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UNIVERSITY OF CALIFORNIA  
SANTA CRUZ

**VIRTUAL APPARITIONS, DIGITAL GHOSTS:  
A SCULPTURAL MANIFESTATION OF A SOCIAL NETWORK**

A thesis paper submitted in partial satisfaction  
of the requirements for the degree of

Masters of Fine Arts  
in  
Digital Arts and New Media

by  
**Colleen Jennings**

June 2018

The Thesis of Colleen Jennings is approved:

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Professor Jennifer Parker, Chair

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Professor Edward Shanken

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Tyrus Miller  
Vice Provost and Dean of Graduate Studies

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2018

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## ABSTRACT

*VIRTUAL APPARITIONS*, COLLEEN JENNINGS

*Virtual Apparitions* explores the transfer of identity through networks by examining the physical manifestation of virtual bodies using platforms that support congenial, friendly, romantic, or intimate relationships over long distances. Virtual bodies, including avatars, social media profiles, or video platforms, do not relay intimacy or subtle social cues; however, as technology advances, the gaps between the corporeal and virtual continue to diminish. The work visualizes the extended social network as a physical presence through the use of video, sound, and sculpture. In the cacophony of voices, presence is indeterminable, focus is scattered, and the network pulses with artificial liveliness.

## **DEDICATION**

This thesis research and project is dedicated to my wife, Jen. My positive experiences as a graduate student are predicated on the unfaltering support and dedication you supplied from a distance. The work is also about the unseen relationships that have changed and built me as a person; these family, friends, mentors, colleagues, and associates deserve unlimited praise and have my deepest thanks for helping me in the foundation, encouragement, and creation of this project.



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## INTRODUCTION

My work is based in a multifaceted exploration of virtuality; of information that manifests as an illusion of visual form and the exchanges between physical and nonphysical bodies—between the corporeal and incorporeal. I am also deeply invested in relationships: relationships of the body to technology, of the body to networks, and bodies to other bodies. To be clear, relationships can include my phone sending data long distance through an ethereal network, routing that data into another device, and visualizing it as an incomplete partial scan of my face. These relationships also include my relationship to my phone as a transmitter of the visual and auditory elements of myself to my wife over two hundred miles from me and my relationship to her and everyone else I know over any distance and through any network.

I began this work with an examination of my own body in virtual space. I was deeply fascinated by the amount of data lost in transition, due to both limitations of technology and my persistence in exploiting those limitations for the purposes of art making. It was engaging to be immersed in this elegant metaphor where entropic processes of the body, and perhaps the inner self, are visualized as data loss. I kept returning to these metaphors again and again while contemplating bodies moving through space as data. I came to the Digital Arts and New Media program from across the country, leaving my home in Florida three days after my wedding day. For almost every day that I have been married, I have been streaming my virtual body through a satellite or server farm to the receiving device of my partner. The image of myself that appears on the other end is a projection embedded with disruptions and disfigurements. It is a body that is both similar and dissimilar to my own. I came to think of this transfer of identity as a metaphor for relationships that break down over time and distance; of the body that is incapable of being fully activated through technology. A visualization of this metaphor started to take shape in the form of a sculpture of disrupted and

disfigured bodies. Each piece would serve as the resting place for an individual that I communicated with over a networked distance. It became a kind of exploded social network and self portrait: bodies bouncing between physical presence and virtual presence and my technological inability to achieve both simultaneously. While reflecting on the significance that each person in my network held as an influence and historical marker in my life, I created a series of sculptures that represented my own body as the canvas for their visual influence.

I began physically building the monolithic framework for this exploded social network, each piece milled from a 3D scan of my own face. I contacted a variety of people that have had a profound impact on my life and my work as an artist and engaged them in determining the measure of mine and their relationships to social networks through a casual interview process. One benefit of the work was forcing myself to reignite friendships that had grown stagnant through time and distance. In processing the incredible wealth of input from this formula, I found surprising synchronicities that I refer to as 'moments of liveness'. These minute behaviors lie between actuated performativity in front of a computer or phone camera, thoughtfulness in considering the context of questions, and uncertainty or surety of their responses. It was these moments that became the crux of familiarity, intimacy, and sincerity throughout the experience of the piece. For me, the moments of liveness rebuild some of the connectivity that feels like data lost in the network, briefly allowing bodies to close the distance between the virtual and physical.

This project creates a space for invisible relationships: both the relationships between bodies and technology, and the personal relationships that are embedded in my history. The sculpture is about creating a physical context for these spectral networks.

## FORMAL AND CONCEPTUAL FRAMEWORKS

*Virtual Apparitions* is an investigation of aspects of identity and the relationship of the virtual world to the physical body and identity. Many facets of identity that are associated with our physical body are difficult to translate and perform in virtual spaces and vice versa; specifically, I am interested in the facets associated with mannerisms, bodily communications and facial expressions, intimacy, and familiarity. These features of physicality are complicated to define in physical spaces and present a unique challenge when adapted to virtual spaces. While body representations online are able to personify many physical traits and emotional contexts that present as a form of identity, the physical presence of the body has yet to manifest in virtual space. Virtual bodies and portraits, including character avatars, social media profiles, FaceTime and Skype video chats, do not relay physical intimacy or presence to our physical bodies; however, as technology advances the gaps between the corporeal and incorporeal bodies will no doubt diminish, offering limitless possibilities for bodily alteration, personalization, and exploration. At the forefront of these explorations are artists; experimental engineers, curious scientists, and devoted examiners of innovation. This project has taken critical inspiration through the foundational and intrepid works that sprung from the net art and video art movements. The following passages serve as critical analyses of each of these historical projects and frame my work in a historical and theoretical context.

KIT GALLOWAY AND SHERRIE RABINOWITZ, *SATELLITE ARTS PROJECT* (1977)

As some of the first pioneers to employ satellite technologies as a creative and performative medium, artists Kit Galloway and Sherrie Rabinowitz have garnered well-deserved accolades and attention from many artists who work with telecommunications and networks. Their collaborative experiments established the delayed satellite video image as a differentiated space where a variety of performances can take place. Over the course of several of these performances, each taking place between two locations, the artists experimented with

feedback and immersive environments. Kris Paulsen's book, *Here/There: Telepresence, Touch, and Art at the Interface* examines the intensity of the moment when telematic platforms became available to artists. The Galloway and Rabinowitz are transported to another space that is unlike either location: "The screen does not simply frame or transmit a camera's view; it brings two feeds together to form a space parallel to those it represents, and which does not mirror any single reality [...] It becomes a meeting ground, or as the artists termed it, an 'image as place'" (Paulsen, 2017:27). One of the more important credentials that *Satellite Arts Project* can claim is the successful use of the satellite medium as a platform that invites participation in both directions. Artists Liza Bear and Keith Sonnier's earlier satellite project, *The Send/Receive Satellite Network*, antagonized the conceptual use of these satellite technologies as simultaneous and ubiquitous platforms for collaboration, citing the inherent problems associated with their use as undeveloped technologies. Through a demonstration of "confusion and cacophony," resulting from their two-part collaboration, the artists conclude that the unfounded optimism in the futuristic platform was a premature celebration (21). This conclusion expresses a frustration with the inability to achieve a simultaneous moment across vast distances; to create a space where the body is manifested in two parts of the same whole. Unlike its predecessors—artworks that purposefully examined the inability of these platforms to become the rose-tinted technologies they were proclaimed to be—the *Satellite Arts Project* features collaboration, spontaneity, and delay as a methodology that must be practiced with intention. Galloway and Rabinowitz use the latency of the connection to embark on an intrepid exploration of the body as a fragmented material that experiences time in fragmented moments across space. As well as being interested in the body as a collection of incomplete data through networks, *Virtual Apparitions* also explores the body's experience of fragmented time through these networks. By choosing to retain the expressive quality of the video delays, laggy networks, and disconnecting glitches, my project is more connected and emblematic of the qualities of the interface that it is discussing. These temporal anomalies create a dysphoria of communicative modes; one that we have been experiencing as long as we have been recording messages. Our

experience of these delays is by now well understood and accepted (or tolerated), yet we still express our frustrations at the impracticalities of a technology that transports our messages across space and time. Galloway and Rabinowitz chose to place these frustrations at the forefront of their conceptually-driven project, allowing the technology to express these inherent features while celebrating the discovery of the immaterial body moving invisibly across vast distances. In the vein of this tradition, *Virtual Apparitions* is an experience loyal to the technologies it represents. Like *Satellite Arts Projects*, my work is an examination of the same complex dimension that transported their bodies as data and expanded our comprehension of a previously unappreciated technology. The portraits of friends and family that transcend time and space as part of *Virtual Apparitions* impress upon their audience the impact of this network in their lives: the frustrations as well as the celebrations. Each chuckle of the responsive viewer is an acknowledgment of their role as the recipient of these delayed messages.

ROY ASCOTT, *LA PLISSURE DU TEXTE* (1983)

Roy Ascott's work in exploring telecommunications as a medium for creative meaning-making is impossible to ignore in relationship to *Virtual Apparitions*. His work on *La Plissure du Texte* was an experiment appearing not long after the emergence of the first commercially available network systems. The piece itself was a collaborative effort taking place over twelve days, three continents, and with the contributions of eleven cities. Proposing a global fairy tale, Ascott invited participants to perform the role of a traditional fairy tale character through text entries. In the tradition of the exquisite corpse, the piece took on a life of its own, evolving into a unique narrative in each location as time differences in each city affected the recipients' perception of the progressing story ("LA PLISSURE DU TEXTE," 1983). Ascott's formula provided a distinct approach to collaborations over the network by negotiating time and distance into his equation. He reflects on the power of the network as a collaborative tool in his "Art and Telematics" article published shortly after: "In telematic discourse, meanings are not asserted and consumed in one way linearity, but negotiated, distributed, transformed and layered in multiple exchanges where the authorial role is decentralised and scattered in

space and time” (Ascott, 1984). Ascott is deeply invested in the distribution of meaning as well as the promotion of shared authorship, and thereby more interesting and creative content.<sup>1</sup> In *Virtual Apparitions*, the content is arguably guided, but with a primary focus in generating similar responses from interviewees. Each participant plays an authorial role in the final narrative by contributing a unique response to similar questions. Like *La Plissure Du Texte*, my project requires a coordination of these contributions across time and space: participants are located in various time zones, have unique schedules, and require flexibility in planning appointments. Content from these interviews is spliced together to form a concrete narrative that informs the project’s core concepts. Additionally, the project undergoes iterative transformations based on participants’ input. Ascott comments on the ability of networks to promote this level of congenial exchange: “There is always this sense of community, the presence of your collaborators is all about you [...]” (ibid.). In the process of creating this body of work, I was engaged in a constant feedback state from the input of interview participants. *Virtual Apparitions* is largely successful because of these subtle influences.

NAM JUNE PAIK, *WRAP AROUND THE WORLD* (1988).

Nam June Paik’s orchestrated broadcast *Wrap Around the World* arrived in a moment when satellite television was quickly becoming commonplace around the globe. Premiering one week before the Seoul Olympics, Paik’s monumental undertaking included video contributions from ten countries on nearly every continent. While this surge of recorded performances flowed into Paik’s studio, the artist created video compositions that were then rebroadcasted to participating networks globally. Emulating the spirit of the Olympic games, *Wrap Around the World* was an investment in cultural exchange, traditions, popular culture, and the then-current technologies that bridged these disparate communities. The artist’s dedication to exploring the time-traveling media made possible through the use of satellites is intrinsic to what artist and writer Eduardo Kac describes as his “search for a visual language that suppresses physical space as a function of real time” (Kac, July 1988). Paik’s desire to

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<sup>1</sup> These concepts are discussed in more depth in the Project Concepts section of this paper.

explore connectivity on a global level is also evident in the materials that are included in his project. With a focus in technology as an extension of popular culture, the entire broadcast features performances by relevant and mainstream entertainment artists side-by-side with traditional dances and slice-of-life presentations.



**Figure 1. Screen capture of Dr. Mobius using the telescreen.**

Well known for his earlier satellite works, especially *Good Morning Mr. Orwell* (1984), Nam June Paik differentiated *Wrap Around the World* as a piece meant for a global consumption; one of the first of its kind. His exhibition takes place over the course of 90 minutes. Paik's live video mixing is thematically present throughout the airing, paired with pre-recorded performances and hosting staged by comedy duo Al Franken and Tom Davis. In Franken's mock news coverage of *Wrap Around the World*, an interesting parallel emerges between Paik's convictions of the broadcast's 'liveness' and the narrative enforced by the hosts: a referential motif that includes a face-to-face communication device with which the character



Dr. Mobius witnesses the performances from a distance.<sup>2</sup> The hosts continue to appear throughout the broadcast as magnanimous alien Dr. Mobius oversees the Earth's defense of itself through cultural promotion and human compassion.

Although Paik's work was well received by Eduardo Kac's editorials in Brazil and undoubtedly in many other countries, *New York Times* writer John J. O'Connor describes the transitions of the piece a little more ruthlessly (and with a great deal less imagination):

The program then began jumping from country to country, contending that what was being transmitted was live. Technically, perhaps, yes [...]. There may have been a live hookup to the sources, but in several instances, the transmitted content was clearly filmed in advance (O'Connor, 1988).

O'Connor's disbelief in Paik's narrative reflects a common critique of satellite-based projects during this time and serves to undermine the artist's attempts at claiming the liveness he dares to achieve. While it is irrefutably true that Paik's broadcast is at least partially composed of performances filmed in advance of the airdate, metaphorically Paik's piece is more focused on the final exchange of these performances toward a greater understanding of a popular world culture through the use of cultivated technologies. Similarly, *Virtual Apparitions* relies heavily on prerecorded materials to portray the metaphors of liveness achieved through technology. The sculpture's preliminary focus is contained in the recording of live interactions extracted from my social network. In *Wrap Around the World*, Paik offers the viewer a glimpse into his extended network: into the people and places that create his concept of home. Paik's piece emerges into a Cold War era during the appropriate pre-hype of the 1988 Seoul Olympics. With his own definition of distance in mind, one that may or may not include Paik's long separation from his South Korean home, the artist is, at least according to Eduardo Kac, engaged in untangling the politics of these distances through satellites:

Along these lines one could say that "Wrap Around the World" helps us reinvent human dialogue on a planetary scale; it helps us re-discover the symbolic dimension of the exchange between different cultures and peoples.

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<sup>2</sup> This device and subsequent parody is remarkably modeled after a device known as the 'interocitor' from film classic *This Island Earth*—first released in 1955—wherein an alien race employs the high-tech equipment to communicate visually with Earth scientists. The characters and references here appear intentional on Paik's part as a nod to his attempts at bodily connectivity over a planetary distance and a science fiction future that was rapidly becoming fulfilled by then-modern telecommunications.

Paik's work aims at showing how new technologies, if used properly, can be employed to promote and celebrate cultural diversity and global harmony (Kac, September 1988).

Both Kac's and Paik's optimism for technologies as an instrument for positive exchange in an otherwise non-communicative landscape echoes my own sentiments concerning the use of these modern platforms, albeit on a much larger scale. Through the use of communication mediums that are fictionally caricatured and symbolically embedded throughout the *Wrap Around the World* broadcast, Paik illustrates the abilities of these platforms to form lasting relationships between distant and different peoples. In my own work, this idealism is reflected through the variety of relationships present throughout the piece: each one requires an unacknowledged amount of labor, both emotionally and physically, past, present, and future, to manifest in its final presentation of a body. Much like Paik's featured content, each of these unique and varied relationships is woven together through my own processes of meaning making. *Wrap Around the World* is a display of Paik's relationships to many places and people and the ability of technology to bridge these relationships in both spontaneous and memorialized contexts. For this and many reasons, Paik's work is an inspiration for the vital concepts in *Virtual Apparitions*. Like Paik, I have a stake in the relationships and locations that are featured in my piece. While some of the recorded interviews in my work are deeply connected to an embedded personal narrative, many are relatable contexts that unite viewers and users of these telecommunication technologies. Underneath each frustrated moment, poignant observation, or carefree expression is a deeper yearning for connectivity and inclusion in the broad expanse of humanity.

#### TONY OURSLER (COLLECTIVE WORK).

Tony Oursler's work is collectively focused on faces. The artist is well known for his projected sculptural works where the projection of two-dimensional forms against or on three-dimensional objects creates a distortion of features; an almost uncanny likeness of a not-quite-human face. The artist often pairs the exploration of portraiture with a meditation on technology's role in dissecting and disseminating our bodies into unfamiliar or awkward arrangements. His fascination with the human face is embedded in a historical and somewhat

mythical reading of the face as a signifier for hidden meanings: “It goes back to phrenology and even medieval times, when people were trying to codify the face and connect it to meaning in various ways, of course erroneously, but in my mind they all exist within this same impulse to index humanity and understand ourselves through portraiture,” (Slenske, 2016). Oursler’s sculptures are often humorous, highly characterized, or distorted, giving audiences an opportunity to interact with the pieces by objectively puzzling out their odd behaviors. *Virtual Apparitions* is presented similarly, with audiences that are drawn in by the strange or uncanny behaviors of the projected faces as they are wrapped around a three-dimensional object. As the projected videos embody the still faces, they create a playful tension between the two forms that is characterized by misalignment. Facial features slip around the object languidly, distorting the shape of the projected portraits. The not-quite accurate depiction of the human face creates a perceptible disruption of any illusions about the presence of these projected bodies, forcing the viewer to dissect the context and ascertain the nature of the sculpture in space.



Figure 2. Tony Oursler's *Autochthonous Alien* featured in Eindhoven, Netherlands.

MATTHEW MOHR, *AS WE ARE* (2017).

*As We Are* is a relatively new project by artist Matthew Mohr selected as an emblematic statement of the city of Columbus, Ohio. The project is featured in the Greater Columbus Convention Center as an iconographic testimonial to the diversity of Columbus residents. Featuring ribbon-like LED screens that wrap gracefully around the shape of a fourteen-foot head, the project is certainly eye-catching and inviting. Participants are invited to engage with the sculpture through a small booth at the back of this head where thirty-two digital cameras capture and display their likenesses onto the sculpture's screens. Dubbed by the artist as, "the 'ultimate selfie machine'" (Rose, 2017), the display rotates through a cache of stored faces while active.

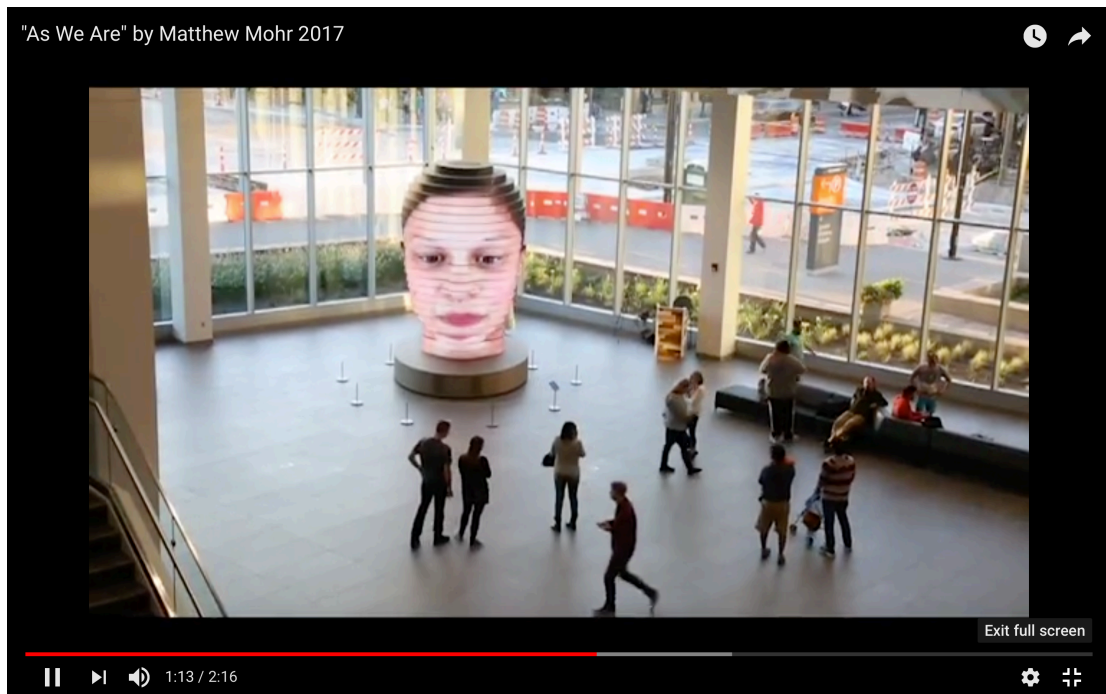


Figure 3. Matthew Mohr's *As We Are* featured in Columbus, Ohio.

Mohr's piece is a celebration of a ubiquitous trend in portraiture; of a 'selfie' culture that is built on the availability and expansion of imaging technology to the masses. Visitors to the piece require minimal instruction or information to perceive the structure's intended purpose. Viewers provide themselves as the muse through which the machine records their likenesses

and escalates their features over the monolithic sculpture. Like *Virtual Apparitions*, *As We Are* is concerned with the sculpture as a placeholder awaiting embodiment. Moment to moment, the sculpture is revived by a physical body that is been recorded from a particular moment in time. The identities of the visitors remain anonymously tied to their features; a small piece in the larger collection. Unlike my project, Mohr's sample social network encompasses every participant to the public space over the length of its presentation. This network is ruled by the visitor's occupation of this inherently physical space. *Virtual Apparitions* in the beginning was conceptually very similar to *As We Are*, offering a ubiquitous tool as the means to record a physical body in 3D space; however, over the course of its development, *Virtual Apparitions* became a more specific sculpture. While Mohr's piece offers a featureless and ambiguous colossal head to support its rotating subjects, *Virtual Apparitions* features my own face (at normal size) as the canvas. This choice is inherently more personal, vulnerable, and engaged with the individuals that provide their likenesses to the work, adding a conceptual layer that speaks to notions of the social network, of private and public relationships, and of my role in these contexts. Mohr's work is driven by representing a large community—and thereby a more ambiguous notion of the exact definition of that community—while my work represents a altogether specific community that is centered around my personal relationships.

In my initial research of artworks that were in conversation with my own work, *As We Are* appeared logically at the forefront: the piece is a giant face with many faces that occupy it over a period of time, it uses 3D portrait technology to recreate a face in three dimensions, and it transforms those faces to reflect a common shape. Conceptually, *As We Are* is very different from my work, removing altogether the artist's role as a participant in the technologies he has provided. My aims in *Virtual Apparitions* is to include and promote myself as an engaged user; a user with risks, uncertainty, and an optimism for the future.

## PROJECT OVERVIEW

### PROJECT DESCRIPTION

*Virtual Apparitions* is a sculpture with projected video. The physical piece is a large suspended, dark wood frame that contains twenty-five individual white sculptures of my own face. These sculptures are constructed from foam and painted a reflective white. Black foam inserts that contain the sculptures within the frame are covered in a light-absorbing felt, creating a dark grid. With added projection, the frame and grid disappear in the darkness and the sculptures appear as brightly, lit but undefined faces. As the video begins, a single moving face fills one of the awaiting sculptures. The formerly indistinguishable face is made alive by the familiar yet unpredictable movements of a face captured in light. The face is accompanied by its voice, making answering declarations to an unheard prompt, meandering through one-sided conversations, or participating in a singular, repeatable moment. As the video continues, other faces are added and subtracted. At certain times, the conversations follow a singular theme that flows easily from one idea to the next in a performance of an involved discussion. In other moments, the voices simultaneously fill the space with laughter. As each moment is completed, the moving portrait disappears and the unfulfilled face is left until all trace of presence is gone from the sculpture. A moment of intense anticipation follows as the viewer awaits coming embodiment.

The mechanics of the artwork are easily described as a video projection onto three-dimensional surfaces. The heights and depths of the faces create a form for the video elements to be cast on, giving an illusion of physical presence. In video editing programs, the video interviews are cleanly trimmed, cropped, and scaled over a two-dimensional model of the sculpture. Through careful planning, building, and adjusting of both the physical and software elements, the video and sculpture are paired as a near-perfect match of scale and

shape. Each video features a group of interview answers or additional moments that circulate and appear for various amounts of time and address a common theme. Because of the similarities in dialog and subject matter, the interviewees appear to have a conversation as words and expressions flow between them. The video lengths vary based on the depth of conversation, between thirty seconds to ten minutes. An intentionally-placed moment of stillness occupies the beginning and end of a given video where every sculpture is cast in white light. A playlist of the videos repeats continuously during the presentation of the sculpture.

*Virtual Apparitions* is an attempt to create a physical impossibility: the transportation of present bodies over networks. This science fiction ideation is never actualized by the piece, but creates a disparate conclusion of its failure to achieve the metaphor. With this in mind, it is impossible to imagine a separation of the physical and projected attributes of the piece outside of documentation. The meaning of the work is deeply tied to the presentation of the meeting of virtual and physical bodies, but the sculpture is built modularly. The piece easily transforms into iterations of larger, smaller, or extracted groups and dialogues. Much like the internet itself, the network of these sculptures can extend across a large space, around corners, and in separated spaces. Additionally, the sculptural surfaces act as blank canvases for explorations in projected content. It is my intention to explore these established themes through adaptations of the sculptural arrangements and continue to reinvent the work over time.

#### PROJECT CONCEPTS

*Virtual Apparitions* engages with networks, bodies, intimacy, artificiality, and identities. Within these broad topics, there is a wealth of preeminent writing and creative work that lays foundational frameworks for my explorations. The project's title is derived from the writings of Vilém Flusser, a journalist and philosopher whose musings on technology, media, communication, and creativity throughout the previous century has garnered significant consideration from media theorists. His short article, "Digital Apparition" was an inspiration

during my early explorations of virtual and physical spaces and mediating the distance between these realities. In the piece, Flusser navigates human perception through the categories that we assign to reality: sight, touch, smell, and taste. It is our implicit trust in these evidential tools that creates a distrust of digital information and declares these spaces artificial or deceptive; an apparition of our physical reality. He draws comparisons between these spaces by making apparent their structures: information taking the form of a cluster of points organized in space to create a material that has implicit rules and can be interacted with through the senses. Through his logic, the material and the immaterial are both deceptions created by the brain to create rules for the brain's extensions; the eyes, nose, tongue, ears, digits, and the computers that navigate through space. "The 'digital apparition' is the light that illuminates for us the night of the yawning emptiness around and in us. We ourselves, then, are the spotlights that project the alternative worlds against the nothingness and into the nothingness" (Flusser, 1996). In researching virtuality as a core concept for this piece, Flusser's article provided a poetic view of the human being as a navigator of the alternative views provided by technological and sensory view. *Virtual Apparitions* does not achieve the realistic likenesses of human bodies, nor is it meant to; but it does achieve what technology—and therefore art—has accomplished in daring to express alternatives to reality and to the physicality of human bodies. Artificial intelligence researcher Marvin Minsky wrote in 1989, "We are entering a new century in which you are connected to the world, to the virtual world. And much more intimately than you are connected to the real world... Our connection with the real world is very thin, and our connection with the artificial world is going to be more intimate and more satisfying than anything that's come before" (Minsky, quoted in *SF Camerawork* [Spring-Summer 1993]: 4). Minsky's prediction paints a dramatic declaration of the extents to which we are captivated and held captive by virtual reality. His support of this intimacy with technology follows on the heels of a newfound era of love for the machinic network that makes possible human connectivity on a global scale. Through the interfaces built to extend our engagement with other humans across the planet, Minsky highlights a movement toward an embrace of the intimacies offered by these technologies as opposed to



intimacies offered by the 'real world'. In my own work, the undulating line between physical and virtual embodiment becomes a discursive argument for an embrace of this technological intimacy. Relationships with these virtual bodies fulfill a growing cavity created by distance and time with physical bodies. Much like my own work, artist Roy Ascott became interested in these networked relationships while building artworks engaged in global interactivity. His 1984 essay on the topic, "Art and Telematics: Towards a Network Consciousness" establishes a plethora of important concepts that address my broader aims in *Virtual Apparitions*, including the use of networks as non-present yet congenial platforms for communication:

A new user coming on line even for the first time senses a connection and a close community, almost intimacy which is quite unlike initial face to face meetings. For anyone not involved in networking, it is probably hard to imagine how a computer-based medium could possibly be convivial and friendly, or how indeed working at a data terminal could lead to interconnections between human beings at any real level of meaning at all (Ascott, 1984).

This interesting narrative pointedly describes two experiential possibilities in our use of non-bodily communication; the first being our predetermined assumptions of the impersonal or artificial nature of interactions using communicative technologies, and the second being the underestimation of the depth of meaning that communications over a technological platform can convey. My interest in this research was initially an exploration of bodily and non-bodily expressions; minute moments of shared understanding, subconscious affect, or physical features resembling a body. The body, bodily communication, and facial expression that is transferred through networks is not the same as a present, physical body or face, but is an expression of a body regardless. Ascott's article was written at a moment when the expanse of technology very rarely included face-to-face telecommunication. The platforms in which my research is focused frames these bodies through the applications of video chat: the visible face is transformed into data that traverses electrical wires and radio waves, is catalogued into pixels and render speeds, is filtered through expressions of text and numbers read at inhuman speeds, and is displayed as light pulsating at a rate adjusted for our eyes from a screen. In this engagement, we regard the being on the other end of this exchange to be composed of a body while ignoring the total sum composed of interferences that create a

human face with which we engage. Many media theorists claim that these bodies and interference are part and parcel of the same whole being stretched over physical and virtual spaces. These intensely complex networks expand our concepts of physicality and barriers, extending across dimensions with which we are ultimately unfamiliar. Professor N. Katherine Hayles observes this modern transition of the body into a post-technological state: “[...] the posthuman implies a coupling so intense and multifaceted that it is no longer possible to distinguish meaningfully between the biological organism and the informational circuits in which it is enmeshed” (Hayles, 1993:80). Hayles is well-regarded for her mediations on posthumanism, the transitional state implied by these blurred lines between embodied and disembodied humanity. Media theorist Marshall McLuhan’s famed book *Understanding Media: The Extensions of Man* portents this eventuality through technological engagement:

In this electric age we see ourselves being translated more and more into the form of information, moving toward the technological extension of consciousness. That is what is meant when we say that we daily know more and more about man. We mean that we can translate more and more of ourselves into other forms of expression that exceed ourselves (McLuhan, 1964:69).

As a researcher interested in these translations of the body into varying forms of information, McLuhan’s statement became a kind of mantra to begin exploring notions of the virtual body. Unlike traditional sculpture, my portrait bust moved invisibly from my body, to my mobile device, to a cloud storage file, to my computer, to a software, and eventually to a rapid prototyping machine. While arguably disconnected from the physical act of constructing a sculpture, the tools my process utilizes bear no remarkable differences from a chisel; as an artist I am physically engaged with tools that likewise result in a physical sculpture. These tools were manufactured by a human enterprise and reinvented until they performed a specialized role. McLuhan’s statement makes plain the roles that technology, whether visible or invisible, plays as an extension of our capabilities. Like nerve endings, neurons, and fingertips, the network is another realization of the brain moving past the bony barrier of our physical body. Roy Ascott begins to imagine the possibilities of human networks as artworks in themselves: “In this sense art itself becomes not a discrete set of entities, but rather a web of relationships between ideas and images in constant flux, to which no single authorship is

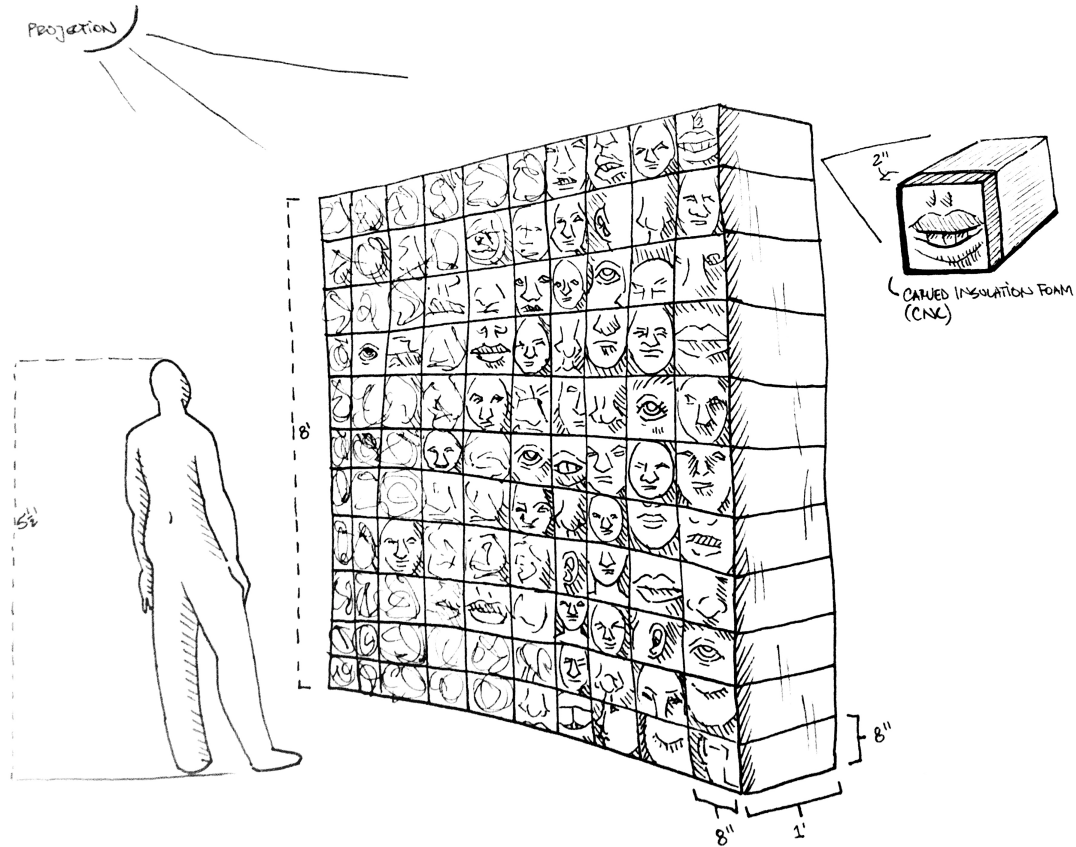
attributable and whose meanings depend on the active participation of whoever enters the network” (Ascott, 1984). This is a concept I want to explore in the future of *Virtual Apparitions*: adding a layer of meaning to the work by building a system that continues an examination of networks from my initial build. I have predilections for the eventual overshadowing of my own network beneath the tide of networks that grow from its base form. These future aspirations are explored more deeply in the conclusion following this section. Ascott continued his explorations of the budding romance between telematics and art in his 1990 article “Is There Love in the Telematic Embrace?” In his assessment of this relationship, Ascott contends the artist’s role as meaning-maker in the traditional sense, instead giving this power to the system itself: “Meaning is the product of interaction between the observer and the system, the content of which is in a state of flux, of endless change and transformation” (Ascott, 1990:241). He suggests that this state of constant exchange, with signals passing from end to end within milliseconds, is in itself the artwork. While we might assume that creative authorship is therefore in decline, Ascott later defends his logic by cultivating an argument for shared creativity with emphasis on individual authenticity in the collective. In this utopic and democratic network of communal authority over meaning, the artist is inundated with opportunity and creative vitality (243). In *Virtual Apparitions*, the medium indeed became the essence artwork. Through the cultivation of recorded face-to-face interactions where interconnectivity as both a success and a failure is theatrically addressed and displayed simultaneously, the artwork generated meaning that required minimal explanation. An audience all-to-familiar with the interfaces of these platforms understood innately that they bore witness to a ubiquitous network. While my scripted questions guided interviewee responses to participate in a dialogue alluding to the network that they actively participated in, authorship of the content was arguably a shared effort and only minimally altered before it was applied to the final sculpture. Ascott’s lifelong embrace of the telematic phenomenon dared to describe communication networks as not just effective, but intimate in their varying interfaces. This testimony is my shared experience while experimenting with the types of mediums that Marshall McLuhan predicted and Roy Ascott promoted. As a future technology,

face-to-face network communications were perceived as akin to communicating with a lifeless, empty room. Currently, these technologies are offered through a wide variety of software applications and are more commonplace than a checkbook. There is a vitality of communication altogether separate in these networked exchanges that provide for fathomless creative explorations of intimacy present in virtual space and through endless networks.

## PROCEDURES

In its beginnings, this research body was focused on a variety of potential topics associated with processes of current rapid prototyping technologies, including 3D modeling softwares, 3D printers, and laser cutting. Driven by a desire to capture the body as information existing between physical and virtual, I began my research with explorations of the body as defined by a 3D scanner. This commercially available scanner, known as the Bevel3D, is a small device that uses laser scanning and image capturing to create a textured likeness of the face. These likenesses are saved into the memory of a mobile phone where they can be uploaded to the web and downloaded as a variety of file types. This inexpensive piece of hardware is limited in its capabilities; scans are often riddled with incomplete surfaces, rough textures, and holes. While using the Bevel3D, I purposefully took advantage of its shortcomings to explore the inaccuracies captured in representation and began to catalogue these damaged models in 3D printed form. Through the use of this small scanner, I found inspiration in exploring identity as incomplete or improperly formed data. I continued my research in larger forms, building large damaged faces in laser cut plywood. With aspirations to catalogue a variety of faces and identities, I formed a thesis concept that aimed to capture and sculpt the likenesses of the faces that were dearest to me. My proposal was to create a sculptural network that showcased the faces of my family and friends as moving figures. Focusing on different elements of each face, these sculptural portraits would form a collection of individual, partially-constructed pieces that would form a Frankenstein-like whole. By focusing on the face as small parts of a whole, the resulting sculpture intensified the uncanny representation

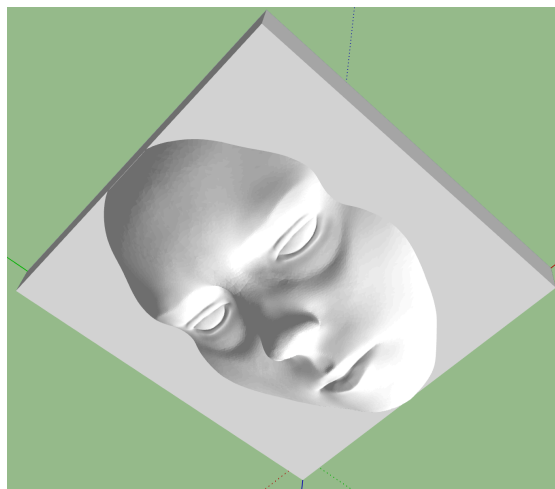
of each face; a kind of amplified monstrosity presenting on the behalf of the aforementioned technological implements that failed to accurately depict the face as a whole.



**Figure 4. Initial proposal of one hundred small, individual sculptures.**

While the thematic elements of this project underwent some adjustments over the course of its implementation, a resolute building process was quickly established after the initial proposal. The sculpture followed a pattern of modularity that allowed for adjustments to the final size and scope of the project. At the advent, I had proposed a modest set of one hundred partial faces or facial elements to build the network wall. Each sculpture would contain part of an individual with video projected onto the surface. The construction of the wall would manifest as a matrix of ten by ten stacks carved from insulation foam. Each piece would be dimensionally identical, allowing for variety in placement. To build the pieces, I relied on computer-aided machining (CAM) processes.

Although my initial proposal included realizing the likenesses of one hundred faces, the reach of the equipment proved less lofty. Capturing and building the faces of these individuals was an important element to recreating the individual's identity across the networked distance, but was creating considerable logistical issues, including the modeling and manufacturing of over one hundred 3D models. These individuals were and are only available to me through the use of networks or at extremely limited intervals. This element of the project was already the central topic of contention and inherently obscured my role as the distant recipient of these relationships. Unable to capture the proposed faces of my relationships, I contended with a conceptual reworking of my proposal. It occurred to me that the inability to achieve their physical presence was a deeply embedded theme in my presentation of this project. With a library of my own likeness in 3D form at my disposal, I adjusted my proposal to reflect a wall comprised of my own face as the surface on which other important people had reflected. This metaphor ultimately became the framework for the entire piece. Through this approach, my design of the surface simplified into a flattened, softened, and symmetrical presentation of myself. Using this adjusted model, I programmed the carving of the face tile in CAM software.



**Figure 5. 3D model of the artist's face as a projection tile.**

The resulting artifact from this process is a time map of machine movements known as g-code; a programming language that instructs a CNC to perform a rough cut of the model followed by a separate refined cut. In choosing what process to create the forms, there is

another layer of conceptual depth that applies to the sculpture. There are many methods that create a final sculptural form, including additive and subtractive. By choosing to use a milling CNC, the form is approximated through the subtraction of surface material using code; similar to the process that an image undergoes while traveling through a network. Through the use of a milling CNC, the model was carved into layered insulation foam tiles. Initial cuts were four or more hours of cutting time. After these test cuts, the model was adjusted to perform both processes within an hour and forty-five minutes. The overall success of cuts varied, with errors resulting from machining, material, and artist. After cutting, tiles were sanded, repaired, and painted. During the sculpting process, faces were often repaired with spackle or carving tools before receiving two coats of projection quality white paint. Much like the individuals that would embody these sculptures, each face tile behaved as an individual, had a variety of flaws, was given a designated number (in order of creation), and bestowed a glamorous title to officiate its creation.

The framing of these tiles required a careful consideration of the tile materials: the sculptures are easily damaged and required an impermanent housing fixture. The frame would also need to be easily adapted to quickly accommodate a change in population. While the sculptures are meant to reflect bright light, the framing device would need to be undetectable in these conditions. Additionally, the frame would need to bolster the tiled sculptures at eye level or higher in midair. With these concerns in mind, a frame was built from wooden planks with embedded structural supports. The grid followed suit, constructed from a more flexible black foam core board and layered in a light-absorbing adhesive felt. Once finished, metal shackles installed into the structural supports of the frame were attached to wires strung into the ceiling and floor. Tiles placed within the frame were adjusted for size but held in firmly by the frame. A black felt was used to cover the backside of the frame.

While the physical attributes of the piece were built, the collecting and editing of projected video also occurred. During this time, many of the conceptual strengths of the final sculpture were realized through the interactions taking place virtually. At the outset, a list of contacts

was created with names, categories of relationships, and interview questions that related the exchanges to my project interests. Ten questions were used initially, each with a focus in either social media, distance, or general relationships. Questions were intentionally built to incite a predicted response: one of thoughtfulness, sentimentality, or playfulness. Often, interviewees responded similarly with answers that were easy to categorically build into a dialogue through the editing process. The original ten questions were amended to fifteen at the midpoint, reflecting a lack in the range of emotional responses and my desire to accurately depict the depth and meaning of these relationships. The frequency of questions asked was documented to create variety for respondent answers. I self-encouraged outreach to a wide range of relationships, including frequent or infrequent contacts. Infrequent contacts were an equally important aspect of the project, proposing that networked relationships could be based in a professional, non-familial, but a nevertheless vital and intimate category.

Each interview lasted between two to seven minutes, with interviews consisting between four and six questions. Respondents were encouraged to ask questions and engage with the context, but I restricted my overall interactions to focus on their answers. Over the course of this process, I relied on both FaceTime and Facebook messenger and video chat to engage participants. These platforms were fruitful for a variety of reasons, most importantly allowing participants to engage with facial filters popularized by facial recognition softwares. Interviews were conducted over wifi signals that varied in bandwidth strength. This was intentional; the resulting videos were filled with expected glitches, including interruptions, stalls in video feed, broken images, and audio discrepancies. These glitches were kept in the final edits as a testament to the platforms that created them.



NAME	Relationship	Video	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Cheyenne M	Associate	✓	1/28 PM	x						x	x	x	x					
2 Eliza E	Associate	✓	1/30 PM	x	x					x	x	x	x					
3 Sara O	Associate	✓	1/24 PM	x	x	x	x				x							
4 Meredith H	Associate	✓	4/12 PM	x	x								x		x	x		
5 Sarah C	Associate	✓	2/6 PM	x	x	x	x						x					
6 Thomas A	Colleague																	
7 Sara G	Colleague	✓	1/29 PM	x	x					x	x	x	x					
8 Marge K	Colleague	✓	1/30 PM	x	x	x	x	x						x				
9 Ann A	Colleague	✓	3/25 PM	x	x									x			x	
10 Katie G	Colleague																	
11 Arthur D	Colleague	✓	2/6 PM	x	x									x				
12 Parul W	Colleague	✓	3/26 PM	x	x										x		x	
13 Shaun P	Colleague	✓	2/5 PM	x	x	x	x											
14 Rachel B	Family	✓	3/31 PM	x	x													x
15 Bart J	Family	✓	3/31 PM	x	x													x
16 Grace J	Family	✓	1/21 PM	x	x													
17 Bart J	Family	✓	1/21 PM	x	x													
18 Dorotha J	Family	✓	3/31 PM	x	x													x
19 Bobby J	Family																	
20 T.J. T	Family	✓	1/21 PM	x	x	x	x											x
21 Rebecca S	Family	✓	1/29 PM	x	x													
22 Jessica K	Family	✓	1/27 PM	x	x													
23 Aaron R	Family	✓	4/11 PM	x	x													x
24 Lorrie R	Family																	
25 Laurie W	Family																	
26 Doug R	Family																	
27 Theresia R	Family																	
28 Stuart M	Family	✓	1/29 PM	x	x													
29 Sarah H	Friend																	
30 Heather C	Friend																	
31 Julie G	Friend	✓	1/30 PM	x	x													
32 Jordan A	Friend	✓	1/21 PM	x	x													
33 Laura M	Friend	✓	3/26 PM	x	x													
34 David M	Friend	✓	3/26 PM	x	x													
35 Blaise M	Friend	✓	2/15 PM	x	x													
36 Emily N	Friend	✓	1/21 PM	x	x													
37 Jane H	Friend	✓	2/5 PM	x	x													
38 Katherine R	Friend																	
39 Jessie P	Friend	✓	1/21 PM	x	x													
40 Jamie Z	Friend																	
41 Arlice M	Friend	✓	2/15 PM	x	x													
42 Claire M	Friend																	
43 Kane T	Friend																	
44 Shauna W	Friend	✓	2/6 PM	x	x													
45 Adam V	Friend	✓	3/6 PM	x	x													
46 Emma S	Housemate	✓	1/21 PM	x	x													
47 Matthew B	Housemate	✓	1/21 PM	x	x													
48 Carinne K	Housemate																	
49 Jennifer R	Partner	✓	1/21 PM	x	x													
50																		
		35		35	17	16	19	17	15	13	16	13	11	3	5	2	2	5

DISTRIBUTION	Use
Associates	5
Colleagues	8
Family	15
Friends	17
Housemate	3
Partner	1
<b>TOTAL</b>	<b>49</b>

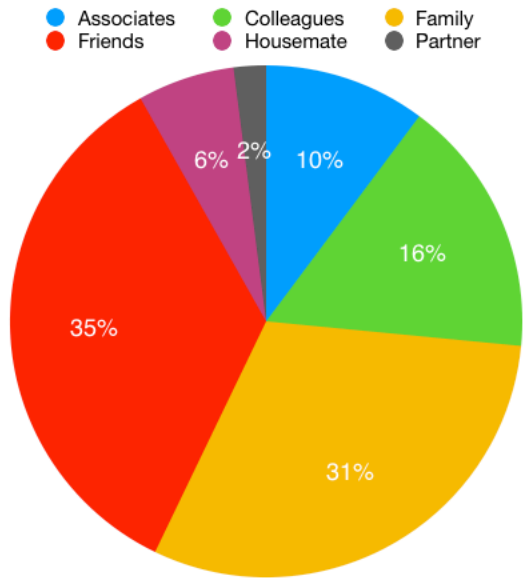


Figure 6. Spreadsheet with interview contacts, details, and distribution of relationships.

Figure 7. Chart of interview questions and distribution of questions.

Using a video software, the interviews were edited, separated by question or topic, and my audio erased from the final rendered video. Through this undertaking, I came to several

	QUESTIONS	Use
1	Who is the most important person/people you stay in touch with through social media?	35
2	How far away is that person from you (hours or miles)?	17
3	How would you describe that relationship in one word?	16
4	What is an example of content you share with these close contacts?	19
5	How often do you see or visit this relationship in person?	17
6	If you could talk to anyone right now, who would it be?	15
7	How far away from your hometown do you live (hours or miles)?	13
8	What is something you like or dislike about communicating over social media?	16
9	Do you use social media at a certain time of day? What time/for how long?	13
10	What does this interaction feel like?	11
11	Do you experience difficulties in communicating over face-to-face video? What are some examples?	3
12	How long have we known each other? How did we meet?	5
13	What is the most recent real, strong feeling or emotion you've experienced? Was it associated with a person, place, or thing you can describe?	2
14	Through the use of social media, have you ever experienced feeling left out, lonely, or ignored? You can generalize or describe a situation.	2
15	What general mood best describes you while using a social app? Is it a different mood between Facebook, Instagram, Twitter, Snapchat, FaceTime, etc.?	5

conceptual realizations: primarily, that my disembodied voice in the conversations refused to promote my intentions. Secondly, that the moments I had intended to capture were eclipsed by the moments I unintentionally captured. These moments were referred to as the 'moments of liveness,' and special care was taken to collect and give spatial attention to these unexpected successes. A black mask resembling the grid that existed in physical space was created to partition the videos in the software. This grid was filled with a template of 2D images representing the face tiles while edited video elements were placed, cropped, and sequenced thematically. Original audio recordings were problematically varied, so audio levels were adjusted to equal levels before final video renderings. Once rendered, each video

contained a singular topic addressed by each video participant, arranged sequentially to imitate conversations. Collected into a playlist, the videos were transferred to a stationary computer that fed the video data into a mounted projector above the sculpture and the audio feed into a speaker positioned on the floor beneath the sculpture.

With the physical and nonphysical elements resolved, the final sculpture was complete. The piece was left in a looping state while on display, with projection and audio disconnected during closing hours. Audio was adjusted each day to compensate for exhibition activities. Deinstallation of the sculpture was incredibly smooth and quick.

#### GOALS & OUTCOMES

*Virtual Apparitions* succeeds in the fleeting combination of various aspects of intangible bodies. Through these pairings, the sculpture is brought into faux embodiment in a context that can only be achieved through the meeting of the physical and virtual. Outside of this context, whether in digital forms or through the augmentation of one or both of these parts, the sculpture loses its meaning. Within these restrictions, the sculpture is surprisingly versatile and adaptable to a variety of spaces. *Apparitions* was created with a focus in modularity so that alternative presentations could be achieved. Each facial sculpture is a successful standalone object capable of embodiment through the use of projected video. In the iteration of the project presented for this thesis, the totality of the object is an entire grid of twenty-five individual sculptures. The intentional reading of this piece is as a catalogue of individuals that I know; an sample group of an entire social network. Through the separation of this grouping, other contextual meanings can be explored in depth, longer conversations experienced, different pairings or complex arrangements formed, and other performances examined. Additionally, creating a micro view of the sculpture will achieve a concentration of themes that are more difficult in the larger arrangement: themes of intimacy, familiarity, proximity, affection, and contemplation. By allowing the sculpture to become malleable, other moments, other relationships, and other topics can be inspected more closely.

**Figure 8.** *Virtual Apparitions* displayed during the exhibition.

*Virtual Apparitions* is an undoubtedly physical sculpture. Through the examination of embodiment, the faces necessitate a viewer to experience the sculpture in 3D space. The



sculpture in its current iteration will loop through the entire playlist in less than twenty minutes. In that time, I have personally seen viewers who participate between 2-5 minutes each, often returning to the piece after walking through the exhibition. An audience is usually most interested in the distortion of moving faces across the still sculptures with some enraptured by the flow of audio conversation. The sculpture is intentionally direct, with captured bodies that present the audience with eye contact and verbal engagement. Some even present empathy to their audience, expressing sadness, confusion, and laughter.

## REFLECTIONS

*Virtual Apparitions* enjoyed phenomenal success at its presentation in the MFA exhibition. Over the course of its debut, I witnessed viewers that spent moments of still contemplation in front of the sculpture listening patiently for the piece's content, viewers that explored the physicality of the sculpture by stepping behind and around it, some viewers who were entranced for mere moments while a chorus of 'umms' or laughter avalanched through the previously stone-still faces, and viewers who innately understood their place in this sculptural puzzle while taking selfies among the projected faces. Most often, the dynamism of a sudden wave of spontaneous laughter spurred an audience to laughter alongside the projected faces. While the sculpture was on display, I was engaged by viewers who wished to learn more about the content and people on display. With each, they shared with me a similar situation where they found themselves separated from those they loved, felt time and distance change or destroy their friendships, or meditated on relationships that no longer existed. I was grateful for every meaningful story and expression of understanding that reignited my passion and inspiration for this work.

It may be important to note that some of the bodies in this space bore witness to their own virtual portraits in the piece. Their expressions at being on display for a work that discussed distance while being in close proximity were understandably varied. Of these, a few were delighted to see themselves unnaturally distorted and projected onto an unfamiliar face while others felt somewhat overly conscious of their frequent appearance. Why choose to include faces that found themselves within proximal distance of the sculpture? While some felt that a great illusion was uncovered by this fourth wall faux pas, I unerringly felt that their inclusion was an addition to the future of this body of work. The social network that sustained the concepts of the piece encapsulated a 4th dimension: the past, present, and future of my

relationships. The uniqueness of this pinnacle moment in my life was expressed through the inclusion of relationships that are currently physical but that will quickly become virtually networked. In many ways, this piece captures a very specific timeline of my own network; a virtual and technological time capsule.

This time capsule concept continues to drive the future implications of this body of work. *Virtual Apparitions* can easily become an endless project that takes place continuously over many years. Each iteration would capture a specific moment in time, borrow from previous content, and expand into other realms of possibility. In this way, the network expands from the initial set as relationships are concurrently built, changed, and lost. With the evolution of the project, the content of these relationships also naturally changes. Seeking out the serendipitous 'moments of liveness' is a challenge to both scripting the content and retaining its flexibility. While the virtual sculptures are expanded to include newer content and newer faces, the physical sculptures experience change in other ways. As reflections of my own portrait, these pieces represent an identity that is partitioned between each relationship. These can be altered to reflect a particular moment in more metaphorical and physical contexts. Perhaps in some future arrangement, the faces are separated by space, face each other in conversation, or are found in piles on the floor. Perhaps the discussions are more poignant, specific, or emotionally driven; maybe they are completely fantastical or nonsensical with music, singing, ad lib, or quiet sighing.

As a practice, this work has evolved into something of a responsibility: to not only the work, but to the family, friends, and relationships who participated or will participate. This monument serves as a testament to them and to many others living in the conditions of the present moment, where presence is more often streaming through the network than over an afternoon coffee. This project dares to add a shape and texture to this invisible connectivity; a shroud of playfulness and affection over the ambiguous autonomy of the spectral tele-network.

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## **APPENDICES**

### APPENDIX A: ACRONYMS, TECHNOLOGIES, MACHINES, AND SOFTWARES

#### **Adobe CC After Effects**

Motion graphics program. This program was used to build final projected video and audio using a combination of vector images and edited video.

#### **Adobe CC Illustrator**

Vector image software. This program was used to create proposal images as well as a final grid layout and mask for the projected content.

#### **Adobe CC Premiere**

A video editing software. Premiere was used to edit initial interview materials into segments and repair audio elements.

#### **Autodesk Fusion360**

A 3D-modeling program that is easily adapted into CAD and CAM projects. The software is available to students and academics for free. This software was used to build parts of the 3D model used in the final sculptures.

#### **Bevel3D**

A commercially-available and inexpensive 3D scanner that easily attaches to a mobile device through an audio output (headphone mini jack) port. The hardware captures scans through a combination of laser-scanning and camera images to create a full-color 3D scan of an object, although it is more inclined to capture faces.

#### **CAD, CAM**

Computer-Aided Design and Computer-Aided Machining, respectfully. These broad definitions encompass a variety of softwares, tools, and machines that work in 3D environments and create 3D models. While CAD programs are primarily focused in building virtual 3D models, CAM programs are used to create models in physical space, encompassing physicality and materiality in the final output.

#### **CamBam**

CamBam is a CAM design software that exports G-Code, among other things. The software was used to export the final model to the CNC as a rough cut and refined cut. In each case, the software exports two codes that are inscribed with the tool specifications, material qualities, and tool paths for the machine.

#### **CNC**

An abbreviation of Computerized Numerical Control. This automated process uses pre-programmed coding languages to implement a sequence of actions. A router follows these instructions step-by-step to cut and shape materials by moving in 3-dimensional space.

### **DARC**

A building within the University of California, Santa Cruz designated for the use of digital tools and resources. The building serves as the primary studio space for Digital Arts and New Media graduate students as well as a multitude of other undergraduate and graduate programs in the Arts Division.

### **G-Code**

A numerical control programming language. Used in CAM, CAD, and CAE processes to instruct machines in the manufacture of 3D objects.

### **G-Wizard**

This software calculates the 'feeds and speeds' of the CNC in combination with the material that is cut. 'Feeds and speeds' describes the rate that the mill will cut through material, plunge into material, and move materials on the CNC bed. These values are then input into a partner software to export G-Code.

### **FaceTime**

An audio and face-to-face video conferencing software available in mobile, home, and commercial platforms. For the purposes of this project, the software was used to initiate and record interviews.

### **Facebook Messenger**

A messaging platform that is enabled for face-to-face video. The software was an additional tool used to initiate and record interviews. This software has the added benefit of allowing users to use video filters that additionally personalize their representation in the final project.

### **Finish Cut**

The finish cut (or refined cut) is used to cut the material as close to the original model as possible after the rough cut. The finish cut generally takes longer, is slower, and uses a different bit than the rough cut.

### **Milling Bit**

Milling bits are the tools that the CNC uses to cut and clear away material to create the final model. These bits have a variety of uses, shapes, and designations depending on their output and require careful attention to speed and utility. Two bits were used to sculpt the model: a four-flute, quarter-inch end mill and a two-flute, quarter-inch ball end mill (or ballnose). These bits are selected for each cut based on the footprint of their cut.

### **Rough Cut**

A rough cut is used during machining processes to remove a majority of the material before the finish cut. Although the rough cut moves more quickly over the material and

cuts faster than the finish cut, the cut (in this case) takes twice as long as the finish cut. The rough cut for this project utilized a different milling bit than the finish cut.

### **Sculptris (or ZBrush)**

A 3D-modeling program that allows users to freely sculpt and build models using intuitive art-making tools. Sculptris is the limited, but free version of the software ZBrush. In this project, the software was used to repair, soften, and shape the 3D face model created using the Bevel3D before placing the model in Autodesk Fusion360.

### **SketchUp Pro**

A 3D-modeling program used in conjunction with Autodesk Fusion360 in building and manufacturing the final 3D model before moving to other CAM softwares. SketchUp is a purchased software.

### **Tormach CNC**

A brand of CNC machines. For this project, final sculptures were cut on a Tormach CNC 770 Mill available in the DARC prototyping lab from glued sheets of insulation foam.

### **QuickTime**

Quicktime is a video software that records computer screen, webcam, or audio content and plays video or audio content. In this project, the software was utilized to record face-to-face interviews.

## APPENDIX B: LINKS TO PROJECT DOCUMENTATION

### **Web Blog Documentation of Project**

<https://www.colleenjenningsart.com/updates/mfa-thesis-project-and-exhibition-ucsc>  
<https://www.colleenjenningsart.com/updates/moar-thesis-updates>

### **Vimeo Documentation of Project**

<https://vimeo.com/colleenjennings>