The Emotional Potential of Personal Messaging in Immersive Mobile Virtual Reality Environments

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TABLE OF CONTENTS

PROBLEM STATEMENT

Correspondence and communication have existed for millenia and have taken many forms. Words have been exchanged by voice, cave painting, hieroglyphics, written letters and text messages. Communication is fluid, and as our world evolves to accommodate technology such as virtual reality, how we correspond will ultimately evolve as well. Regardless of its progression, correspondence is a vital part of human life. Mobile digital devices, through email, text, or other personal messaging, facilitate much of our present correspondence. However, they are constrained by the two dimensional screen. These constraints limit the conveyance and translation of dynamic qualities and visual cues that may be found in other forms of communication, such as the expression of emotion, which is an essential aspect of social interaction. Because virtual reality employs largely multimodal, sensory and immersive experiences, implementing it as a personal messaging medium could create an arena in which users design dynamic, emotive experiences rather than traditional typed messages. Messaging then transforms into a form of dialogue that is dynamic, emotive and poetic—something that can not only facilitate, but also enrich emotional expression and connectivity in an age of digitally mediated communication.

JUSTIFICATION

IMPORTANCE OF EMOTION

People communicate for innumerable reasons. Whatever the reason, social interaction within cultures relies heavily on the ability to express and react to emotion (Yavuz, 2016). The ability to do so is an imperative part of human behavior and communication. When a person is engaged in face-to-face correspondence, many factors aid in the communication of a person's intended message. Physical environment, tone of voice, facial expressions, body language, etc., are all ways of interpreting and expressing meaning and emotion. "Every communication medium has a different 'affective bandwidth level' varying on how much affective information it is able to transmit (Picard, 1997, cited in Yavuz, 2016)." However, digital personal messaging lacks these important visible social cues, creating personal messaging that, ironically, is not very personable.

Because messaging often lacks that face-to-face experience, emotional intent often relies on the use of other means of expression such as visual metaphor and hyperbole. Tools such as emoticons, memes and GIFs have been incorporated into personal messaging in attempts to facilitate and translate meaningful and personable conversation. However, even these methods are constrained by the static quality of a 2D screen.

WHY VR?

Virtual Reality is primarily considered to be an alternative reality; an immersive experience that can transport and transform its viewer. Just as there is no one paradigm for experiencing physical reality, there is no one paradigm for experiencing the virtual (Kelly, Heilbrun, and Stacks, 1989). This makes VR an intriguing and viable prospect in the realm of communication and correspondence. Whereas traditional messaging is often comprised of two-dimensional qualities, VR exemplifies many modes of communication.

In physical reality emotion is perceived by sensory characteristics (such as environment, gesture, movement, etc.) that are not always present in contemporary personal messaging. Communication in VR, however, allows messages to embody some of the characteristics that physical communication employs even if physical communication is not possible or desired. The ability to represent space is a particularly exciting facet of VR communication. Spatial qualities such as perspective, depth and distance are integral parts of communication and emotional comprehension and in a VR environment, users have infinite space, dimensions and perspectives to express or empathize with emotions.

Virtual Reality is also a very immersive medium in that it occupies the user's entire field of view and actively engages them in the environment. This is especially beneficial in correspondence and the portrayal of emotions because it diminishes outside distractions, capturing the user's full attention. This immersive nature affords another strength of Virtual Reality: its ability to create a sense of presence that is often defined as the "sense of being there" (Riva, 2007). A "sense of being there" also creates an environment with the potential of inducing empathy. Experiencing emotion is directly connected to presence. Studies have shown that when there is a high level of presence there is a higher level of emotion and vice versa, suggesting Virtual Reality to be an effective medium for emotional elicitation and expression (Riva, 2007).

DESIGNING EXPERIENCES VS. MESSAGING

Positioning messaging within Virtual Reality creates a paradigm shift in how and why messages are perceived. Because VR creates a platform for communication that is potentially more reminiscent of a physical environment, messaging in its conventional sense becomes moot. Traditional forms of messaging are primarily, in linguist J.L. Austin's terms, "constative utterances," simple reports on reality. Messages in VR have the opportunity to become more "performative" in nature, where the message itself becomes part of completing an action (Austin, 1976). Users begin communicating by creating experiences for one another. Experience occurs continually in life. However, philosopher and educator John Dewey defines an integral experience as being a singular occurrence, something that is completed in a satisfactory way with its own beginning and end, the result being not only an intellectual one, but emotional as well (Dewey, 2005). Therefore, a "message" sent or received in Virtual Reality can be categorized as crafted and singular communicative experiences between users rather than mere messages.

RESEARCH QUESTIONS

How can the design of multimodal experiences within immersive virtual reality facilitate poetic and emotive personal messaging?

SUB-QUESTION 1

How can the affordances of a mobile VR environment aid in the expression of emotion and the promotion of empathy?

SUB-QUESTION 2

How can aspects associated with traditional messaging be translated and adapted for a message in virtual reality?

SUB-QUESTION 3

How does the incorporation of dynamic properties such as motion, scale and perspective inform the design of personal messaging in a dynamic virtual environment?

LITERATURE REVIEW

MULTIMODALITY

Dual Coding Theory and the Mental Lexicon

Language and communication are multimodal and multifaceted (Serafini, 2011). Sign systems—systems of meaning that determine the ways in which information is communicated and interpreted—exist in every culture (Geertz, 1983). Often when people correspond they are using a combination of systems and modes. According to Dual Coding Theory the human mind operates using two different components, one for interpreting and remembering linguistic material and the other for pictorial material. While separate, they interact frequently (Sadoski and Paivio, 2013). For example, a word is stored in the verbal system while an image is stored in the image system. If a word triggers a certain correlating image, the linked material is stored in both systems. When a piece of information is stored in both systems it is more likely to be remembered, suggesting that when words and images are combined, it promotes understanding (Sadoski and Paivio, 2013). There is also indication that there is a relationship between mental imagery, emotional response and interest while a person is reading.

TEXT & IMAGE

The written word, whether via handwritten prose or text message, is a representation of verbal language, a sign system. Words are used as icons and symbols to embody the item, emotion, scenario, etc., that cannot be indicated otherwise (van Leeuwen, 2006). When written text is encountered, the meaning of those words is deciphered by the sequence in which the words are presented (Serafini, 2011).

However, written words are not the sole representation of our language. Even before the alphabet and written word there were symbols, drawings, and crude visual exemplifications of thoughts and ideas, scrawled in stone and earth. Unlike text, meaning in imagery derives from spatiality and composition (Kress, 2003). These methods of language representation can function both collectively and independently. Just as a traditional novel can communicate through text alone, a photograph or drawing can communicate just as effectively with no words at all.

Art as Experience: Having an Experience

Pragmatist philosopher John Dewey seeks to acknowledge and define what it means to have an experience. Experience is something that happens continually in life; every day, every hour experience is occurring. However, there is a difference between experience and an integral experience. An experience is a singular occurrence, having its own individual qualities, plot, beginning and end. An experience is only an “integral” experience when the activity or work is completed in an acceptable way. While the result of such an experience is often an intellectual one, they can be both emotional and aesthetic as well.

NONVERBAL COMMUNICATION

A Design Practice on Communicating Emotions through Sensory Signals

Being able to express emotion is a vital and enriching part of human interaction and communication. The most common means of expressing emotion is through physical cues such as gesture, body language, facial expression, tone, and touch. However, most contemporary communication is mediated by text-dominant digital platforms, such as text messaging. These types of platforms exclude other sensory and visual cues that are so crucial in emotional expression. Engineering and design educators, Secil Yavuz, Monica Bordegoni and Marina Carulli, suggest addressing the lack of sensory cues by using wearable technology with embedded sensors that incorporate auditory and tactile experiences in addition to the visual.

The Nonverbal Communication Functions of Emoticons in Computer-Mediated Communication

Educator and online behavior specialist Dr. Shao-Kang Lo defines emoticons as quasi-nonverbal cues within computer mediated communication (CMC), meaning that in addition to verbal cues, they perform nonverbal cues as well. CMC is often believed to lack non-verbal communication cues that are important in the comprehension and expression of emotions. According to scholars, the goal of a verbal cue is to communicate ideas, while the goal of a nonverbal cue is to communicate emotion (595). CMC, a platform that primarily uses verbal cues (text), can often be misconstrued and misinterpreted due to a lack of nonverbal communication cues. However, users have devised elements like emoticons to aid in the expression of emotional intent. Dr. Shao-Kang Lo's results show that emoticons greatly affect how users perceive the intended emotion, as opposed to using no emoticons at all, proving that emoticons can perform nonverbal communicative functions.

	Emoticons	Statements
Appears alone	24	13
During phrase	7	7
At phrase break	969	829
Total	1000	849

F1

Chart shows an example of how emoticons are used and placed in message boards in reference to Robert Provine's research concerning the "punctuation effect"

Emotional Expression Online

Robert Provine, a neuroscientist and psychologist, speaks about emoticons in reference to the "punctuation effect." Just as laughter punctuates speech, emoticons punctuate text. The punctuation effect refers to the places in speech where punctuation would naturally occur, indicating that emoticons should ideally be used at the end of a thought or in a natural pause in order to appropriately denote emotion.

In Situ Informants Exploring an Emotional Mobile Messaging System in their Everyday Practice

eMoto is a mobile emotional messaging system developed by Petra Sundtrom, Anna Stahl and Kristina Hook, computer scientists and researchers at the Swedish Institute of Computer Science. This system uses gesture, color, shape and animation incorporated into the background of users' text messages in order to convey emotion and tone. Their study determined that emotions are not separate entities from the conversation but rather integrated parts. It also suggests the need for an open-ended platform that allows users to personalize their emotional expression. The study found that the eMoto prototype was successful in that it was able to denote differences in user personality and provide a form of digital emotional expression.

MOTION

Motion is another compelling mode of communication. Motion can communicate more than speed or movement alone; it can suggest direction, tone, rhythm, etc. Semiotics, a theory of signs, addresses all forms of communication; it is the "tools, processes, structures and contexts that human beings have for creating, interpreting and understanding meaning" (Hall, 2012). Among the processes and structures of semiotics are signs, which are elements that can convey meaning other than themselves. For instance, the word *stop* can literally mean to stop or it can also allude to danger. Signs are comprised of two elements: the signifier and the signified. The signifier carries a message and the signified is what that message communicates (Hall, 2012). Language and type are a specific sign system, wherein the individual word is the signifier and its meaning is the signified. Matthias Hillner proposes that motion comprises a second-order sign system following the first-order of type and language (Hillner, 2005). For instance, when a person shakes her hand back and forth, people are aware that this is not some sort of erratic behavior, but rather a greeting. A simple wave is a motion that conveys meaning without having to utter a single word. The speed of the wave can also help to suggest levels of intensity: a very rapid wave may imply excitement and a slow wave may imply a more somber emotion. Additionally, motion is an aspect of communication that is natural for a person to process and understand. Language, however, is learned. Even a wave is a learned action, but motion that derives from raw emotion, such as trembling with rage or bouncing with excitement, is something that people understand instinctively.

SPACE

Spatiality is an interesting characteristic that is not always associated with communication. However, studies have shown that the right hemisphere of the brain that interprets language and emotion—not just what a person is saying but how they are saying it—is the same hemisphere that perceives and interprets space (Joseph, 1988). Spatial attributes consider arrangement on a plane as well as depth, or how near or far. Depth can be an important emotional and communicative indicator on its own. When two people are standing very close and comfortably occupying the same space, one might assume a level of intimacy between the two, whereas distance might suggest unfamiliarity, aloofness, or perhaps animosity. Spatiality is also important in the interpretation of facial expression and gestures. Without spatial elements within communication, opportunity to fully develop communicative and emotional understanding and perception is diminished.

MEDIUM

The different sign systems affect communication. So does the medium through which the correspondence takes place. Technology and communication are directly related. With technological advances come additional modes and systems for making and interpreting meaning. Once speech could be translated into letters, and consequently, words and sentences, a new door opened to communication. Technology, be it pen and paper or keyboard and screen, facilitates communication and correspondence. Digital mobile devices dominate much of our contemporary communication, but when they mediate correspondence, it creates the opportunity for messages to be misconstrued, making it difficult to decipher characteristics that would typically be intuitive. Technology has allowed for advances of the platforms with which people communicate (i.e. smart phones, computers, etc.), but the actual correspondence has not strayed very far. Users are limited to the very 2D nature of traditional written communication to express things that often have subtle and dynamic qualities like emotion.

Virtual Reality as a Communication Tool: A Sociocognitve Analysis

Often virtual reality is described as technological hardware or a collection of devices that create immersive simulations. However, psychologist Guiseppe Riva seeks to describe VR as a communicative medium rather than hardware alone. What makes VR stand out among a sea of other communicative media is the relationship between the user and the virtual environment, where the immersive nature of VR constitutes communication. Using situated-action theory and positioning theory the meaning of communication can be redefined; context is co-created by users and communication is used to exchange meaning rather than information.

Affective Interactions Using Virtual Reality: the Link between Presence and Emotions

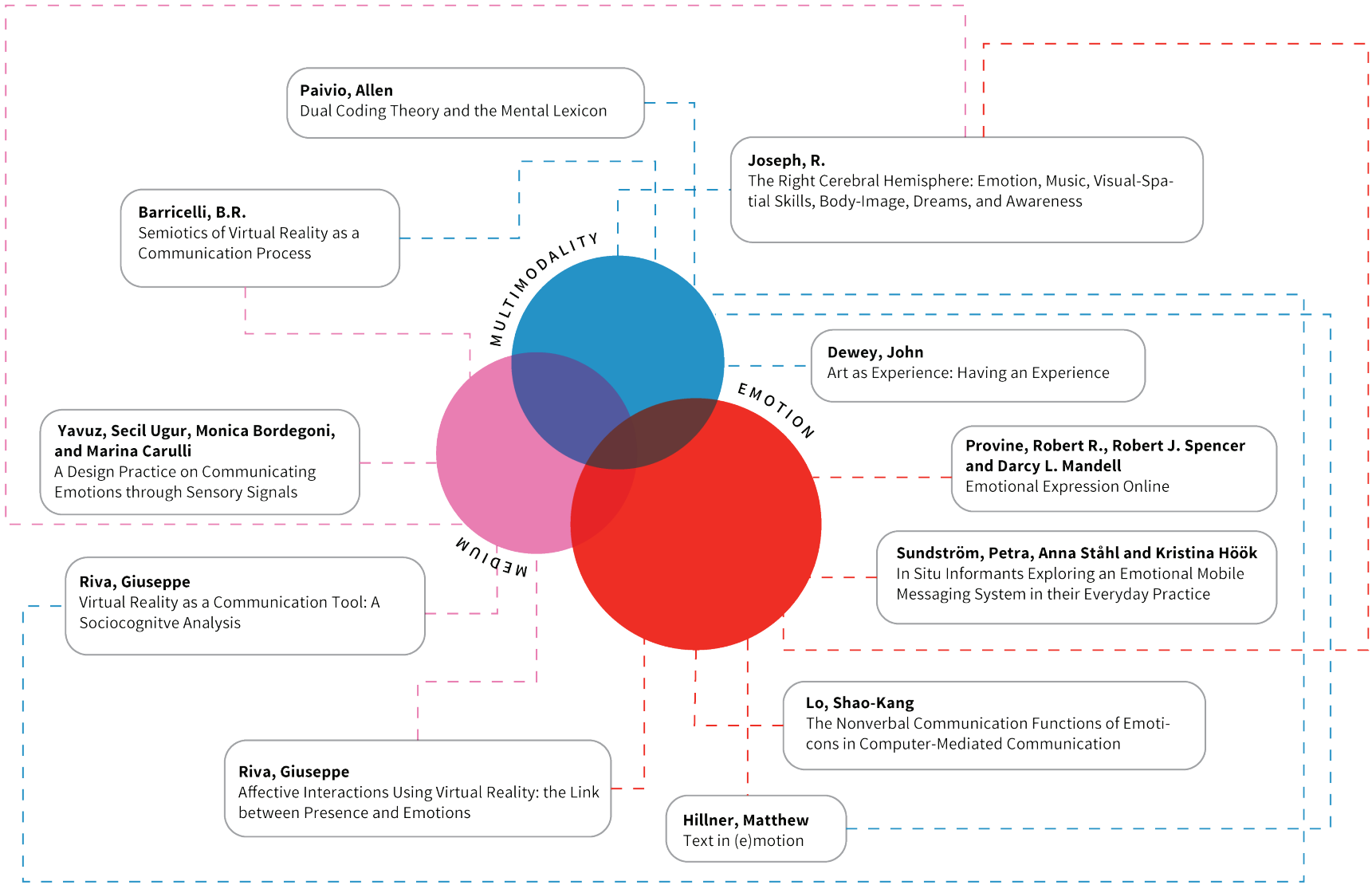
Riva also explores the hypothesis that virtual reality is an effective medium that can induce specific emotions. The study consisted of three virtual environments intended to represent an anxious emotion, a relaxed emotion, and a neutral emotion. Questionnaires administered to participants were used to determine the effectiveness of each environment. Results confirmed the hypothesis that VR is an effective emotion inducing medium. It also concluded that a sense of presence in a virtual environment depends heavily on the emotional factors as well as technological or visual ones.

Semiotics of Virtual Reality as a Communication Process

Computer scientists and researchers Barbara Barricelli, Davide Gadia, Allessandro Rizzi and D.L.R Marini define virtual reality as a communication process mediated by computer systems that use visualization and sensory stimuli. Their study explores how VR can be analyzed using semiotic theory and general semiotics. The authors base their analysis on three different levels: the syntactic level (iconicity and visual rhetoric), the semantic level (how the perceptual system must adapt to a non-natural environment), and the pragmatic level (the emotional involvement of users in VR tasks and the structure of storytelling within a virtual environment). Each of these levels provides a framework in which a VR application can be defined and evaluated using parameters that allow the communicative and expressive power to be identified.

F2
"Relaxing" virtual environment

F3
"Anxious" virtual environment



F4
Literature Map

ASSUMPTIONS & LIMTATIONS

ASSUMPTIONS

For the purposes of this investigation, it is assumed that mobile Virtual Reality technology and accessories are readily accessible and prevalent. It is also assumed that users are utilizing mobile devices for communicative purposes and are somewhat knowledgeable and aware of the concept of VR.

LIMITATIONS

For this investigation, studies are being limited to mobile devices. Therefore, target users are people who utilize smart phones for a large portion of their daily communication. While there are countless reasons for mobile device communication and Virtual Reality, visual studies are limited to the expression and evocation of emotion and empathy in mobile VR. This investigation's main concentration will be comprised of several individual studies that exemplify emotional exchange between different personas. A study may address technical aspects such as messages alerts, inbox and user interface. Such aspects, however, are not the primary focus of this investigation. Individual studies are visual only. Haptic and audio features are beyond the scope of this investigation. Studies are also not concerned with how a user will create message content. In addition, proposed software for the investigation is an independent platform rather than one integrated with existing messaging programs. Because users must then actively choose to enter the platform in order to view a message, this limits the physical context of use. Furthermore, due to technological and time constraints, visual studies are limited to prototypes and visual representations rather than fully functional applications.

METHODS

CASE STUDIES

Case studies are utilized to gain a better understanding of tools or precendents that already exist for emotional expression via personal messaging. By analyzing existing tools, I am able to determine successes, failures and areas that have yet to be explored in order to further my own research and prototypes.

SCENARIOS

Scenarios are used within this investigation in order to provide a narrative in which a person might use virtual reality as a personal messaging medium. The scenarios take form as text message conversations between the persona and two others (a good friend and a significant other). The scenarios frame different categories of emotional expression that may take place in day-to-day digital correspondence and how they thrive in a VR environment. The variety of categories is used in order to show a breadth of emotion that is likely to be expressed in different types of relationships and circumstances.

PERSONAS

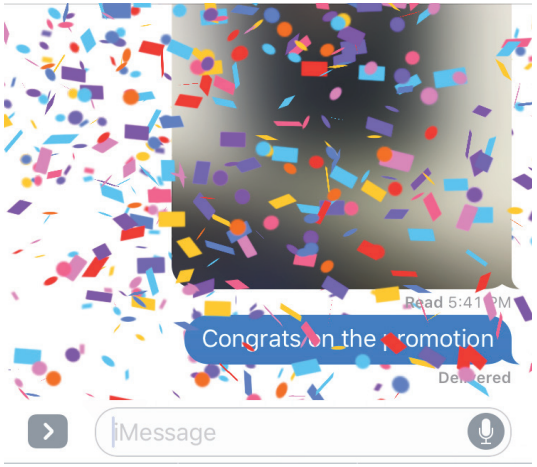
This investigation uses a persona in order to provide a human reference for which scenarios and studies will be based. Using a persona helps to understand the types of people and interactions that would benefit from using VR in personal messaging.

PROTOTYPING

Both low and high fidelity prototypes are used in this investigation to visualize how VR messages may appear and behave in real-world circumstances. Prototypes in the form of sketches and thumbnails are used in initial explorations to gain understanding. Final studies are higher fidelity prototypes that can be viewed in virtual reality using a computer or mobile browser and Google Cardboard.

CASE STUDIES

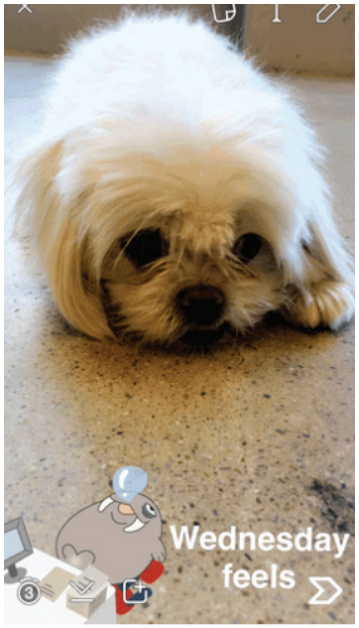
F5
iMessage screen effects



IMESSAGE

Apple's iMessage for iOS 10 is an instant messaging platform built into iPhones that allows users to communicate with text, sound, image, video, etc. iMessage messages appear in shapes intended to mimic speech bubbles, which begins to give the platform a more conversational and casual approach. In addition to traditional text messaging, iMessage now allows users to personalize their conversations even more. There are predetermined animations that can be selected for message bubbles as well as a variety of screen effects, such as balloons or fireworks. Message "tapbacks" can also be used to react to a message without necessarily replying (thumbs up, ha, !!, etc.). In addition, suggestions for emoji substitution are provided based on the message that a user has typed. For example, if the word pizza is typed, iMessage may suggest using the pizza emoji instead.

Overall, Apple's iMessage is beginning to make messaging much more dynamic and interactive by incorporating interactions and effects that consume the user's message background, message bubbles of variable appearance, and an "emoji first" type of messaging. Each of these features permits a more expressive conversation than traditional messaging may offer. Two-dimensional qualities of the screen still limit the application. For instance, iMessage's dynamic screen effects could be much more powerful if they were able to utilize the immersive space and dimensions that Virtual Reality offers.



F6
SnapChat interface example

SNAPCHAT

Snapchat is a mobile messaging platform that primarily utilizes images and video that self-destruct within a few seconds for communication. It also incorporates a more traditional messaging system using text, stickers and emojis. Snapchat allows users to share images of themselves, their surroundings, etc., in real time. Users have the option of sending messages to specific people or making their “snap” public. Geofilter, another interesting feature of the Snapchat platform, allows users to select filters for their images or videos that are specific to their location at the time. Snapchat also invites creatively inclined users to create and submit geofilters for specific places, events, etc. The markup feature that allows users to draw or type on their photos is a strong personalization attribute.

Snapchat’s strength lies in its ability to personalize its content so that users can send unique messages; no two snaps are the same. It is also a helpful platform when it comes to emotional expression. Access to the device’s camera allows users to record gesture, facial expression, and other physical cues helpful in interpreting and expressing emotion that are otherwise lost in traditional messaging applications. Like other platforms, however, limits are imposed by constructs of the screen; users can only view what the screen size allows.

GIF KEYBOARD

GIF keyboards are keyboards only in the sense that they occupy the same space that the keyboard normally would on a mobile device. Contrary to traditional mobile keyboards, there are no letters or numbers aside from those used for a simple search function. These particular keyboards allow you to communicate via animated GIF files. Similar to emojis or emoticons, these GIFs help the user express emotions that are difficult to express through text alone. Many of the GIFs accomplish this by appropriating short clips from television, movies, etc., that potentially relate to a mood or conversation. GIFs are categorized by concepts, phrases, or emotions (hungry, I miss you, happy, etc.).

While effective, GIF keyboards do not allow for much open interpretation. Categories are specific for the most part and many GIFs have text that denotes the meaning embedded in the animation. In addition, while more dynamic than the traditional text or emoji, GIF keyboards are still very much constrained to the 2D, static nature of the screen and are often accompanied by a traditional text message for clarification or further conversation.

F7
GIF Keyboard interface example

OTHER PRECEDENTS

The three previous visual precedents are the most beneficial and useful examples for the purposes of this investigation. However, the following table denotes other precedents that were considered.

Rage Faces	Rage Faces are very crude face drawings that are meant to represent and over exaggerate certain emotional scenarios
Memes	Memes, similar to GIFs used in the GIF keyboard, are appropriated images that are used to express thoughts and/or emotions about a subject often unrelated to the actual meme content.
Facebook	Facebook now incorporates a drop down menu that a user can use to select their current emotional state or feelings in general or about a particular post. It also incorporates 360° video.
eCards	eCards allow people to digitally send animated and expressive “cards” that often have emotional intentions (Get Well, Happy Birthday, Congratulations, etc.)
Twitter	Twitter is a digital platform that allows users to post, share and reply to emotive content such as memes and Gifs.

F8

The figure to the right is a depiction of the Visual Studies Matrix upon which the subsequent visual studies are based. The matrix consists of 6 emotional scenarios and 2 messaging categories. The traditional category is for studies that exemplify some characteristics of traditional messaging while unprecedented studies use more VR specific characteristics.

	Traditional	Unprecedented
Feeling overwhelmed or uncomfortable		
Have a good day		
Having a bad day		
Expressing excitement		
Expressing affection		
Reminiscing on a shared experience		

DESIGN

VISUAL STUDIES

This investigation consists of several mini-studies, each of which is situated along the visual studies matrix, based upon scenarios involving the persona. Studies take form as thumbnail sketches and digital prototypes. The purpose of these studies is not to arrive at a single, concrete solution, but rather to explore a breadth of opportunities and possibilities.

PERSONA

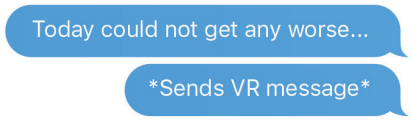
Anna is a 25 year old graduate student in her first year of study. Pursuing graduate school meant that she had to move hours away from many of the important people in her life. Maintaining relationships is very important to Anna. Due to the distance, she cannot always travel home, so she relies heavily on technology and digital communication to stay connected. While texting has been useful, she sometimes finds it difficult to accurately express how she is feeling or interpret how someone else is feeling.

VISUAL STUDIES
PART ONE

The following investigations take place within a conversation between the persona, Anna, and her significant other. The image to the right provides an overview of the entire narrative. However, each indvidual study will focus on one VR exchange at a time. Images to the side of the messages are intended to be previews of the studies and are not part of the actual interface.

F9

VISUAL STUDY 1.1



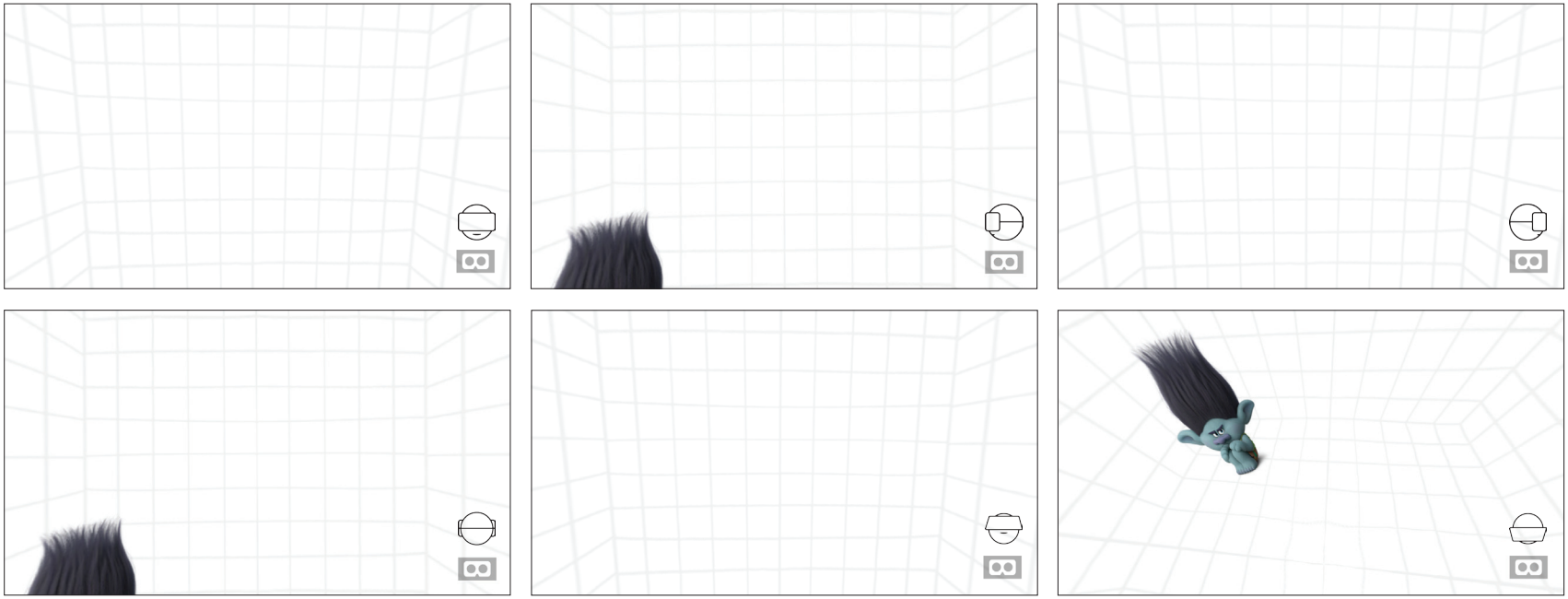
	Traditional	Unprecedented
Overwhelmed or uncomfortable		
Have a good day		
Having a bad day		X
Expressing excitement		
Expressing affection		
Reminiscing on a shared experience		

DISCUSSION

Beginning with a text conversation between Anna and her significant other, this study explores personal messaging in a way that is more specific to an immersive VR environment. In the visual studies matrix, this study is positioned within the “having a bad day” category.

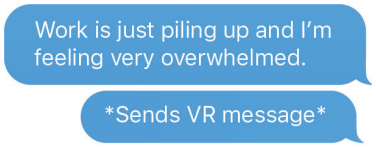
After having a exceptionally stressful morning, Anna sends her significant other a text message exclaiming that she is having a bad day. Following the text, Anna sends an accompanying VR message. At first glance, the message seems to be relatively empty, containing only a gray grid in the background. However, as her significant other begins to look around a tuft of black hair in a bottom corner catches his attention. Upon looking down to investigate, he sees a small troll huddled in the corner. The troll’s expression and body language suggests it is pouting and in a generally foul mood, comparable to Anna’s own emotional state.

In this particular message, Anna is using the troll’s expression in an attempt to show her significant other the sort of day she is having. However, more important than its appearance is the troll’s location. It is not in direct view; Rather, Anna has placed the figure so that it appears to be behind and below her significant other, cowering in the corner, forcing him to search for the figure. Perspective is a very important aspect in conveying Anna’s emotional state, one that is only made possible in an environment such as VR. Anna could have easily sent an image of the same troll to her significant other, but having it cower in the corner of a space and out of direct view adds a layer complexity and richness to her intended message. Because of its location, one begins to feel a deeper level of sympathy for the marginalized troll and, by extension, Anna.



F10
Having a Bad Day
http://design.ncsu.edu/thenfinally/jordan/bad-day-troll.html

VISUAL STUDY 1.2

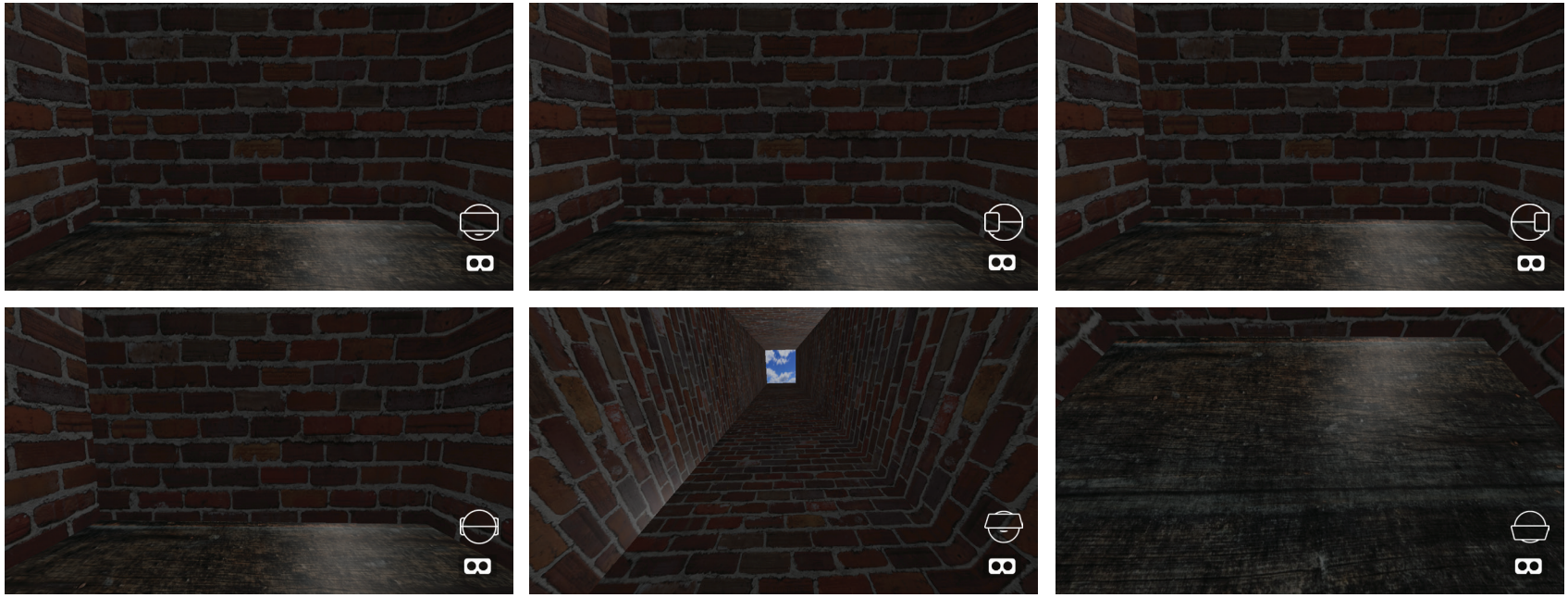


	Traditional	Unprecedented
Overwhelmed or uncomfortable		X
Have a good day		
Having a bad day		
Expressing excitement		
Expressing affection		
Reminiscing on a shared experience		

DISCUSSION

Anna has already expressed to her significant other that she is having a bad day. When he asks why, she responds by stating that she is overwhelmed with school. Accompanying the text is a VR message that transports her significant other into an enclosed brick room. The walls are very close to the viewer and have no windows or doors. The only opening to the brick room is at the top of the exceptionally high walls. The walls and floors are both dark and dreary in color. The only brighter color is the sliver of sky that can be seen from the top of the room, which is impossible for the viewer to reach.

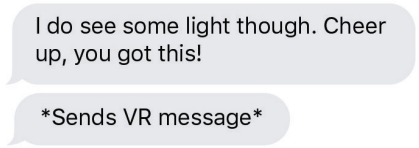
Anna's goal is not to literally show her significant other a tall brick room, but rather to create an environment that suggests her current emotional state. For instance, if Anna were trying to depict an actual place she had been, the intent of the room could be interpreted alternatively. However, because Anna frames the VR message by stating that she is overwhelmed, the purpose becomes an emotional one. The dark colors, tight space and impossible escape promote the idea of being trapped or feeling hopeless, both of which can be associated with overwhelming situations. Perspective is a key element in this message, one that traditional messaging does not offer. Because Anna uses virtual reality to convey her emotional state, she is able to control the perspective of her significant other, "placing" him inside the room itself—and thus within her personal experience—instead of showing him a still image. The sense of presence acquired from feeling as if he is actually in this environment adds merit and strengthens the empathetic potential of Anna's message. Her significant other is better able to understand her and how she is feeling.



F11
Panic Room

http://design.ncsu.edu/thenfinally/jordan/panic-room.html

VISUAL STUDY 1.3

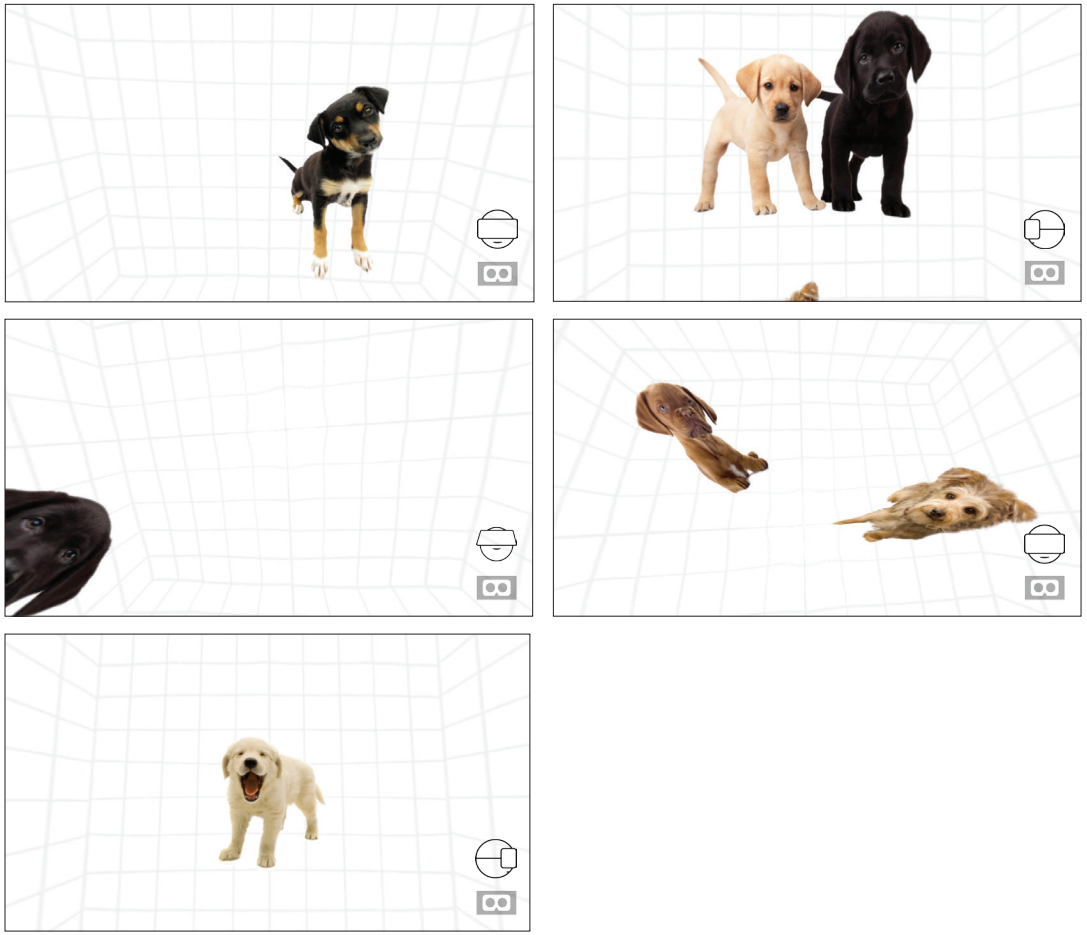


DISCUSSION

In order to demonstrate a scenario in which a message in VR can be a response to another VR message, this study is a reply sent to Anna from her significant other. It is also positioned within the “have a good day” emotional scenario.

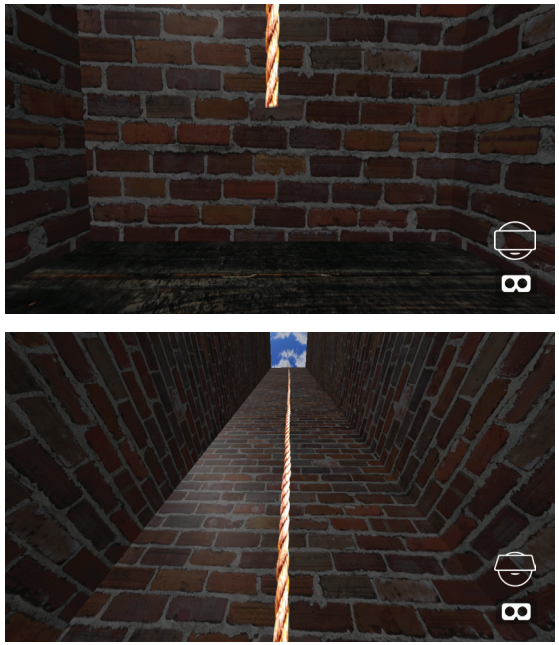
Following Anna’s expression of having a bad day and feeling overwhelmed, her significant other sends an encouraging response. In attempt to brighten her day, he also sends a follow-up message in VR. Similar to the first VR message Anna sent about her terrible day, his message is relatively simple, transporting Anna into a space in which she is surrounded by images of puppies.

As a broad generalization, a room full of puppies is bound to make a person smile. In this case, the images of the puppies are not the most meaningful feature. The same images could be sent as a text message rather than a VR message, but the effects are vastly different. By placing the images in VR, Anna is then in an environment in which puppies are all around. This creates an increased level of presence for Anna, intensifying her enjoyment of her significant other’s message. Perspective also adds to the sensation of presence in this message. A moment of particular significance is when Anna looks down to discover a puppy looking back at her. The ability to place the puppies below Anna’s field of view is a characteristic inherent to messages in VR and creates a more powerful scene than if the puppies had only been positioned in front of her.



	Traditional	Unprecedented
Overwhelmed or uncomfortable		
Have a good day		X
Having a bad day		
Expressing excitement		
Expressing affection		
Reminiscing on a shared experience		

F12
Have a Good Day
http://design.ncsu.edu/thenfinally/jordan/puppies.html

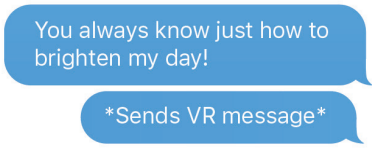


F13
Panic Room-Alternate Response
http://design.ncsu.edu/thenfinally/jordan/panic-room-2.html

As an aside, this study shows an alternative response to Anna's claim that she is feeling overwhelmed (see study 1.2). Anna's significant other sends a message that builds upon Anna's message containing the brick room Rather than an entirely different message like the puppy scene, he makes a small change to Anna's brick room by adding a rope that leads to the top of one of the walls.

The rope, while a minute change, seems to offer Anna a "virtual escape" from her overwheming emotional state. Not only does the rope aid in providing comfort and encouragement to Anna, it also provides a look into an alternative method of creating these VR messages and the potential for collaboration within a single VR experience rather than the messages always being singular utterances.

VISUAL STUDY 1.4



	Traditional	Unprecedented
Overwhelmed or uncomfortable		
Have a good day		
Having a bad day		
Expressing excitement		
Expressing affection	X	
Reminiscing on a shared experience		

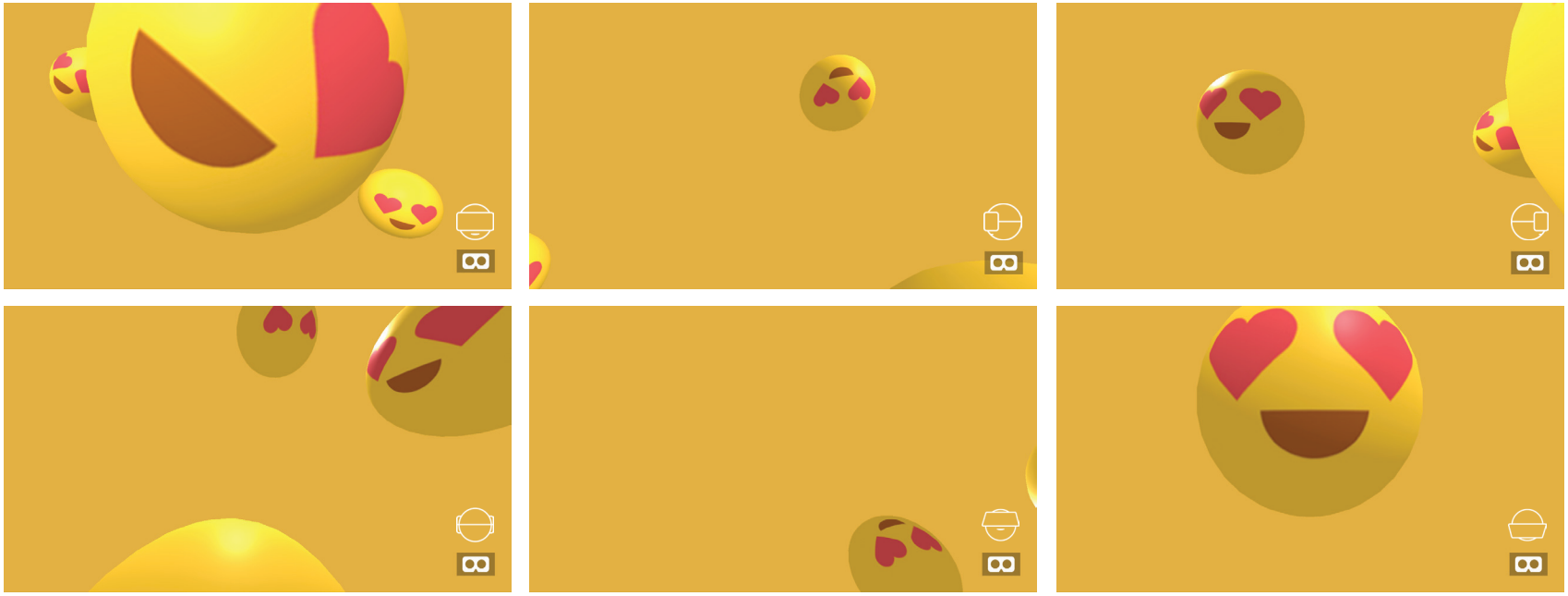
DISCUSSION

The aim of this study to explore how an aspect like emojis, often associated with more traditional forms of messaging, can be translated and adapted for an immersive VR environment. The study is positioned under the category “expressing affection” as noted in the visual studies matrix.

In this particular scenario Anna has just received a message of encouragement from her significant other. She shares her affection and gratitude by responding to him via virtual reality. Her VR message consists of many heart-eyed emojis that appear to surround the viewer. Some are larger and very close to the viewer while some are farther away and smaller. The emojis also appear to slowly bob up and down and rotate side to side. The subtle movements feel light and happy.

Of course, emojis are already a popular and traditional way of expressing emotion in messaging. However, placing the emoji within a VR context changes the way it is perceived. The immersive nature of VR intensifies the emotion the emoji conveys. By placing them so that they surround the viewer, the emojis take over his own environment, helping to create a sense of presence. Anna’s significant other is being bombarded with seemingly endless affection, expanding the range of emotional expression of an emoji. Motion is an important distinction within this scenario as well. The subtle floating and turning of the emojis adds an additional layer of communication and expression. Love and affection are often associated with blissful movements such as these. Even if the heart-shaped eyes were not present, the movement of the spheres would suggest a light and loving tone.

This VR message could also be interpreted as a response to the significant other’s previous VR message in which case, Anna could be expressing her love and adoration of being surrounded by puppies (a scenario sure to put a smile on anyone’s face). Perhaps, it is a response to both her significant other and the puppies. The open-for-interpretation nature of this message is reminiscent of face-to-face communication, adding poetic quality to the conversation.



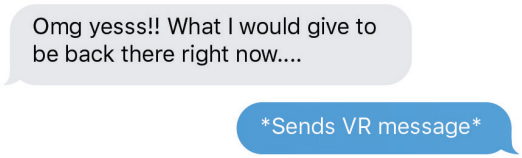
F14
Expressing Affection
http://design.ncsu.edu/thenfinally/jordan/heart-eyes.html

VISUAL STUDIES
PART TWO

The following investigations take place within a conversation between Anna and a good friend. The image to the right provides an overview of the entire narrative. However, each individual study will focus on one VR exchange at a time. Previews of those messages can also be seen, but again, are not part of the actual interface.

F15

VISUAL STUDY 2.1

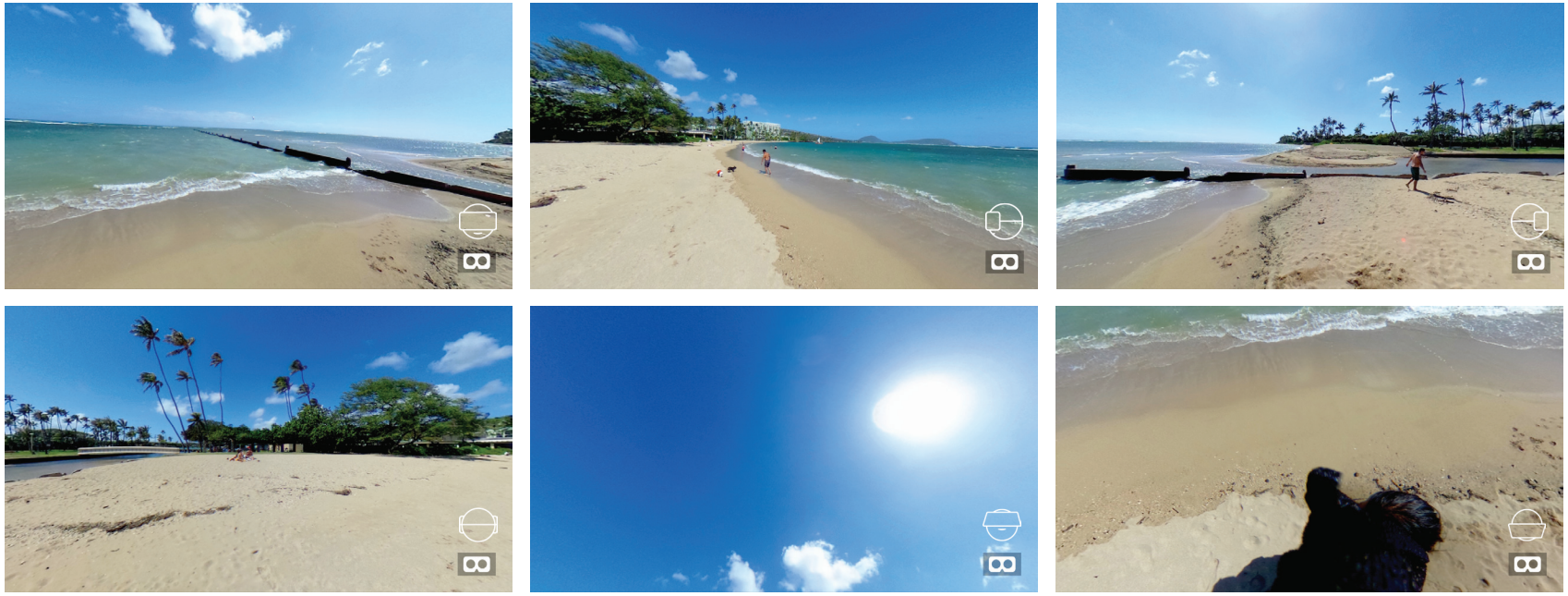


DISCUSSION

Situated within the “reminiscing on a shared event category,” this study errs on the side of more traditional messaging. However, when paired with VR technology such as Google Cardboard, the intent of the message changes. During a conversation, Anna and her good friend reminisce on a beach vacation the two of them shared last summer. After her friend expresses her desire to be there, Anna sends a VR message containing a 360° image of the very beach they had visited.

In traditional forms of messaging, it is a common occurrence to send and receive images. Anna could have sent a regular image of the beach they visited, but by sending a 360° image in a VR environment, the paradigm shifts from simply sharing an image to sharing an experience or memory. Unlike a flat image, her friend is now able to look around and seemingly relive the very moment the photo was taken, evoking memories and emotions shared while vacationing with Anna. She is “transported” from her current location and is now back standing on the beach that she longed for, with agency for exploring it on her own (shifting her gaze).

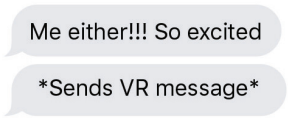
	Traditional	Unprecedented
Overwhelmed or uncomfortable		
Have a good day		
Having a bad day		
Expressing excitement		
Expressing affection		
Reminiscing on a shared experience	X	



F16
Beach Day

http://design.ncsu.edu/thenfinally/jordan/beach.html

VISUAL STUDY 2.2



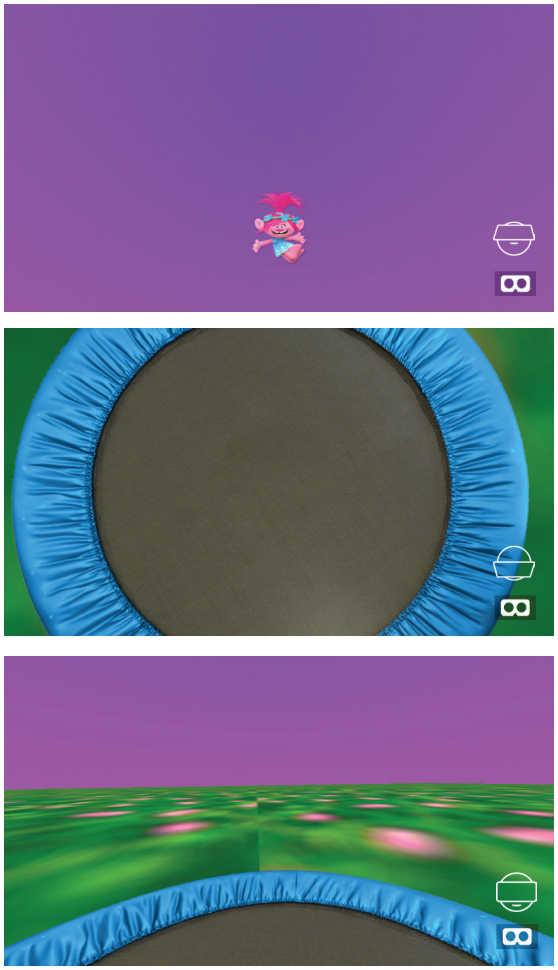
	Traditional	Unprecedented
Overwhelmed or uncomfortable		
Have a good day		
Having a bad day		
Expressing excitement		X
Expressing affection		
Reminiscing on a shared experience		

DISCUSSION

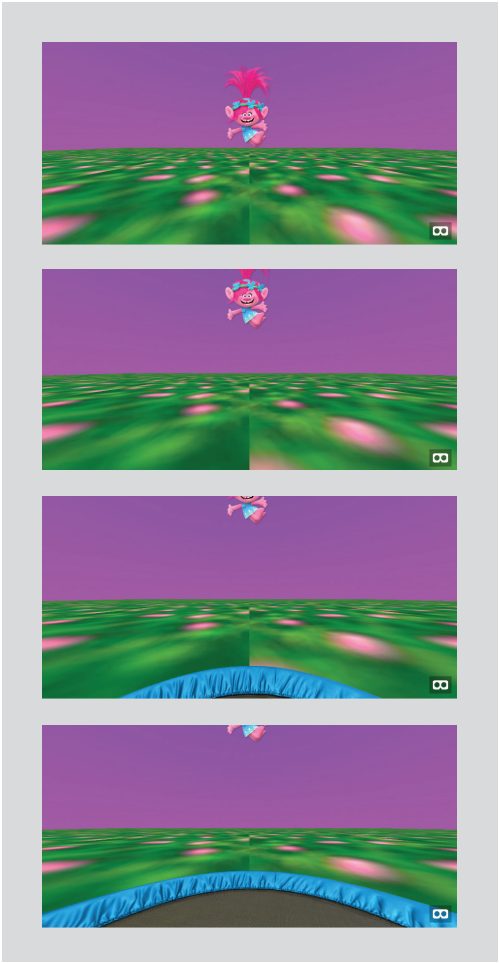
This study takes place within a conversation between Anna and her good friend in order to help demonstrate a variety of conversations in which VR messaging could be useful. It is positioned within the "expressing excitement" category of the matrix and explores characteristics that are not found in typical messaging.

After engaging in a conversation about a shared beach vacation last year, Anna exclaims that she is eager to return to their sandy getaway. The good friend concurs by conveying her excitement in the form of a VR message. Upon opening the message, Anna is surrounded by bright, happy colors (pink and purple sky, green grass, etc.). As she looks around, Anna notices that her field of view seems to be shifting up and down and soon discovers she is bouncing on a trampoline. As she bounces, a very excited troll comes into view.

This message utilizes two characteristics that could only be possible within a VR messaging environment: presence and motion. While the scene itself promotes a light and happy environment by including bright and exciting colors, the bouncing motion of being on a trampoline strengthens the excited feeling that Anna's friend is trying to express. Excitement and enthusiasm are often associated with light and quick movements (bouncing, shaking, etc.). For many, jumping on a trampoline is symbolic of happiness and excitement, as implied by the expression "jumping for joy." Being able to replicate that experience in a VR message with motion also increases the sense of presence, providing countless opportunities for emotional expression. Because Anna is able to look beneath her and see the trampoline as well as the illusion of a bouncing field of view, she feels as though she is actually present in the space her friend has created, allowing her to recognize and empathize with her friend's excitement.



F17
Expressing Excitement
http://design.ncsu.edu/thenfinally/jordan/excited-troll.html



F19
The figure to the left depicts the jumping movement that is experienced upon opening the VR message. The four frames show the different fields of view that occur as the user is looking ahead.

CONCLUSION

The purpose of this thesis was to expose and explore a breadth of emotional expression that may be possible in personal messaging within a VR environment. By completing several of these visual studies and prototypes, I was able to investigate and reflect upon how people might communicate within this virtual, personal messaging environment. Grouping them by varied emotional scenarios allowed me to explore this communication based upon the different circumstances and contexts that may present themselves during a personal messaging conversation.

These visual studies suggest a paradigm shift in the way people are accustomed to communicating, especially within a personal messaging atmosphere. Personal messaging becomes less about sending a message and more about the creation of experiences. Experiencing this type of personal messaging for a length of time could begin to alter the way in which people communicate with one another. People might begin to look for opportunities to create emotional experiences for others, thus creating a sort of emotional vocabulary that is not necessarily present in traditional messaging. Presence, motion and perspective become integral aspects in the creation and success of emotional messages, whether the intent is to reminisce on a shared vacation or complain about how badly a day is going. These elements supplement those that are already in place, such as text and image, to promote an increased range of emotional expression. This type of messaging also sets a higher bar for call-and-response. This brings into question the types of users who will take the time to create such messages.

As the sender has to take time to create these experiences, it suggests a greater emotional connection between senders and receivers of VR messages. Senders are more likely to take the time to create and send an elaborate VR experience to someone they already have a close connection with as opposed to an acquaintance. Children and younger users also have the potential to be a fruitful user group as they are often more willing to spend time creating and playing with this type of messaging regardless of the response.

The use of VR is becoming increasingly popular and will continue to gain traction in the communication realm as robust companies like Facebook and Google begin to implement it more within their current systems. Facebook already allows users to upload and share 360° images with one another, which primes users for a content-creation type of communication that personal messaging in VR would offer. While grounded, this particular project is speculative as it is not fully achievable at this time. However, it lays a foundation for the types of messages and range of expression that may be attatinable with such technology and suggests how specific characteristics of VR can be advantageuous in the evocation and expression of emotion and empathy.

This investigation is concerned only with the variety of messages that can be created in emotive personal messaging. In future work, I would like to delve deeper into the construction side of VR messaging—how users can create content. Creating VR content can often be more laborious than typing a text or selecting an emoji—although tools like Panoform and Vizor (see appendix) help greatly in terms of user-friendliness. A few of the initial studies in this thesis utilize stickers as a means of creating characters and content, something of which many messaging programs take advantage (emojis, stickers, images, etc.). Perhaps developing a templated platform complete with a library of images,

stickers, characters, textures, etc., could make for a quicker, mobile-friendly interface. It would also be interesting to explore how these messages might be archived or kept as memorabilia. Digital moments like these VR messages could become totems or souvenirs in which the user could return to the initial memory. These studies could also inform applications of emotional VR other than messaging, such as helping those with Autism better recognize and express emotional responses. Regardless of its use, emotional expression in VR has the potential to alter and enrich how we communicate. This investigation is simply a starting point for exploration and creation of concepts associated with emotional expression and virtual reality. With further research and exploration, a deeper understanding and potential for practical use is imminent.

BIBLIOGRAPHY

Austin, John L. How to do Things with Words. 2. ed., issued as an Oxford Univ. Press paperback ed. 397 : philosophy Vol. Oxford [u.a.]: Oxford Univ. Press, 1976. Print. Theoe William James Lectures .

Bachfischer, Gerhard, and Toni Robertson. From Movable Type to Moving Type - Evolution in Technological Mediated Typography. University of Technology. Print.

Baron, Naomi S. Alphabet to Email. New York: Routledge, 2002. Print.

Baron, Naomi S. Always On. Oxford [u.a.]: Oxford Univ. Press, 2008. Print.

Baron, Naomi S. and Rich Ling. “Necessary Smileys & Useless Periods.” Visible Language 45.1/2 (2011): 45. ProQuest Central K12. Web.

Barricelli, B. R., et al. “Semiotics of Virtual Reality as a Communication Process.” Behaviour & Information Technology 35.11 (2016): 879-96. ProQuest Computer Science Collection. Web.

Bays, Hillary. “Visual Iconic Patterns of Instant Messaging: Steps Towards Understanding Visual Conversations.” International Handbook of Internet Research. Dordrecht: Springer Netherlands, 2010. 41-64. Print.

Bowman, Doug, et al. “Information-Rich Virtual Environments”. Web.

Carroll, Joshua, et al. “Screen”. Web.

Chou, Philip. “Advances in Immersive Communication.” ACM Transactions on Multimedia Computing, Communications, and Applications (TOMCCAP) 9.1s (2013): 1-4. CrossRef. Web.

Davenport, Gloria. “Seeking Dynamic, Adaptive Story Environments.” Visions and Views (1994). Web.

Davis, Stephen Boyd. “A Schema for Depiction.” Visible Language 41.3 (2007): 280-300. ProQuest Art, Design and Architecture Collection. Web.

Dewey, John. Art as Experience. Perigee trade paperback ed. ed. New York, NY: Penguin Group, 2005. Web.

Domingo, Myrrh. “Migrating Literacies: Multimodal Texts and Digitally Enabled Text Making.” Text & Talk 34.3 (2014): 261-82. CrossRef. Web.

Dürrenmatt, Jacques. “From Invisibility to Visibility and Backwards.” Visible Language 45.1/2 (2011): 21. ProQuest Central K12. Web.

Hancock, Jeffrey, Christopher Landrigan, and Courtney Silver. “Expressing Emotion in Text-Based Communication”.ACM , Apr 29, 2007. 929-932. Print.

Ho, Chun-Heng. “Spatial Cognition in Design.” ProQuest Dissertations Publishing, 2006. Dissertations & Theses @ Georgia Institute of Technology. Web.

Horstmanshof, Louise, and Mary R. Power. “Mobile Phones, SMS, and Relationships.” (2005). Web.

Jiang, Yu, Jing Liu, and Hanqing Lu. “Chat with Illustration.” Multimedia Systems 22.1 (2016): 5-16. CrossRef. Web.

Jones, Phil. “Italicizing and Understanding Texts through Metaphoric Projections of Movement.” Visible Language 3.41 (2007): 246-65. Web.

Joseph, R. “The Right Cerebral Hemisphere: Emotion, Music, Visual-Spatial Skills, Body-Image, Dreams, and Awareness.” Journal of Clinical Psychology 44.5 (1988): 630-73. ComDisDome. Web.

Kalra, Ankur, and Karrie Karahalios. “TextTone: Expressing Emotion through Text.” Acta Archaeologica 85.1 (2014): 1-7. CrossRef. Web.

Kim, Minseok, and Jae Lee. “Touch and Hand Gesture-Based Interactions for Directly Manipulating 3D Virtual Objects in Mobile Augmented Reality.” Multimedia Tools and Applications 75.23 (2016): 16529-50. ABI/INFORM Professional Advanced. Web.

Lee, Carmen K. M. “Affordances and Text-Making Practices in Online Instant Messaging.” Written Communication 24.3 (2007): 223-49. CrossRef. Web.

Lo, Shao-Kang. “The Nonverbal Communication Functions of Emoticons in Computer-Mediated Communication.” CyberPsychology & Behavior 11.5 (2008): 595-7. MEDLINE. Web.

Marie-Laure Ryan. “Immersion Vs. Interactivity: Virtual Reality and Literary Theory.” SubStance 28.2 (1999): 110-37. CrossRef. Web.

Marsh, Emily E., and Marilyn Domas White. A Taxonomy of Relationships between Images and Text. 59 Vol. Bradford: Emerald, 2003. Web.

Mealing, Stuart. “Value-Added Text: Where Graphic Design Meets Paralinguistics.” Visible Language 37.1 (2003): 43. ProQuest Central K12. Web.

Mitchell, W. J. T. . “Space, Ideology, and Literary Representation.” Poetics Today 10.1 (1989): 91-102. CrossRef. Web.

Nam, Yanghee. “Designing Interactive Narratives for Mobile Augmented Reality.” Cluster Computing 18.1 (2015): 309-20. CrossRef. Web.

Paivio, Allan. “Dual Coding Theory and the Mental Lexicon.” The Mental Lexicon 5.2 (2010): 205-30. CrossRef. Web.

Pimentel, Teresa, and Vasco Branco. “Dynamic and Interactive Typography in Digital Art.” Computers & Graphics 29.6 (2005): 882-9. Print.

Provine, Robert R., Robert J. Spencer, and Darcy L. Mandell. “Emotional Expression Online.” Journal of Language and Social Psychology 26.3 (2007): 299-307. CrossRef. Web.

Riva, Giuseppe, et al. “Affective Interactions using Virtual Reality: The Link between Presence and Emotions.” CyberPsychology & Behavior 10.1 (2007): 45-56. MEDLINE. Web.

Riva, Giuseppe. “Virtual Reality as Communication Tool: A Sociocognitive Analysis.” Presence 8.4 (1999): 462-8. CrossRef. Web.

Rowsell, Jennifer. “The Mood is in the Shot”: The Challenge of Moving-Image Texts to Multimodality.” Text & Talk 34.3 (2014): 307-24. CrossRef. Web.

Sadoski, Mark, and Allan Paivio. Imagery and Text. Second edition. ed. GB: Routledge Ltd, 2013. Print.

Serafini, Frank. “Expanding Perspectives for Comprehending Visual Images in Multimodal Texts.” Journal of Adolescent & Adult Literacy 54.5 (2011): 342-50. CrossRef. Web.

Small, David L. “Rethinking the Book.” ProQuest Dissertations Publishing, 1999. Web.

Small, David, Suguru Ishizaki, and Muriel Cooper. “Typographic Space”.Web.

Sundström, Petra, Anna Ståhl, and Kristina Höök. “In Situ Informants Exploring an Emotional Mobile Messaging System in their Everyday Practice.” International Journal of Human - Computer Studies 65.4 (2007): 388-403. CrossRef. Web.

Toner, Anne. “Seeing Punctuation.” Visible Language 45.1/2 (2011): 5. ProQuest Central K12. Web.

Van Acker, Wouter, and Pieter Uyttenhove. “Analogous Spaces: An Introduction to Spatial Metaphors for the Organization of Knowledge.” Library Trends 61.2 (2012): 259. Docstoc. Web.

van Leeuwen, Theo. “Towards a Semiotics of Typography.” Information Design Journal 14.2 (2006): 139-55. ProQuest Art, Design and Architecture Collection. Web.

van Leeuwen, Theo, and Emilia Djonov. “Notes Towards a Semiotics of Kinetic Typography.” Social Semiotics 25.2 (2015): 244. Web.

Visch, Valentijn T., Ed S. Tan, and Dylan Molenaar. “The Emotional and Cognitive Effect of Immersion in Film Viewing.” Cognition & Emotion 24.8 (2010): 1439-45. CrossRef. Web.

Yavuz, Secil Ugur, Monica Bordegoni, and Marina Carulli. “A Design Practice on Communicating Emotions through Sensory Signals.” Concurrent Engineering: Research and Applications (2016). Web.

KEY TERMS

Personal Messaging
a private form of communication between different members on a platform (Wikipedia)

Experience
An integral experience occurs when a work is finished in a satisfactory way, is individual and singular, each having its own beginning and end, and its own plot. The final import is intellectual, but the occurrence is emotional as well. Aesthetic experience cannot be sharply marked off from other experiences, but in an aesthetic experience, structure may be immediately felt and recognized. There is completeness and unity and necessarily, emotion. Emotion is the moving and cementing force of an aesthetic experience. (Stanford)

Multimodality
a theory of communication and social semiotics that describes communication in terms of the textual, aural, linguistic, spatial, and visual resources—or modes—used to compose messages (Wikipedia)

Poetic
having an imaginative or sensitively emotional style of expression (Oxford Dictionary)

Emotive
appealing to or expressing emotion

Expression
something that manifests, embodies, or symbolizes something else; a mode, means, or use of significant representation or symbolism (Merriam-Webster)

Immersive
relating to activity that occupies most of one's attention, time, or energy; activity that actively engages one's senses and may create an altered mental state

TOOLS

PANOFORM™

Panoform

panoform.com

Panoform, developed by Dr. Derek Ham, Payod Panda and Luis Zapata, is a simple, easy-to-use tool for creating quick VR scenes. By using a prefabricated grid that can be found on the Panoform website, users can draw and construct scenes that can then be uploaded to panoform.com. Once uploaded, the sketches are converted into 360° images that the user can experience in VR. This was an integral tool in my own investigations that allowed me to prototype and test quickly and I believe that it will be a helpful tool moving forward for designers seeking to orient themselves to a VR space.

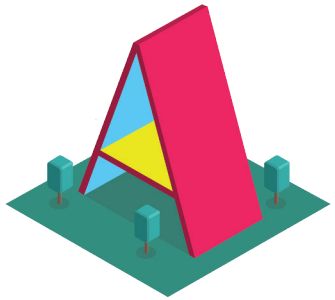
Vizor

vizor.io

Vizor is a WebVR platform that allows designers to create immersive web experiences without needing an extensive knowledge of code. Instead, it uses a visual programming approach that features simple tools such as “drag and drop” to create WebVR scenes, sites and stories. I found it to be useful for protyping and testing ideas in a quick manner.

A-Frame

aframe.io



A-Frame is an open-source web platform for creating virtual reality experiences. Basic coding knowledge and skills are necessary as the platform is based primarily upon HTML and JavaScript. It also follows and entity–component–system pattern common to game development. While coding is a necessary skill, A-Frame is easy to learn and quick to utilize, making it an excellent choice for building out solid VR experiences. Since the platform uses HTML, each VR experience can be locally hosted on any site. Each visual study in my investigation is built using A-Frame. It has been an invaluable resource and will continue to be an integral tool for building VR experiences.

LIST OF FIGURES

F11

Images of Study 1.2 Feeling Overwhelmed
design.ncsu.edu/thenfinally/jordan/*panic-room.html*

F12

Images of Study 1.3 Have a Good Day
design.ncsu.edu/thenfinally/jordan/*puppies.html*

F13

Alternate response to Study 1.2 Feeling Overwhelmed
design.ncsu.edu/thenfinally/jordan/*panic-room-2.html*

F14

Images of Study 1.4 Expressing Affection
design.ncsu.edu/thenfinally/jordan/*heart-eyes.html*

F15

Narrative conversation for Visual Studies Part Two: Anna + Good Friend

F16

Images of Study 2.1 Reminiscing on a Shared Experience
design.ncsu.edu/thenfinally/jordan/*beach.html*

F17

Images of Study 2.2 Expressing Excitement
design.ncsu.edu/thenfinally/jordan/*trampoline.html*

F18

Motion detail of Study 2.2 Expressing Excitement