs, sensors, and micro-controller.

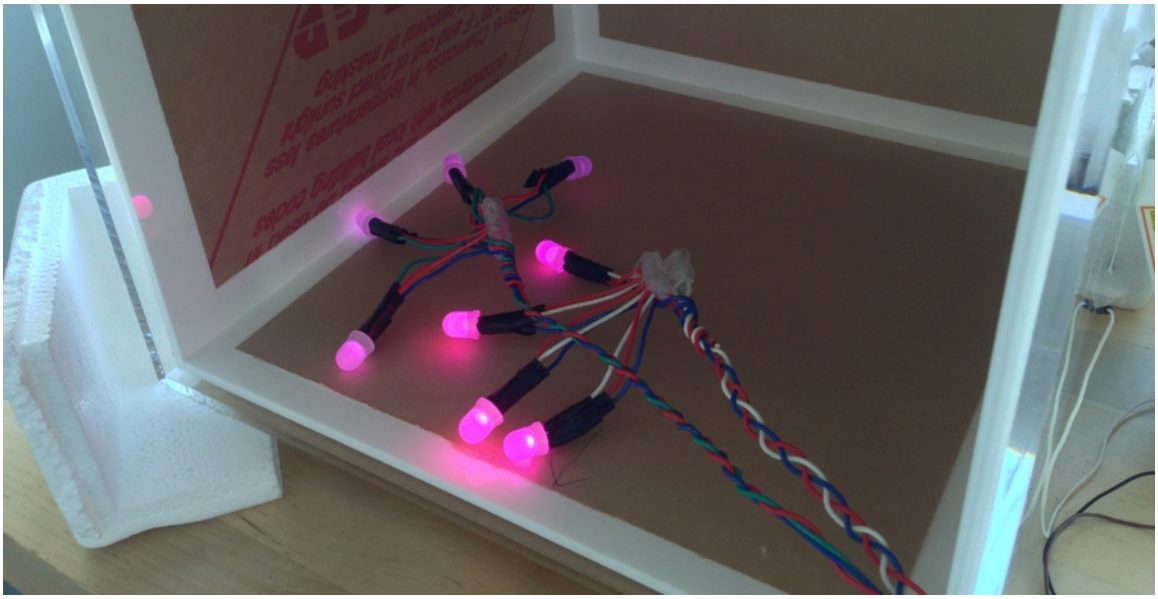

Fig. 28. RGB LED bundles

CHAPTER 6

CONCLUSION

With this collection of work I hope to address the ideas of "embracing" and "functionality" in multiple ways. "Embrace" exists in these pieces in the sense that you are engaging in direct, intimate embrace with other participants or, with objects and systems themselves. The sculptures display a programatic embracing of the participant. You are asked to embrace your fellow participants and to embrace the experience itself.

Simultaneously, when considering the ways in which corporate entities have embedded themselves in our lives (digital or otherwise,) we are being asked to somewhat blindly embrace the decisions of those major corporations. We are asked to embrace these new systems and embrace the companies themselves so as to have such an intimate, trusting, relationship with them that we will volunteer personal demographic information, likes and dislikes, GPS locations, and actively recruit those around us to do the same.

The "functional" in these works relates to the means of producing such exchanges by mechanisms. I've also posed these websites and objects as possible alternatives to current devices and services— fulfilling the *function* they once played in our lives. They exist as surrogates and as facsimiles— digital systems described to have a functional benefit, that serve the need to dispel isolation and fulfill a longing for connectivity. A kind of therapeutic system. The *Embrace Objects* can either be seen as functional entities

existing to be manipulated by you, for you, providing a response, or perhaps, their designed functionality is solely to manipulate *you* into manipulating *them*.

Here too functionality speaks to the goals of corporate interests. To Mark Zuckerberg, *Facebook* does not function to bring you closer to those around you. To Yahoo! Inc., *Tumblr* does not function to provide the world with art and culture. These experiences, these objects, as beautiful as they may be, serve to function toward the goal of their creator's economic progress. It is highly unlikely that board meetings are held in the campuses of these companies that choose to discuss the poetics and emotional ramifications of their products— unless that is, to find ways to best leverage these properties into driving users to engage in a behavior that will accrue the creator more capital.

"The Master's Tools Will Never Dismantle the Master's House," title of Audrey Lorde's 1979 address and subsequent 1984 essay, is a phrase that is always with me as I create using digital tools and attempt to critically, and subversively, participate in today's Internet. Broadly, as it pertains to issues of social justice, I think this idea holds incredibly true— especially as spoken about in the Lorde treatise. However, when it comes to the creative and critical pursuits of art, I feel, or hope, that there may be room for substantial impact to be brought to the Master's House with his very own tools. However, this can only come about when those tools are wielded in an extremely careful and considered manner.

This collection of work elects to wield the Master's Tools, in that, it exists within the medium of the very things it hopes to ask participants to critically examine, but also,

simultaneously forgoes those tools and the “house” itself altogether— establishing what can exist and continue to function as gestural or theoretical alternatives to the things they intend to critique.

There may still be traces of the utopian ideals of early Internet left in what we have today, but they are substantially compromised. I will continue to navigate this space in the hope of producing things that both inspire and move through their poetics and emotive properties, but also pose substantial critique of the institutions that contain them and the systems that operate them.

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TECHNICAL RESOURCES

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ofx iOS, http://www.openframeworks.cc/setup/iphone/
ofxJSON, https://github.com/jefftimesten/ofxJSON/

Node.js, http://nodejs.org/
Socket.IO, http://socket.io/
socket.IO-objc, https://github.com/pkyeck/socket.IO-objc/
Express, http://expressjs.com/

Processing, http://www.processing.org/
Processing.js, http://processingjs.org/
jQuery, http://jquery.com/

Arduino, http://www.arduino.cc/
Stino, https://github.com/Robot-Will/Stino/
HRLV-MaxSonar®-EZ4™ , http://www.maxbotix.com/documents/HRLV-MaxSonar-EZ_Datasheet.pdf

Pure Data, http://puredata.info/
libPD pd-for-ios, https://github.com/libpd/pd-for-ios/
RjDj rjlib, https://github.com/rjdj/rjlib/