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“A Delicate Agreement”: Exploring Subtle Gaze-Triggered Interaction in Art

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "'A Delicate Agreement': Exploring Subtle Gaze-Triggered Interaction in Art" submitted by Lindsay MacDonald in partial fulfilment of the requirements for the degree of Master of Fine Arts.

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Abstract

Elevators are awkward spaces. There are unspoken rules about what behaviour is acceptable while riding with a stranger. If these rules are broken, the remainder of the elevator ride becomes unbelievably uncomfortable. If a stranger casts their gaze in any direction other than towards the doors, this can threaten the delicate agreement that tacitly exists between the occupants of the elevator, turning the mood into an emotional pressure cooker.

A Delicate Agreement is a gaze-triggered interactive art installation that explores this concept. It is a set of elevator doors with a peephole in either side that entices viewers to peer inside and observe an animation of the passengers. Each elevator passenger, or character, has a programmed personality that enables them to act and react to the other characters' behaviour and the viewers' gaze. The result is the emergence of a rich interactive narrative made up of encounters between the characters.

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To my Grandma,
LILY MAY ARNOLD
1918 – 2011

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List of Abbreviations

Abbreviation	Definition
LCD	Liquid Crystal Display
LED	Light-Emitting Diode

Chapter One: Introduction

Imagine walking into a regular elevator lobby, realizing there are peek holes punched into the doors of the elevator, and being able to observe the people within as they travel from floor to floor. These passengers interact with each other, depending on their moods. You are able to affect them with your gaze. *A Delicate Agreement*, the interactive art installation developed as the visual of this thesis, instantiates this concept. In this supporting document I will describe and discuss the results of undertaking the conceptualization, design and implementation of a major interactive installation as part of my Master of Fine Arts degree with a specialization in Computational Media Design.



Figure 1-1 *A Delicate Agreement*, exterior view.



Figure 1-2 *A Delicate Agreement* as a site-specific installation, with the artist.

1.1 Motivation

Our schedules are carved into blocks of time that are devoted to various tasks. Time to get up. Class time. Lunch time. Meeting time. Between these blocks of time in our day exist small streams of “in-between” (Duke & Battersby, 2005). These are not our coffee breaks or bathroom breaks; they are the time between leaving our desks and arriving at the coffee shop or bathroom. We normally let these moments pass by without a second thought, even though, stacked end-to-end, they probably account for a sizeable portion of our lifespan. Sometimes a meaningful event will occur during one of these “in-between times”, such as a casual interaction with another person. As an extension of this idea, when I relate stories of these events at a later time to others, I begin with the phrase, “While I was on my way to...”. Instead of identifying a clear space to serve as the setting for the anecdote, I use the origin and destination as parentheses to define location.

There is a certain expectation that tacitly exists for common liminal spaces such as stairways, hallways and elevators. These spaces require movement in order to exist comfortably within them, for example, walking through a corridor or riding in an elevator. If movement ceases in these spaces, an awkward situation is instantly created as the now stationary person exists in a state of unnatural rest, and is left to examine his or her surroundings, and those still in motion in this space will likely look over at this uncomfortable person as they pass by. For example, if an employee is summoned to her supervisor’s office, she will enter the liminal space of the corridor between her office and her supervisor’s. Before entering the supervisor’s office, she knocks, and realizes that the supervisor has just received a phone call and is not ready to receive her. The employee then has to wait in the corridor, awkwardly, while the supervisor finishes the phone call.

In the case of an elevator, the space itself is moving and the people within must wait for it to complete its task. Consequently, a definite “in-between” time is created within a liminal space, and the movement of people is restricted to a limited area. In Western civilization, we have very well defined notions of personal space that we expect others to respect. This is not limited to proximity alone, but includes gaze and speech. In Chapter Two, I will examine Erving Goffman’s (1959) ideas of performance in relation to this kind of situation. Many television shows¹ use the elevator as a plot device to isolate two characters who share some kind of tension: One of the characters will stop the elevator so that the two of them can address the tension in this liminal space before re-entering the world and interacting with others.

The liminal space of the elevator is an appropriate setting to examine the effects of gaze on interaction between strangers. There is an intrinsic awkwardness and tension in this space; its occupants hope that their co-riders will not break the silence or somehow violate the delicate agreement about how one ought to behave and where it is acceptable to look when one must be alone with a stranger for a set amount of time in a confined space.

1.2 In the context of my previous work

In this section I discuss my own previous work to provide some context for this current work. I have always been interested in creating interactive art installations that encourage viewer participation and are realized through familiar objects that have been modified to become digitally interactive. Specifically, I explore objects and settings of daily ritual,

¹ *Grey’s Anatomy*, *Ugly Betty*, *House M.D.* and *Private Practice* are all examples of television shows that rely on elevators as a plot device.

and the performances we execute over and over as part of our routines within these settings, using these objects. The scale of these projects usually means that I get the opportunity to collaborate with others with different expertise from my own.



Figure 1-3 *Saturday Mornings, The Diner*, 2008 – 2010, Sarah Fuller, Lindsay MacDonald and Lia Rogers. Interactive installation.

In *Saturday Mornings, The Diner*, pictured in Figure 1-3, I collaborated with photographer Sarah Fuller and technologist Lia Rogers to create an interactive diner booth setting. We travelled to several diners around Southern Alberta before deciding on

three locations to feature in our piece. At each of the three diners, Fuller and I interviewed the owners and shot photos and video of the interiors. We acquired an authentic diner booth, complete with red vinyl covering and a formica tabletop, then purchased an old Seeburg selection box, which Rogers and I took apart and fitted with Phidgets.³ The song selection menus were replaced with titles of the video clips that were shot at the diners, which were assigned corresponding button presses (ie. J-10). The selection box was connected to a computer, which was running a software application that detected button presses from the selection box and called the video clips to be displayed on the wall that the booth was sitting against. The desired effect of this was to virtually transport viewers to their diner of choice, evoking nostalgia and pleasant memories of sitting in a regular haunt and enjoying their regular meal or snack. Viewers needed no instruction on how to interact with the piece as sitting in a diner booth and operating a jukebox is still a well-remembered activity to anyone who has frequented a 1950's-style diner.

³ Phidgets are physical manifestations of graphical user interface widgets. <http://www.phidgets.com>



Figure 1-4 *That's not in my Outlook*, 2009, Lindsay MacDonald. Interactive installation.

That's not in my Outlook, Figure 1-4, was a site-specific interactive installation that was commissioned and developed for a group exhibition in an office space,⁵ curated by Tiffany Collinge. Each artist participating in the exhibition was given a cubicle space in which to set up a site-specific installation. In the case of *That's not in my Outlook*, visitors approached an office cubicle and were encouraged to go through the day-timer sitting on the desk and rifle through the desk drawers. A computer and monitor were set up on the desk, running an interactive video. The interface was set up to resemble a typical Microsoft Outlook calendar, with various appointments scheduled throughout the week. Viewers used the mouse to click on these appointments, triggering videos of me

⁵ *The Office Show* was held in Edmonton, Alberta, from May 21 – 25, 2009 as a satellite exhibition supported by artist-run centre Latitude 53.

performing the scheduled actions in the same cubicle that the piece was set up in. These actions or appointments were tasks that normally would either not be part of a typical schedule, such as the “in-between” times (Duke & Battersby, 2005) mentioned earlier, or were activities that violate what we understand as “cubicle etiquette”, such as practicing the saxophone or hosting a cocktail party. As in *Saturday Mornings...*, the interface that was designed and implemented for *That’s not in my Outlook* was easy for viewers with previous experience with office work to understand.

A Delicate Agreement follows in the vein of these installations that feature embedded interactive technology within everyday objects. In this project I decided to explore the aforementioned concept of an uncomfortable liminal space by embedding LCD screens, a gaze-tracking system and a stop-motion animation into a set of elevator doors. These doors are situated in a gallery that has been set up to resemble an elevator lobby, a setting that should be familiar to most viewers. While putting finishing touches on the installation, I noticed that when the peek holes in the doors are discovered by viewers, they know to peer into them without direction to do so, driven by their curiosity about what is on the other side. I first thought of the idea of putting peek holes into elevator doors because I thought that the small hole located at the top of some sets of elevator doors (Figure 1-5) was actually a peek hole.

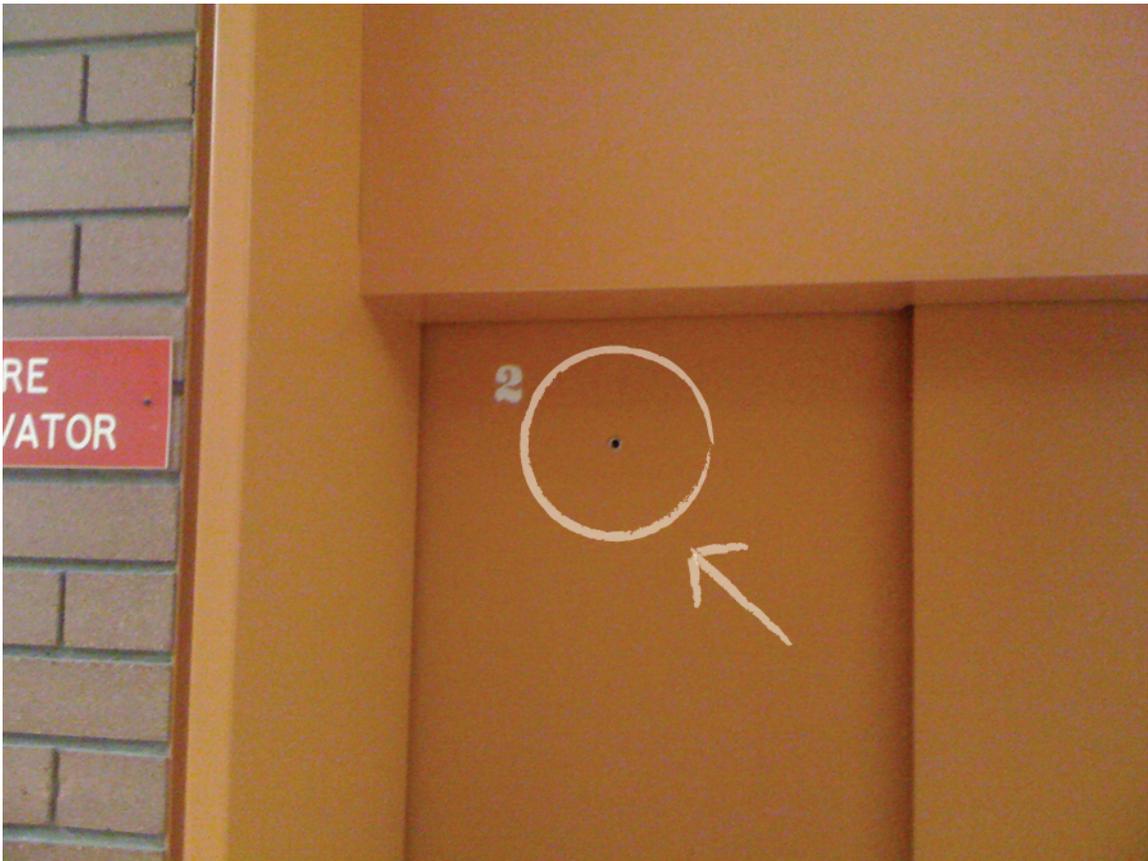


Figure 1-5 A hole at the top of a set of elevator doors in the Math Sciences Building at the University of Calgary.

The fact that they were located about seven feet off of the floor, an impossible level to casually peer through, made me believe that they were specifically meant for repair people to check and see if the elevator car was in place behind the doors. I recently discovered that this hole is a keyhole for the door, which is used for emergency access to the elevator shaft.

The gaze-triggered interaction with the characters riding the elevator serves as a way to loop the viewer into the stories that can emerge in this work. Without input from the viewer, the characters can become stuck in moods and repeat the same routines and interactions with each other as will be further described in Chapter Three.

1.3 Challenges

Several challenges presented themselves over the course of developing this piece. First, a methodology that addressed the interdisciplinary research had to be settled upon. Second, a cast of characters had to be selected to ride in the elevator, and their behaviour determined. Third, the installation itself had to be designed and implemented. I will briefly outline the scope of these challenges in this section.

1.3.1 Developing my personal methodology

The approach I took to establishing a methodology for researching and developing *A Delicate Agreement* was an interdisciplinary one. A cornerstone of my art practice is keeping the viewer interaction in mind while developing a piece, which relates directly to human-computer interaction research in computer science. However, it is also important to me that the design and technology not eclipse the content of my work. To this end, I integrated a well-established method for development in human-computer interaction into my creative practice. This methodology is described in Section 3.1.1.

As mentioned previously, the scale of this project and the diversity of knowledge- and skill-sets needed to successfully realize it necessitated a collaborative effort between me, Miguel Nacenta and John Brosz; specifically, for creating meaningful content, for developing the gaze-tracking system and for developing the elevator mechanism software. One methodology for this kind of collaboration is suggested by Joke Brouwer et al. (2005, p. 6) in their “Introduction and Manual” to their book, *aRt&D: Research and Development in Art*. Another is explored in a paper by artist Arlene Stamp and computer scientists Tobias Isenberg and Sheelagh Carpendale (2007a), “A Case Study from the

Point of View of Aesthetics: A Dialogue Between an Artist and a Computer Scientist”.

These methodologies are discussed in Section 3.1.2.

The interaction design of this piece needed to allow for both the chance that a viewer might not notice that she is using her gaze to interact with the characters, and the possibility that the viewer is aware of this and begins controlling her gaze to move to certain areas to see what how the characters respond. This is discussed in Section 3.2.

1.3.2 Establishing the characters

First, it should be mentioned that the socioeconomic setting of *A Delicate Agreement* is similar to mine: middle-class North American, and predominantly white. The actors chosen were volunteers, mostly from my peer group or my family. This choice was not intended to make a political statement, nor does it set out to ignore visible minorities. It is simply a reflection on my surroundings.

The eight people who appear inside the elevator, who I refer to in this supportive paper as “characters”, were designed based on observing real people in elevators and other public spaces. Of the eight, two were designed as representations of typical students at the University of Calgary, who would be easy for viewers to identify with: Nicole and Max, the young woman and young man. The other six were designed to be exaggerated stereotypes, and function as a means of creating interesting exchanges and stories inside the interaction space. There is a mobster, a businessman, a little girl, an elderly woman, a teenage boy and a teenage girl. Each character has a personality that is embedded in the animation programming, and behaves according to established behavioural codes. The characters have a range of behaviours from neutral to volatile, and these behaviours, as in

real life, are triggered by the behaviours of the other characters and influenced by the gaze of the viewers.

These characters were played by a cast of eight volunteer actors who were photographed in a studio set up to resemble the interior of an elevator. A list of behaviours was developed for each character before the photo shoot sessions, and the actors were directed to perform each action in a sequence that would enable the resulting photos to be assembled in a stop-motion animation.

1.3.3 Creating the installation

The challenges in creating the installation, or form and content of *A Delicate Agreement*, lay in the production of the image sequences that make up the characters' behaviours and designing and constructing the physical structure of the elevator doors and the support for the technology behind them. This process is described in Section 3.4.

1.3.4 Software response

Software needed to be designed that had three purposes: facilitating gaze interaction, enabling the characters' personalities and providing logical movement of the virtual elevator. The gaze trackers needed to be connected to the four general gaze areas on the image, and then linked to the personalities of the characters to affect reaction. The personalities of the characters were developed using colour diagrams that were made to be "code-able", based on work done by Clifford Nass (Nass & Bethune, 2010) and Erving Goffman (Goffman, 1959), and visualized by Edward Tufte (Tufte, 2004, p. 50). A mechanism needed to be developed for the elevator that allowed the elevator to travel up and down the fictional building, stopping on the various floors to pick up the characters. In addition to this, the elevator mechanism also needed to control the

movement of the characters on and off the elevator and act as a timing mechanism for the characters to perform their behaviours. I describe the way these challenges were addressed in Section 3.5.

1.4 Document organization

For the convenience of the reader, the remainder of this supporting document is organized as follows:

Chapter Two provides context for this work, first through related art pieces, then through the more theoretical lenses of performance, the gaze and participation in interactive narrative.

Chapter Three describes the challenges of realizing the piece. First, methodology is presented, followed by a description of the development of the viewer experience, character design, installation, and software.

Chapter Four presents an example of the viewer experience of the installation.

Chapter Five discusses future work and conclusions.

Chapter Two: Context

A Delicate Agreement resonates with many themes and pieces in both the art world and in the world of human-computer interaction. In this chapter, I focus on related work that lies mostly in the realm of visual and media art. I will start by describing each piece of related work in the field of interactive art in Section 2.1, as well as a related piece by Marcel Duchamp in Section 2.2, and how these are related to my own work in this thesis. The pieces that are more closely related to my work have more in-depth discussion than those that are more distantly related. Section 2.3 will frame *A Delicate Agreement* in the context of art theory.

2.1 Related Work: Interactive Art

In this section, I discuss related work in the field of interactive art. For the convenience of the reader, these works are, in the order presented: *Videoplace* by Myron Krueger (Krueger, 1975), *Zerseher* by ART + COM (ART + COM, 1992), *Eyecode* (2007) and *Opto-Isolator* (2007) by Golan Levin, *Chameleon* by Tina Gonsalves et al. (Gonsalves, Frith, Critchley, Picard, & El Kaliouby, 2008) and *Tall Ships* by Gary Hill (Hill, 1992). For each of these, I first describe the piece, and then discuss the relation to *A Delicate Agreement*.

2.1.1 Videoplace, 1975 – , Myron Krueger

Myron Krueger is widely recognized as one of the pioneers of interactive media (Turner, 2002). He began developing what became *Videoplace* (Krueger, 1975) in the early 1970's, beginning with an idea of creating a responsive environment that would provide participants with visual feedback to their presence in the room. This encourages participants to play within the space to see how the piece will react (Krueger, 1977). The image found at the URL mentioned below shows an example of an image generated by this responsive environment.⁶ The person shown in silhouette jumping with balloons is actually the silhouette of a viewer jumping in the gallery, which is incorporated into the environment of the piece by adding a landscape and balloons.

A Delicate Agreement aims to establish a similar playful dynamic with viewers in that it responds and changes according to how the viewer is interacting with the image using their gaze. However, while *Videoplace* uses a more active interactive scheme for

⁶ As of April 24, 2011, the image discussed above can be found at http://1.bp.blogspot.com/_OAu5ITn3WFk/SrqQ2asfC3I/AAAAAAAAAFdQ/8_UJFXhKjrk/s1600-h/videoplace3.jpg.

viewer participation, *A Delicate Agreement* requires little action of the viewer outside of what they are already doing to look at the piece, making the interactive scheme mostly passive. Passive and active interaction are discussed in Section 3.2.

2.1.2 Zerseher, 1992, ART+COM

*Zerseher*⁷ (ART + COM, 1992) is an interactive installation developed by Berlin creative company ART + COM that uses an infrared eye-tracking system to follow the gaze of the viewer across a framed, rear-projected image of *Boy with a child-drawing in his hand* by Giovanni Francesco Caroto (Caroto, 1515). At the location on the canvas that the viewer's gaze is detected, the image distorts (ART + COM, 2011) (Figure 2-1). If, after a period of 30 seconds, no gaze is detected, the image reverts to its original state (ibid.). It is assumed that it is likely that the gaze will never follow the same pattern on the image, especially if the image is being viewed for the first time (A. Duchowski, 2007, pp. 244 - 252), and therefore gives a unique experience with each interaction.



Figure 2-1 *Zerseher*, 1992, ART+COM. Installation progresses from original to distorted state, with viewer.⁸

A Delicate Agreement also makes use of gaze-tracking technology as a means of viewer interaction. As in *Zerseher*, the unpredictability of the movement of the gaze, in both one- or two-viewer scenarios, and the design of the software controlling the virtual

⁷ The title of this piece can be translated into English as “De-viewer”.

⁸ © ART+COM 2009, photograph courtesy of ART+COM.

motion of the elevator and the behaviours of the eight characters, ensure that a unique experience is generated for viewers with each visit.

2.1.3 Eyecode, 2007, Golan Levin

Eyecode (Levin, 2007a), shown in Figure 2-2, is an interactive installation that is literally built out of the gaze of the viewer. Eye-tracking technology captures an image of the viewer's eye for the period between blinks, then adds it to the collection of blinking eyes making up the image on the screen. According to Levin (Levin, 2007b), the experience of the piece is gazing into a living, vibrating, recursive image made up of the act of gazing at it in the first place.

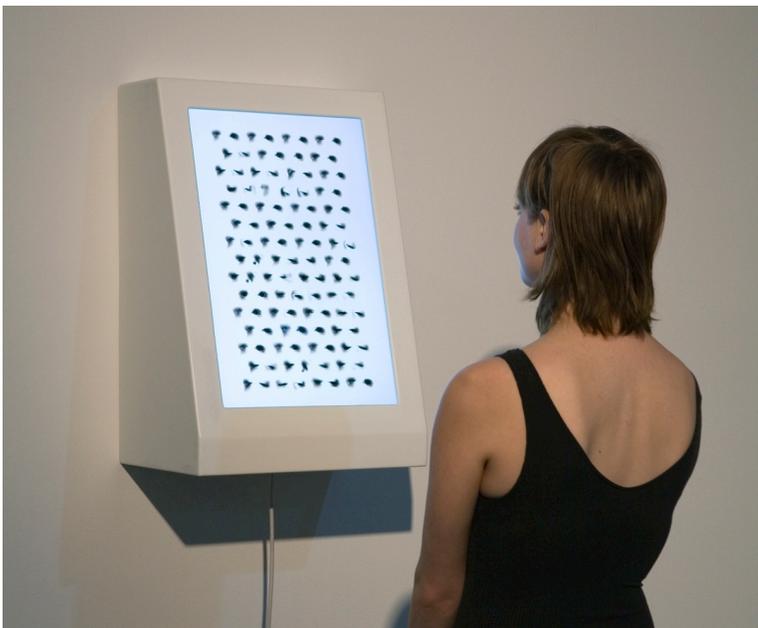


Figure 2-2 Detail, *Eyecode*, 2007, Golan Levin. Interactive Eye-tracking installation.⁹

The subject matter of this piece is hinged on participation; it is composed entirely of traces left behind by the gaze of viewers, and as such, makes itself over the course of being on view in a gallery space. The subject matter contained within *A Delicate*

⁹ © Golan Levin 2007, photograph courtesy of Bitforms Gallery, NYC.

Agreement is certainly affected by the presence and effect being looked at, in that the interactions between the people inside the elevator change as a result. The traces left by viewers, in this case, are the emotional baggage or contagion (see section 2.1.5) that spreads from character to character as they enter and leave the elevator. In contrast to *Eyecode*, *A Delicate Agreement* will continue to create its own story, even when no viewers are present, through the interactions between the characters and their programmed personalities.

Levin amplifies the feeling of being looked at by multiplying the moving image of a gazing eye, and in doing so de-sensitizes viewers to the guilty sensation one experiences when one is caught staring at someone else. All of the eyes are focused back onto the viewer. When a new gaze is detected, it is soon added to the composite of blinking eyes, letting the viewer know they have participated in the creation of the piece (Levin, 2007b). I have placed a condition within *A Delicate Agreement* that, when the gaze tracker first detects input, the adjacent character stops what they are doing inside the elevator to peer back at the viewer and perform the appropriate reaction to the realization that they are being observed. This serves as an indication to the viewer that they are now involved in affecting the events in the piece.

The gaze-tracking technology developed for *Eyecode*, and *Opto-Isolator*, which I discuss in section 3.5.3, was designed with a similar goal to mine. Levin (Manusco, 2009) wanted to be able to track the viewer's gaze without the cumbersome equipment and lengthy calibration processes normally required in a commercial gaze-tracking system, as these would certainly cause disinterest in viewing an artwork, and are also extremely expensive. His trackers were also designed to not change the regular

experience of walking up and viewing a piece of art, like a painting, for example, from one or two metres away (ibid.). *A Delicate Agreement*'s trackers did not need to detect gaze at a distance greater than three to four centimetres because of their position behind peepholes in the doors, but otherwise follow the same design principles. I will further discuss the design of *A Delicate Agreement*'s gaze trackers in section 3.5.3.1.

Another interesting parallel between the discussions of these two pieces occurs in the fact that Levin (Manusco, 2009) describes the resulting image on *EyeCode*'s screen as "typographical", and subsequently refers to each of the eyes as "characters".

2.1.4 Opto-Isolator, 2007, Golan Levin and Greg Baltus

Opto-Isolator (Levin & Baltus, 2007d) (Figure 2-3) is a gaze-responsive interactive sculpture that returns the gaze of the viewer. Made up of a gaze-tracker and a human-sized, mechatronic eye that mimics human eye-blinking patterns, it blinks one second after the viewer and gives the impression that it is looking the viewer in the eye and examining his or her face. If the eye is stared at for too long, it will look away as if behaving shyly (Levin, 2007c).



Figure 2-3 *Opto-Isolator*, 2007, Golan Levin and Greg Baltus. Interactive Eye Robot.¹⁰

This piece has an effect that is the inverse of *Eyecode* in that the gaze returned to the viewer is singular, and the movement and blinking patterns of this eye echo psychosocial eye-contact behaviours (Giddins, 2009) that will elicit emotional reactions from viewers based on previous experience with having eye contact with another person. The fact that *Opto-Isolator* lacks a face that would usually present other behavioural cues distills this performance down to pure gaze, making viewers acutely aware of their affect on the piece.

In addition to utilizing similar gaze-tracking technology and ideas of performance and gaze as discussed in section 2.1.3, *Opto-Isolator* is the product of a collaboration

¹⁰ © Golan Levin 2007, photograph courtesy of Bitforms Gallery, NYC.

between artist Levin and engineer Greg Baltus of Standard Robot Company. This references Joke Brouwer's treatise on collaboration between artists and engineers (Brouwer et al., 2005, p. 6), mentioned in section 1.3.1, which I will discuss in more detail in relation to my own work in Section 3.1.

2.1.5 Chameleon, 2008, Tina Gonsalves, Chris Frith, Hugo Critchley, Rosalind Picard and Rana El Kaliouby

Chameleon (Figure 2-4) is a large scale art-science collaboration between Australian media artist Tina Gonsalves, social neuroscientist Chris Frith and emotional neuroscientist Hugo Critchley from the Wellcome Department of Imaging Neuroscience, and affective computer scientists Rosalind Picard and Rana El Kaliouby of the MIT Media Lab. Based on Gonsalves' previous work in the area of social relationships, trust and intimacy within the context of interactive technology, and current neuroscience research in sensing technology, *Chameleon* focuses on the effects of emotional contagion within itself as an art piece, and also between the viewer and the piece (Gonsalves, Frith, Critchley, Picard, & El Kaliouby, 2008). Gonsalves recorded video portraits of individual actors performing various emotions, ranging from anger to sadness, tiredness to happiness. When a viewer enters the installation space, he or she sees several screens, each with the face of an actor. Face-reading technology determines the current emotional state of the viewer and incorporates that into a computer program that decides what the emotional reaction of the actors should be. Over the course of two years, nine incremental prototypes of *Chameleon* were developed and exhibited around the world by Gonsalves and her colleagues.



Figure 2-4 Prototype 09 of *Chameleon*, 2009, by Tina Gonsalves, Chris Frith, Hugo Critchley, Rosalind Picard and Rana El Kaliouby. Interactive installation. Shown here installed at Fabrica in Brighton, UK.¹¹

Chameleon is quite closely related to *A Delicate Agreement* in that both pieces require passive interaction from viewers and feature a cast of characters that have software-constructed personalities. Both pieces can be examined through the lens of performing expression and impression as defined by Goffman (1959, p. 2), and rely on viewer participation to create stories.

2.1.6 Tall Ships, 1992, Gary Hill

Tall Ships (Figure 2-5) is an interactive video installation in which sixteen ghostly figures are projected on the walls of a dark hallway. Pressure-sensitive sensors are embedded

¹¹ Image © Tina Gonsalves, 2009. Used with permission of the artist.

under the carpet in front of each figure, which are all controlled by a computer program (Hill, 1992).

If no viewers are present in front of a projected figure, it is standing off in the dark distance. When a viewer stands in front of one of the figures and trips a sensor, the figure walks toward the viewer until he/she is standing, life-sized, facing of the viewer, waiting and shifting his/her weight, showing little emotion. When the viewer steps off of the sensor, the figure turns around and walks away from the viewer. If the viewer steps onto the sensor again, the figure immediately turns around and wanders back to face the viewer again. Each figure is projected through a projection lens fitted onto a black and white monitor with the cathode ray tube removed. This method of projection produces a dim, hazy image and eliminates extra light, allowing the darkness of the space to give the illusion that these figures are ghosts adrift in a void. When a pressure sensor is activated and the adjacent ghost comes to the foreground to face the viewer, the viewer gets a sense that they are exchanging gaze with it.



Figure 2-5 *Tall Ships*, 1992, Gary Hill. Sixteen-channel video installation, silent.¹²

As such, in this piece, the viewer is placed in an intimate situation with the ghosts. Even though they are projections of people standing and waiting, facing the viewer, the fact that the viewer must remain standing on the pressure sensor in order to keep them standing opposite means that the ghost and the viewer are standing quite close together, intensifying the sensation of exchanging gaze. The viewer will project that the ghost is conveying a sense of longing through their gaze based on similar experiences with other people. In *A Delicate Agreement*, the viewer does not have the same kind of opportunity to exchange prolonged gaze with the characters or directly control their movement. However, a similarity lies within the expectation of the viewer to reflect upon the presented situation and relate to the characters living in the world of the piece using their

¹² © Gary Hill 1992, Photography by Dirk Bleicker, Courtesy of the artist and Donald Young Gallery, Chicago.

own experiences, and the gaze functioning as a vehicle to achieve this. In this way, interplay is established between passive and active interaction in both pieces.

2.2 Related Work: *Étant Donnés: 1° la chute d'eau, 2° le gaz d'éclairage*¹³, 1946 – 66, Marcel Duchamp

I will now draw a comparison between *A Delicate Agreement* and *Étant Donnés...* (Duchamp, 1966), pictured in Figure 2-6. There are several similarities between the two pieces, both formalistic and conceptual.



Figure 2-6 *Étant Donnés: 1° la chute d'eau, 2° le gaz d'éclairage*, 1946-66, Marcel Duchamp. Sculpture.¹⁴

This piece was Duchamp's last significant artwork and is permanently installed at the Philadelphia Museum of Art. Viewers look through two peepholes, one for each eye, in a set of large old wooden doors to see this tableau consisting of a constructed bucolic

¹³ Translated as "Given: 1. The Waterfall, 2. The Illuminating Gas"

¹⁴ Photograph by Miguel Ariel Contreras Drake-McLaughlin. Creative Commons Attribution-NonCommercial-ShareAlike License. Available at <http://www.flickr.com/photos/bigbabymiguel/2438121267/>

landscape and nude female form with an obscured head (Høy, 2000). The fundamental viewer interface is the same in that the viewer must confront a set of doors with two peepholes, but while Duchamp's peepholes are intended only for one viewer, mine are spaced far apart and are meant for two. Given the scene on the other side of the peepholes in each piece, this sets up a different relationship between the viewer and the content. Viewers can get a sense of playing the role of voyeur while peering into Duchamp's scene, and because there is no gaze returned from the other side, there is no risk of being caught. In addition to this, other gallery visitors have no way to tell which part of the interior of the piece is being viewed.

The viewer's attention is likely drawn immediately to the nude woman's vagina, as it is central in the composition, and the woman's pose leaves this area quite exposed and vulnerable. Upon closer examination, the viewer will notice that the vagina is malformed in a way that emphasizes its form as a gaping hole. This establishes a tension between the viewer's erotic gaze (Foucault, 1990, p. 46) and the more objective, evaluating medical gaze (Foucault, 2003, p. 107), while also encouraging the viewer to impose their own narrative on the scene before them; they will likely wonder why these genitalia are irregular and how this woman came to be in this situation.

In my work, there is a possibility that the viewer's gaze can be returned from the scene within because the faces of the people are visible and possibly a focal point. The role of the viewer in the context of the physical form of the piece is unclear. The exterior of the piece leads the viewer to believe that perhaps they can get away with acting as a voyeur when they peer inside, but because the piece is tracking and responding to their gaze, some of that power is taken away when one of the characters stops what they are

doing to return the viewer's gaze. In addition to this, viewers create their own narratives about what is happening between the two people inside the elevator based on their previous experience in their own lives observing body language; the movements of each of the characters is generated by software, and there is no pre-established story arc.

In the next section, I will discuss *A Delicate Agreement* in the context of art theory.

2.3 Theoretical Context

There are many theoretical and philosophical angles that one may use in discussing *A Delicate Agreement*. In this supporting document, I choose to examine the piece through the lenses of performance as defined by Erving Goffman (1959), Michel Foucault's notion of gaze (1990; 2003), and interactive narrative structure and participation according to Jørgen Bang (1993). I mention some of the characters in *A Delicate Agreement* by name in this section. They are described in more detail in Section 3.3.1

2.3.1 Performance and the gaze

The screen inside the elevator installation enclosure is divided in half. Two characters can be displayed at a time, one in each half. From a technical point of view, they are unaware of who is travelling with them on the other side of the screen; they only know whether the adjacent half is occupied or not, and what level of aggression and desire for attention they receive from the other occupant's behaviour. They are merely executing a sequence that has been performed in advance by actors in a photography studio, which is then being called forth by the elevator software.

Viewers instinctively search for familiar performances in the subsequent interactions, either between the two characters within, or the character alone being

watched by the viewer. For example, during a test run of the elevator software in which random behaviours were performed by characters in no particular order, Max, the young man, alone in the elevator, moved into the “disgust” behaviour with no visual stimulus: he wrinkled his nose, squinted his eyes, and was visibly perturbed. Immediately following this performance, he moved into the “Actively avoid other person” behaviour (Table 1), which for him involves digging in his bag. One of the viewers observing this test of the software declared, “He must have something that smells bad inside his bag! Maybe it’s a squashed banana!”

Goffman (1959, p. 1) indicates that we can lean on our previous experiences in a particular kind of space that in which a particular kind of person is present. Similarly, past experiences with a certain person will lead us to expect of certain kinds of behaviour from others who remind us of that person (1959, p. 1). In the case of a public elevator, we may have a more difficult time guessing what kind of person will appear, depending of course on the kind of building the elevator located within. In an elevator at a University, we can expect to see middle-class academic people, both students and faculty. In an elevator in a public works or government building, we can perhaps expect to see a wider variety of people from various walks of life. The elevator that appears in this thesis is intended to be situated in a middle-class apartment or condominium complex in a large Canadian city such as Calgary. There is expensive-looking wood paneling on the walls and warm lighting, which indicates that this building’s management is concerned with making its visitors feel welcome. We can assume that the people that use the elevator are the middle-class residents of the building, or people who are coming to visit them. The location of this elevator can easily be transferred to other locations we associate with

middle-class life, and this, in turn, affects what narrative and even identity viewers will project onto the characters. If the elevator was located in a bank building downtown, Robert, the man in the suit, will be perceived as a banker. Leo, the man with the gun, would become a bank robber. Alice, the little girl, is lost. Everyone else is likely a bank customer. If the elevator were in an airport, Leo could be perceived as being an undercover police officer. Robert could be Alice's father, trying desperately to find her by phoning Security. For a more detailed description of each of the characters, please refer to Section 3.3.1. It is very unlikely that the setting of this is in a more austere institution such as a prison or hospital; the elevators in those buildings are likely lit with fluorescent lights, and have metal walls that can be thoroughly cleaned and disinfected. Also, the cast of characters are not who we would expect to frequent such an establishment.

Both Goffman and Foucault examine performance and gaze as related to the environment of the "total institution", such as a prison or a psychiatric hospital (Hacking, 2001, p. 288). The residents of these spaces will develop and perform behaviour in front of the staff or guards to seem "normal", but in their absence will behave differently. Even though the elevator is not located in a "total institution", there is a difference in the way the characters act while viewers are present and when they are not. In fact, it could be argued that the opposite may be true in *A Delicate Agreement*: the people in the elevator tend to behave more neutrally towards each other when no viewers are present, and can be affected to antagonize each other when someone is watching.

The behaviour modules for the characters in this piece were developed based on observation of other people in liminal spaces described in chapter one: in elevators,

shopping centres; they are also based on people observed interacting with each other in coffee shops. This process was casual, more of an artistic one than a structured sociological study: I observed and later made notes. I decided on eight characters: an elderly woman, a businessman, a little girl, a rebellious teenage boy and girl, a threatening man, and a young man and woman. Some room was left for interpretation on the part of the actors portraying each of the eight characters. During the photography shoots for this piece, the actors were asked to interpret and perform what they thought would be an appropriate representation of their character's behaviour. They were given very little background information about their character, which sometimes resulted in cynical performances of perceived stereotypes. In the case of the characters' "attracted" behaviour, most of the actors chose a cynical approach (Goffman, 1959, p. 19) to performing the role. For example, Leo's display of being attracted to the other person in the elevator is very aggressive and will likely be perceived by his audience as being inappropriate flirting. Leo likely knows this and therefore is more likely performing this action to assert a position of domination or power over the encounter. This can also be said of Kevin's act of grabbing his crotch while performing "attraction". On the other hand, any of the characters present as the audience of these displays are sincere when they perform avoidance or anger in reaction to this.

Characters in this elevator have only fleeting contact with each other and therefore tend toward making assumptions about each other. According to Goffman (1959, p. 2), "express" can be bisected into that which is given, which can be controlled by the person expressing, and that which is given off, which essentially is how the expression exists after leaving the character and how it is received by the other character

(the audience). Impress, on the other hand, is the effect left by the expression on the audience. The eight characters interact with each other in a cycle of express and impress. The structure of their coded personalities reflect this societal code set forth by Goffman (ibid.): when a character performs a behaviour, their coded personality sends an aggressiveness number value and an attention-seeking number value over to the other character in the elevator, which can be deemed “expression”. The character receiving these values, or the audience, passes them through his or her own perceptual filters, which here is “impression”, adding or subtracting from the expressed values, in order to determine which behaviour should be performed next. An example of this personality code is shown and discussed further in 3.5.1. This being said, the elevator passengers’ interactions tend to be calm and neutral, as in an actual elevator ride, unless there is input from viewers.

The viewer plays a role in determining the behaviour of the occupants of the elevator. When she first casts her gaze through the peephole in the door towards a character’s face, the character recognizes that he/she is being stared at and returns the gaze. As such, the direction of the viewer’s gaze also expresses behaviour, which is impressed upon the characters through their perception filters, and in turn draws the viewer into the story and making her aware that she is affecting this person’s behaviour. The impression factor is multiplied when two viewers are present. This establishes that now, the viewer is the person who is socially misbehaving and causing mayhem in the elevator. When she leaves, the piece becomes more neutral. In this piece, the viewer becomes the tipping point that can upset the “delicate agreement”.

In *The Birth of the Clinic*, Foucault (2003, p. 107) defines an “observing gaze” of a physician that simply takes in what is present without intervening. He then states (p. 107) that “it [the gaze] was to open on to something which always speaks a language that is at one in its existence and its meaning with the gaze that deciphers it - a language inseparably read and reading.” This directly relates to Goffman’s (1959, p. 2) cycle of expression and impression between performer and audience, as described on page 31 of this document, which also includes the viewer’s input and points toward interactivity. At first, given the exterior design of the peepholes in the doors of the elevator, viewers may assume that they are employing the observing gaze without consequences while looking inside, much like viewing surveillance footage. The affect on the characters’ behaviour is immediate and institutes the gaze as a means of interaction, which can be called the “participatory gaze”.

2.3.2 Participation and interaction

This piece is constructed as an open text, narrated in circular mode, as opposed to a more traditional closed text narrated in linear mode. This has several implications for the viewer experience.

In a traditional text, such as a novel or Hollywood movie, the plot of the story will follow a predictable course of the linear model of storytelling: Prelude, presentation, elaboration, escalation, climax and then fade-out (Bang, 1993, p. 215). Jørgen Bang, quoting Danish drama critic Birgitte Hesselaa, proposes that the diagram for this mode of storytelling, shown in Figure 2-7, is remarkably similar to the diagram for the male orgasm, shown in Figure 2-8. There is a regular buildup of dramatic tension, fuelled by events in the story, leading up to a “point of no return” and climax (orgasm), then the

relaxation or fade-out. The narrator's role in these texts tends to be one of an observer following the protagonist, who is not actively participating in furthering the story (Bang, 1993, p. 216). The reader becomes absorbed into the story's universe in a state of fascination, leaving the self behind and experiencing the story entirely through the lens of the protagonist.

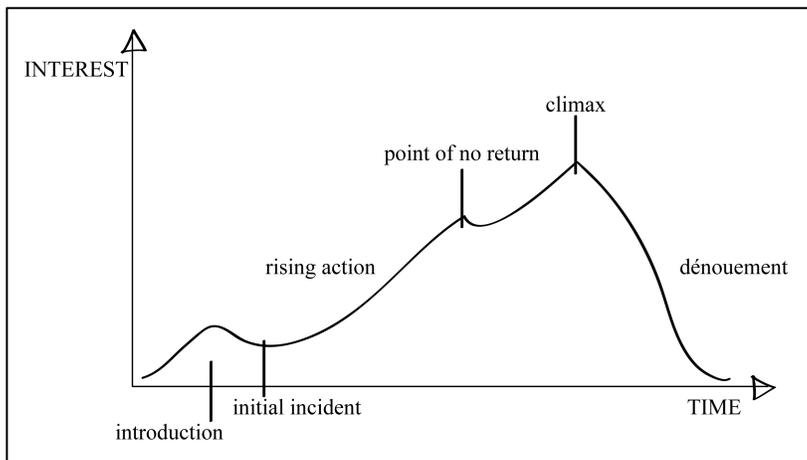


Figure 2-7 Linear Narrative Structure, based on Jørgen Bang's description.

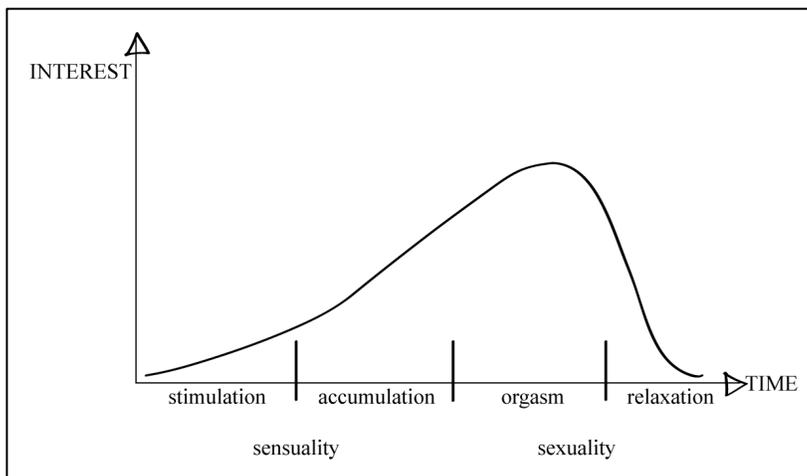


Figure 2-8 Male Orgasm Structure, based on Jørgen Bang's description.

Again quoting Hesselaa, Bang suggests that in an open text, story events that are not necessarily situated consecutively on a timeline, but instead organized in a “recurrent

or even escalating manner” (1993, p. 217), make up the “wave model of storytelling”.

The diagram for this model (Figure 2-9) is very similar to that of the female orgasm (Figure 2-10). There can be many different climaxes depending on the events in the story.

In the case of interactive narrative, the reader takes on the role of participant by determining the course of the story by the choices she makes while interacting. In this way, the participant does not necessarily enter the same state of passive fascination as with the linear model, rather, she enters a state of contemplation (1993, pp. 218-219).

This contemplation permits the participant to make her choices based on her own life experience, and the resulting experience of the story becomes an extension of her mind (1993, p. 219), which relates to the discussion of familiar performances on page 28 of this document. The participant reflects, and then relates. The more choices the participant has, the more reflective the process (1993, p. 220).

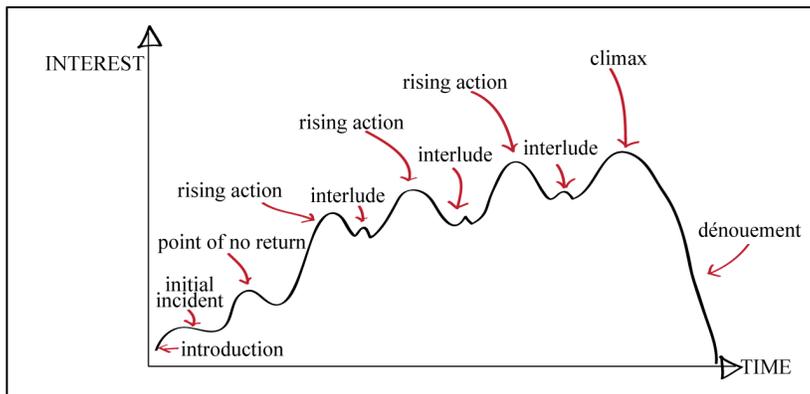


Figure 2-9 Wave model of storytelling, based on Jørgen Bang’s description.

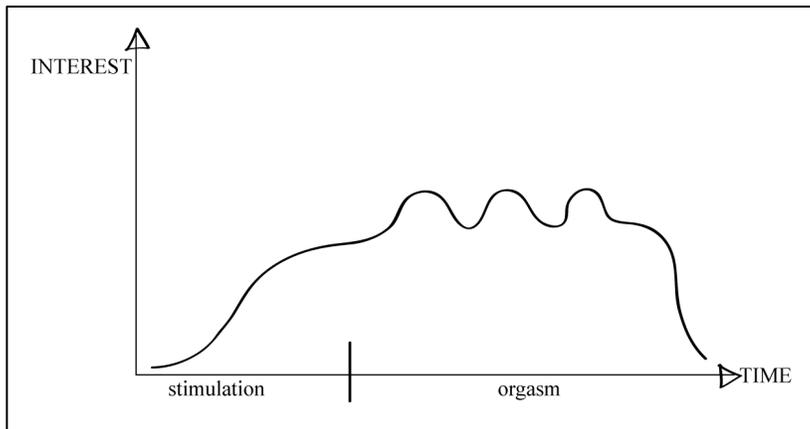


Figure 2-10 Female orgasm structure, based on Jørgen Bang’s description.

In the case of *A Delicate Agreement*, the timeline of the story would appear relatively flat until a viewer approaches and begins “stimulating” the story via gaze interaction. There are an infinite number of possibilities for the course of the story, based on combinations of characters, behaviours, number of viewers present and the direction of their gaze. Due to the fact that the elevator is traveling up and down the building and the characters do not remain on board for an extended period of time, the story can be divided into subplots or micro-stories as people enter and leave. The piece is capable of producing new outcomes each time it is viewed and interacted with. Based on previous experience in similar situations, viewers choose where to point their gaze, triggering any number of new and different plot climaxes within a single viewing and interaction session. During test sessions of the software, viewers often lingered for long stretches of time observing and interacting with the various combinations of characters and resulting scenarios.

2.4 Summary

This chapter presented related work from the area of interactive art and a seminal piece by Marcel Duchamp (1966) that exhibits a similar exterior form factor, and described

how each relates to *A Delicate Agreement*. The theoretical context was then discussed, incorporating ideas related to performance, the gaze and interactive narrative structure.

In Chapter Three, I will describe the process of realizing *A Delicate Agreement*.

Chapter Three: Realization

This chapter discusses my methodology using the framework of the challenges I listed in chapter one. For the convenience of the reader these are: developing my personal methodology, establishing the viewer experience, developing the characters, creating the installation and determining the software response to the presence of viewers.

3.1 Developing my Personal Methodology

3.1.1 Interdisciplinarity: Borrowing from Computer Science

In my experience as a media artist and as a production coordinator at the Banff New Media Institute, it can be difficult to realize a piece that strikes a balance between focusing on the technology it uses and focusing on rigorous and compelling artistic content. Quite often, one of these two key components of the work is swept aside to make room for the other until the final phases of the project, and it is usually the idea that is thought of first (technology-based or artistic) that gets the focus.

In the case of *A Delicate Agreement*, I made an effort to ensure that the process of designing and realizing has been evenly split between focusing on technology and focusing on content. As such, a methodology has emerged that can be loosely based on the iterative design model as defined by Hugh Beyer and Karen Holtzblatt (1998, pp. 220-227).

In *Contextual Design*, Beyer and Holtzblatt establish a model for iterative design and development, for commercial interaction design, that is essentially cyclical: design, implement, evaluate (Figure 3-1), then begin the cycle again until the customer is satisfied (1998, pp. 220-227). This particular methodology is often implemented in research and prototyping in the area of human-computer interaction.



Figure 3-1 Iterative design cycle as defined by Beyer and Holtzblatt

For this thesis, the method of development followed stages of conceptualization, design and implementation, similar to that which is mentioned above. However, while the

iterative design cycle has clearly defined and chronologically separate phases of development, my methodology heavily interrelated the conceptualization, design and implementation phases to an extent that they occurred simultaneously and constantly affected each other. Instead of being cyclical, the model of development was braided or interwoven (Figure 3-1).

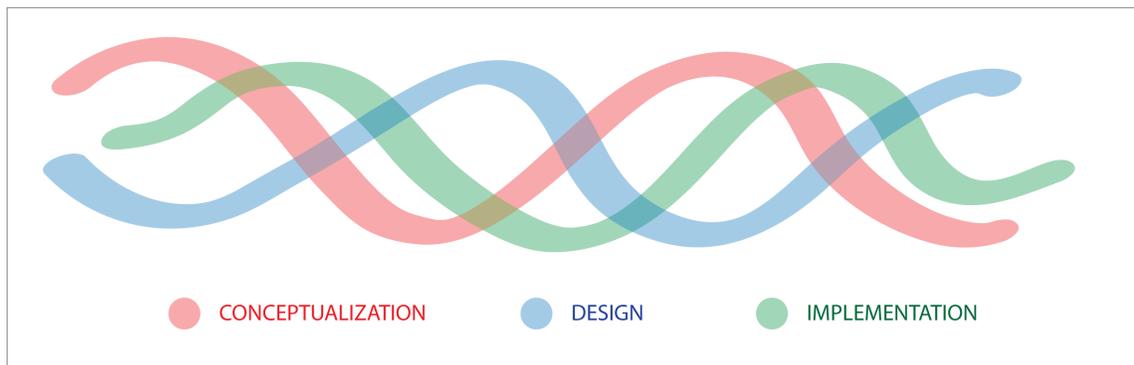


Figure 3-2 Adapted braided/interwoven development model used for this thesis

The process of navigating through the art-related, design-related and technical challenges in this work acted like a push-pull system. When addressing a challenge in one area, the ideas generated trickled forward and affected the decision-making process in the other areas at the same time. This particular development model proved effective for working in collaboration with people from a more scientific background who were familiar with the iterative design method mentioned above but had never worked on a creative project before.

3.1.2 Collaboration

The phenomenon of artists collaborating with computer scientists to create large-scale interactive works such as *A Delicate Agreement* has been much discussed from many different perspectives (Brouwer et al.; Stamp et al.). In *aRt&D: Research and*

Development in Art, Brouwer (2005, p. 6) uses the terms “engineer” and “technician” interchangeably in regards to art-science collaboration. The connotations here indicate that he is diminishing the creative potential of the engineer, relegating this person to the role of someone who takes direction from the artist. The artist, in turn, does not need to learn anything about the engineer’s development process.

The collaboration model that Miguel Nacenta, John Brosz and I used while developing *A Delicate Agreement* is more similar to the one that is discussed by Arlene Stamp, Tobias Isenberg and Sheelagh Carpendale (Stamp, Isenberg, & S. Carpendale, 2007a). Through extensive discussions and planning sessions, Stamp, Isenberg and Carpendale, an artist and two computer scientists, became aware of each other’s processes and gained respect for each other’s problem-solving skills. This facilitated their collaboration on *Growing Patterns* (Stamp, Isenberg, & Carpendale, 2007b), an interactive art piece that allows viewers to generate visual patterns. The process we used closely paralleled theirs. Nacenta is an electrical engineer and computer scientist who specializes in perceptual human computer interaction, and was responsible for the physical design of the gaze trackers and adapting the ITU Gaze Tracker open-source platform (San Agustin, Skovsgaard, J. P. Hansen, & D. W. Hansen, 2009) to suit the needs of *A Delicate Agreement*. The gaze trackers and their software response are described in Section 3.5.3. Brosz is a computer scientist with a background in graphics, and is a very skillful programmer. He developed the software that drives the motion and logic of the elevator, which also determines which floors the characters embark and disembark; and also developed the software bridge that joins the input from the gaze trackers to the elevator program and the characters’ personality software, bringing the

interactive portion of the piece together. The software response of the elevator is described in Section 3.5.2. As the artist, designer and principal investigator of this project, I took the lead on the conceptualization, production and implementation of the content of the piece. I instigated the idea of having a gaze-tracking elevator as an interactive art piece for two viewers; developed the eight characters and their personalities, recruited and directed volunteer actors, designed and built the theatrical set of the inside of the elevator in a photography studio, did the photo shoots and processed and composited the resulting photos, and designed and built the elevator doors and their housing. I discuss this in more detail in Section 3.4. In addition to this, I created the characters' behaviour modules with the processed photos and developed their personality maps and corresponding code, described in Section 3.5.1, to link into the rest of the software. I subsequently adjusted the characters' personalities to allow for interesting narratives to emerge when they meet and react to each other in the elevator and are affected by the viewers' gaze. That being said, the three of us each were involved in each others' process. Discussions were continuous and ongoing through all of the processes. For instance, Nacenta and I both worked on the conceptual design of the gaze trackers, and all three of us discussed the design of the elevator mechanism software. I involved Nacenta and Brosz in discussions about adjusting character reactions. Both the design and construction of the modular supporting structure for the monitors behind the elevator doors and the assembly of the installation in the Taylor Family Digital Library were results of a shared effort between the three of us. By working alongside each other and contributing to each other's process, we gained appreciation for these processes and learned new approaches to problem solving. For example, during the realization process,

I programmed every character's personality, which was a task that I had believed was completely beyond my means before gaining knowledge of Nacenta and Brosz's processes. While writing this code, I was able to recognize parallels between the structure of the code in the software and behavioural codes described by Goffman (1959), as discussed in Section 2.3.1.

3.2 Establishing viewer experience

The process of interaction with *A Delicate Agreement* as I envisioned it is as follows: The viewer approaches the piece, notices the peepholes, peers through, gazes at the characters inside and thus is able to interact. There is a possibility that the viewer may not notice that her gaze is triggering behavioural changes, and this possibility should not exclude this viewer from experiencing the piece and being entertained, nor should it prevent the piece from being affected by this unconscious interaction. In contrast to this, viewers who have previous knowledge of how the interface works will approach the piece with the intention of purposefully directing their gaze in order to trigger events in the interactive narrative that they have not yet witnessed. To address this dichotomy, a flexible interaction strategy needed to be implemented.

I recognized that there would be a challenge in achieving interplay between passive and active viewer interaction. Active interaction is the normal technological approach where people must do specific activities such as clicking with a mouse, touching with the right gestures or even typing on a keyboard. In contrast, passive interaction occurs when people viewing the piece are not required to do anything outside of what they would normally be doing (Nakatsu, Rauterberg, & Vorderer, 2005, p. 8) to observe a piece of art.

Harnessing the power of the gaze of the viewer provides a method of interaction that is passive in that the viewer is not required to do anything over and above what they are already doing by viewing the piece. It becomes active when the viewer realizes that they are affecting the interaction between the characters inside the elevator, which in turn causes the viewer to try controlling their gaze in a more specific way to see how the piece will react. In turn, when the piece reacts, the viewer's gaze is pulled to different parts of the image, which makes the interactive scheme passive again.

In addition to the dynamic of passive and active gaze interaction, there is a tension in the design of the installation between the reality of the setting of the elevator lobby, and the suspension of disbelief as viewers peer through holes in the doors of the elevator to watch the same cast of characters repeatedly travelling up and down this fictional building. The low frame rate of the stop-motion animation also contributes to this tension: it somewhat resembles the style of security camera footage taken at a rate of one shot every two seconds, but the image has high enough resolution to clearly convey details such as facial expressions and the texture of the wood panelling and the characters' clothing.

3.3 Designing the characters and their personalities

As mentioned in Chapter Two, the identities of the eight characters were based on casual observations of people interacting in coffee shops, shopping malls and elevators. In order to create interest for viewers in observing the characters interacting with each other, I decided that some of the characters should be more reactionary than others, easily triggering extreme reactions from their fellow passengers. Others tend towards being

neutral and non-reactionary, and do not have much effect on their fellow passengers.

Subsequently, micro-stories are created, as described in Section 2.3.2.

3.3.1 The Eight Characters

Here, I present each of the eight characters in *A Delicate Agreement*, as they are presented to the viewer. The mannerisms and appearances are described, and the level of complexity based on the number of behaviours available to each character; the more behaviours he or she possesses, the more complex the character. A list of behaviours and which characters perform them can be found in Section 3.5.1.

3.3.1.1 Max



Figure 3-3 Max, a male student

Max is a young man in his late twenties. Viewers can guess, by his clothing and the fact that he is carrying a shoulder bag, that he is probably a student. Max is a fairly complex character with a large number of behavioural possibilities, and is even tempered – that is to say, he requires quite a bit of stimulation, via gaze of either the viewer or the other character in the elevator, in order to trigger extreme reactions like open anger or attraction.

3.3.1.2 Robert



Figure 3-4 Robert, a businessman

Robert is an executive businessman. He will carry on important phone conversations with clients and colleagues at any time that he is not busy with another work-related task. He does not perceive this behaviour as being rude; instead, he thinks it commands respect

and admiration. He will try to make eye contact with strangers while he is on the phone, as if the stranger is in on some kind of inside joke. Unbeknownst to Robert, his behaviour irritates the others, and in some cases, can cause someone to lose their temper. Robert is not a complex character and has a limited range of reactions to others because he is so focused on himself.

3.3.1.3 Leo



Figure 3-5 Leo, a tough guy

Leo is an impatient man. He might be involved in organized crime, likely as an enforcer. His character's machismo hinges on his ability to intimidate others. If he suspects that he is losing his edge of intimidation in any scenario, he feels threatened and will lose his temper. Incidentally, this is normally his reaction to any situation; despite being a

complex character with many behaviours available, he performs most of them aggressively. Leo's presence in the elevator is a trigger for extreme behaviour in the other characters. If he appears often in a shorter period of time, the rest of the characters collectively become upset, an effect similar to the emotional contagion present in Tina Gonsalves' *Chameleon* (2008), described in Section 2.1.5.

3.3.1.4 Alice

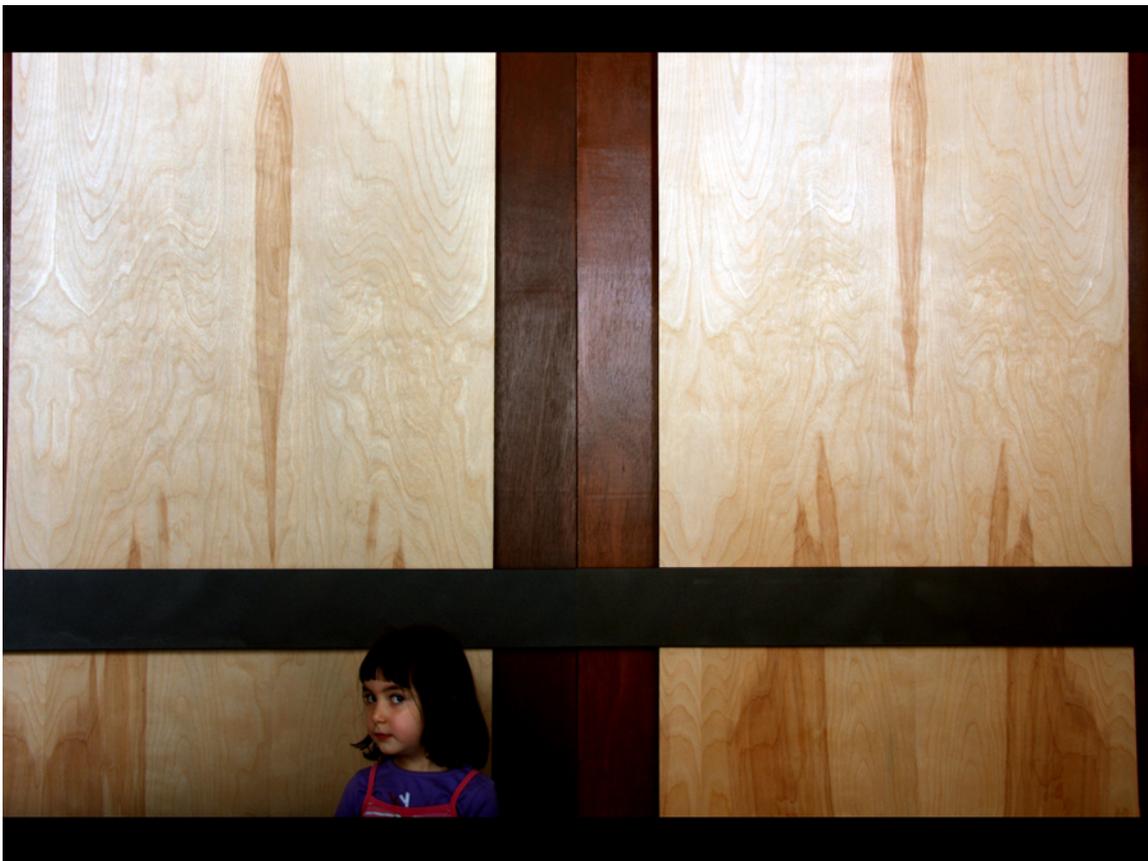


Figure 3-6 Alice, a little girl

Alice is a four-year old girl who rides the elevator without parental supervision. Her behaviour is somewhat unpredictable and most characters don't pay attention to her, which she finds frustrating. Similarly, she is rarely affected by the behaviour of other

characters. She is not a complex character and does not have very many behavioural possibilities.

3.3.1.5 Kevin

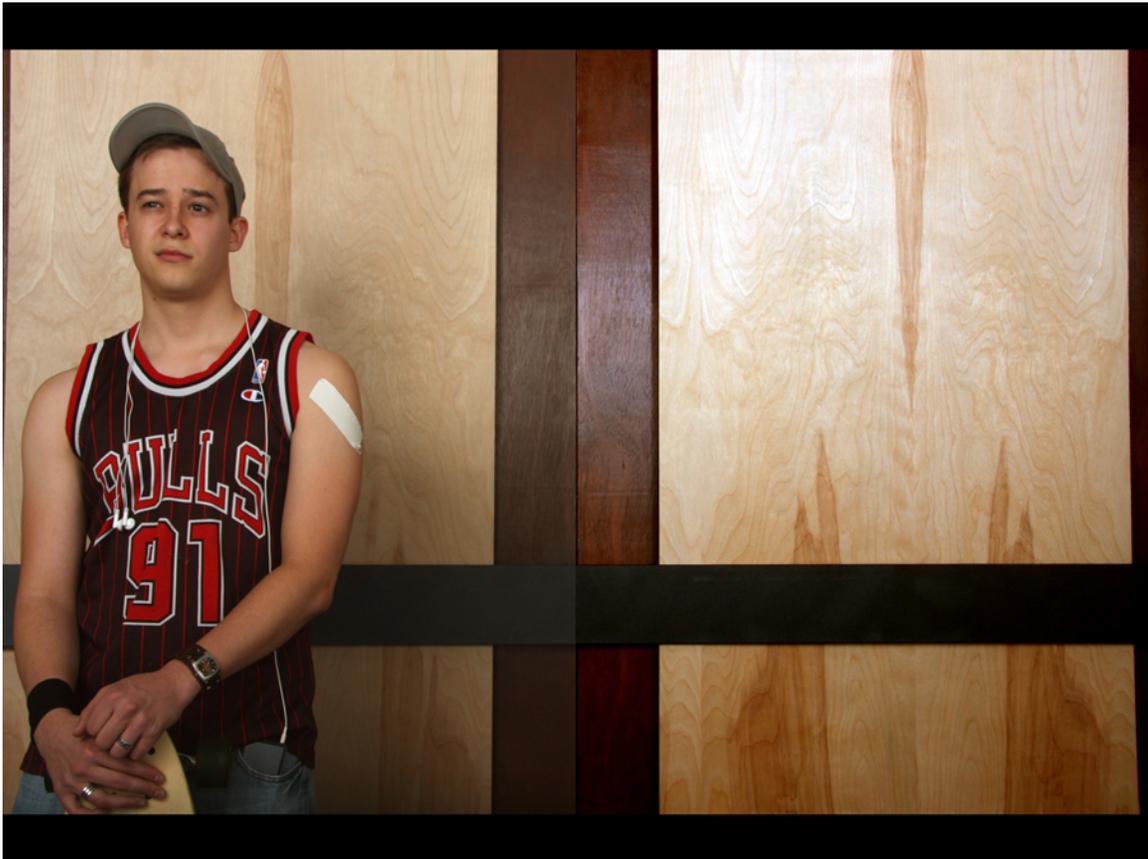


Figure 3-7 Kevin, a teenage boy

Kevin is a self-centred teenage boy. Almost everything he does is with the intention to irritate others, or to somehow attract attention to himself. If he fails to attract the attention he is seeking, he simply tries harder. He enjoys skateboarding and listening to music that other people don't like. He has recently discovered that if he unplugs his headphones from his iPod, the music will come through an external speaker, and he sometimes takes the opportunity to use this as a means to attract attention.

3.3.1.6 Nicole



Figure 3-8 Nicole, a female student

Nicole is a young woman in her late twenties, and is either a student or a young professional. Like Max, she is one of the more complex characters, with a large number of possible behaviours. She is mostly even-tempered, but a bit cynical. She does not require as much stimulation, either from the viewer or from the other character in the elevator, as Max to knock her out of a neutral state. She prefers to use body language to convey disinterest and avoid uncomfortable situations instead of reacting confrontationally.

3.3.1.7 Phyllis

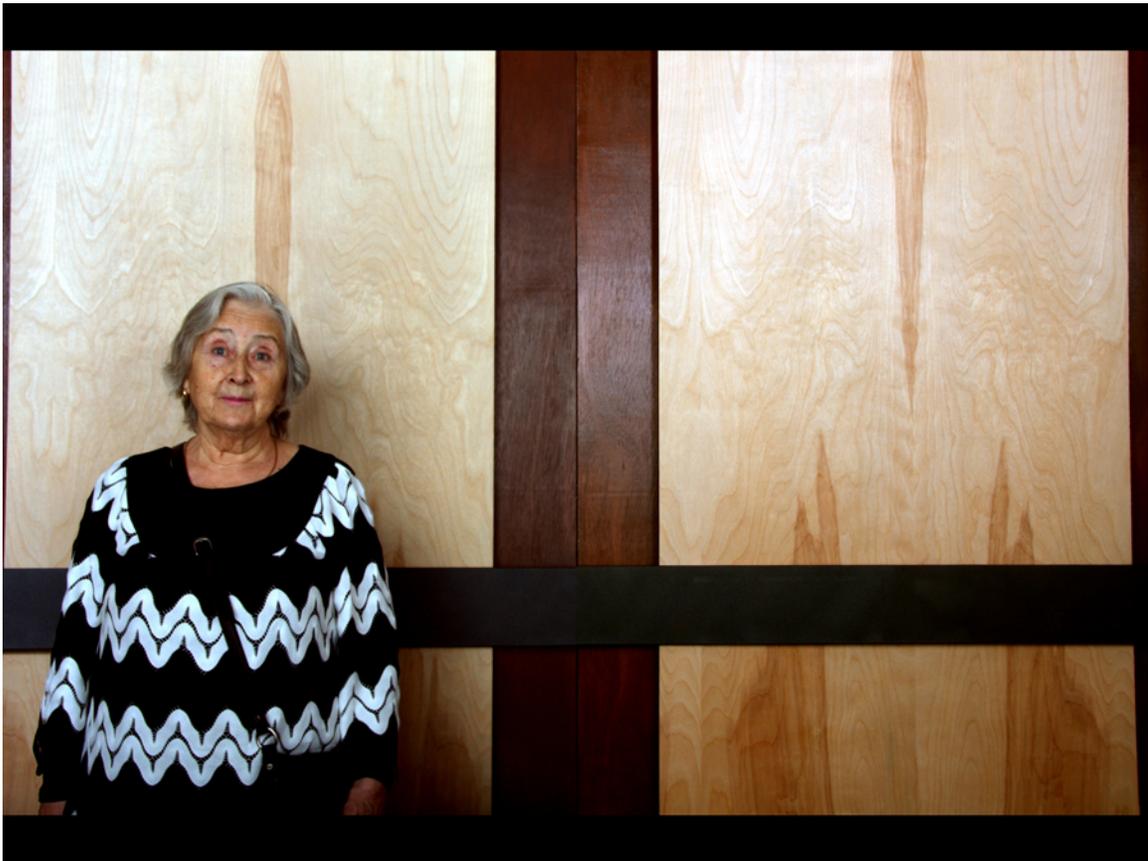


Figure 3-9 Phyllis, an elderly woman

Phyllis is an elderly woman who regularly goes out on errand runs to occupy her time. She is a quiet and tidy woman, mostly non-threatening, and doesn't pay much attention to what others are doing. However, when pressed, she can openly judge others and disapprove of "rude" behaviour. She doesn't often bring out aggressiveness in others, but they will notice her smiling and shift towards seeking her attention. She is a less complex character and not very reactive.

3.3.1.8 Rose



Figure 3-10 Rose, a teenage girl

Rose is a teenage girl who styles herself as a “goth”. While she enjoys shocking other people with her clothing and sometimes with her behaviour, she has some issues with self-esteem and can be very shy. While Rose is a complex character with a large number of possible behaviours, most of them are different ways of avoiding interacting with the other person in the elevator. She can be spurred to become aggressive in some cases.

3.4 Creating the installation

The components that together make up *A Delicate Agreement* are its images, its software, its gaze trackers and its physical form. I will describe each of these in the following section.

3.4.1 Images

In order to facilitate the possibility for viewers to affect the narrative in the piece and allow for the infinite number of combinations of characters and behaviours to occur, the screen real estate in the displays behind the peepholes was divided in two: the left and right halves of the elevator. In previous interactive art pieces I have made, I have found that using video as a means of recording and presenting the content is problematic. If two or more videos are to be played on the screen simultaneously and changed on the fly by viewer input, a memory leak will usually appear, causing the software to become unstable and crash frequently. A piece that lacks stamina to run for more than ten minutes at a time without malfunctioning does not lend itself well to being exhibited in a gallery.

For this piece, a design decision was made to use sequences of digital photographs instead of video.

3.4.1.1 Casting and shooting

The actors chosen to play the characters were volunteers, most of them family, friends or friends of friends; none of them are professional actors. As mentioned in Section 1.3.2, this group of people comes from my own socioeconomic setting and is in no way meant to make a political statement.

I designed and constructed a theatrical set resembling the symmetrical interior of an elevator in a photography studio. The actors were given a very brief, superficial

description of the character they were asked to play, and chose their own costumes based on this. During the shoot, the actors were asked to perform each behaviour twice, once on the left side of the elevator and once on the right, so that their character could perform on either side while the piece is running. Every behaviour sequence was broken down into several photographs, necessitating the actors to hold in-between poses in order to make the movement in the playback of the sequences seem more realistically timed. As a result of this, more than 2000 digital photographs were taken to assemble the behaviour modules for the characters.

3.4.1.2 Image processing and sorting

All of the digital photographs were colour adjusted and motion stabilized, then cut in half and distributed into a file architecture. They were sorted into digital folders, first by the left or right side of the elevator, then by character, then by behaviour.

Every behaviour folder contains a sequence of images, called behaviour modules. When the installation is running, these are called by the character personality and elevator mechanism software, as described in Section 3.5, in a manner that resembles a stop-motion animation.

3.4.2 Physical form of the installation

The goal for the design of the physical form for *A Delicate Agreement* was to make the elevator doors and their setting as convincing as possible for viewers, while supporting the gaze-tracking interface and presenting the stop-motion animated content. There is an assumption of a level of suspension of disbelief when it comes to viewers being able to peer through a hole in the door of an elevator and watch the scene unfolding inside as it moves, as mentioned in Section 3.2.

The installation is made up of a set of elevator doors that were designed and manufactured to scale based on a set of real ThiessenKrupp elevator doors, with peepholes cut into them; real elevator call buttons and indicator lights, a supporting structure for the LCD monitors positioned behind the peepholes, and an enclosure “shed” to house everything, positioned as a site-specific installation in an elevator lobby.

The design of the peepholes in the doors had to serve two purposes: enable the gaze-tracking system to function properly while appearing as though they could actually exist in a set of elevator doors that could open. That is to say, these holes needed to look as though they would not interfere with the doors sliding open. The holes were lined with vinyl to prevent injury from the raw metal edges, and the holes are labelled for use with the viewer’s left or right eye.¹⁵

All parts that make up *A Delicate Agreement* are modular and designed to be easily put together and taken apart for ease of moving and setting up in various kinds of exhibition spaces. The doors and doorframe are made from lightweight aluminum (Figure 3-11) and lined with rigid foam for stability, and attach to the doorframe with bolts.

¹⁵ Using the wrong eye results in inaccurate tracking of the viewer’s gaze.



Figure 3-11 The aluminum doors with peepholes.

Behind the doors, four configurable metal box frames are stacked two by two (Figure 3-12), which are fitted with shelves at equal height to position an LCD monitor behind both peepholes in the doors. The computers driving the trackers and the content sit on the floor inside the lower boxes.



Figure 3-12 The supporting structure for the monitors and computers..

These monitors are fitted with black fabric hoods to block out any peripheral light that would interfere with the gaze-trackers. The shed is made up of six wall sections that are bolted together (Figure 3-13). The side walls are equipped with access doors so that maintenance can be performed on the piece if needed.



Figure 3-13 The shed being installed around the doors

3.5 Software Response

The software developed to drive *A Delicate Agreement* is made up of three major parts: character personality and reaction, the elevator mechanism and the gaze interface. In this section, I will describe how these parts work.

3.5.1 Character personality and reaction

Each character's personality is comprised of a set of behaviour modules and code that tells the software how and when to use these modules. A behaviour module is a consecutive sequence of photos collected into a folder and assigned a number based on Table 1.

Table 1: Assignment of numbers to behaviours

Behaviour Number	Description	Applies to
01	Getting on the elevator	All
02	Leaving the elevator	All
03	Recognizing the viewer	All
04	Neutral Behaviour 1	Nicole, Rose, Max
05	Bored	Robert, Kevin, Nicole, Rose, Max, Leo
06	Mild shock/Avoiding	Robert, Nicole, Rose, Max
07	Looking up/Neutral	Phyllis, Kevin, Nicole, Rose, Max, Leo
08	Glance at other	Robert, Phyllis, Kevin, Nicole, Rose, Max, Leo
09	Blocking out the other person	Nicole, Rose, Max
10	Actively avoiding the other person	Robert, Phyllis, Nicole, Rose, Max
11	Hidden laugh - mild disbelief	Nicole, Rose, Max
12	Defending self/placating other	Robert, Phyllis, Kevin, Nicole, Rose, Max, Leo
13	Disgust	Robert, Alice, Kevin, Nicole, Rose, Max, Leo
14	Frustration	Robert, Alice, Kevin, Nicole, Rose, Max, Leo
15	Openly angry	Robert, Phyllis, Alice, Kevin, Nicole, Rose, Max, Leo
16	Ignoring other person	Robert, Phyllis, Kevin, Nicole, Rose, Max, Leo

17	Attracted to other	Robert, Kevin, Nicole, Rose, Max, Leo
18	Emergency exit*	Nicole
19	Cute reaction*	Nicole and Phyllis, Alice
20	Obnoxious-attention seeking	Rose, Leo and Robert
21	Passive aggressive	Phyllis, Kevin, Leo
22	Neutral Looking at other	Alice
23	Neutral alone	Alice
24	Antagonize/Obnoxious aggressive	Rose, Leo and Kevin
		* Not implemented in this version of the piece

Some characters have more behaviour modules than others, as shown in Table 2.

Characters with more modules available give a wider range of reactions to stimuli and contribute a wider range of possibilities to the interactive narrative in this piece; therefore these characters are more complex than those with fewer behaviours.

Table 2: Behaviours available to each character

Character	Possible Behaviours
Robert	01, 02, 03, 06, 08, 10, 12, 13, 14, 15, 16, 17, 20
Phyllis	01, 02, 03, 07, 08, 10, 12, 15, 16, 21
Alice	01, 02, 03, 13, 14, 15, 22, 23
Kevin	01, 02, 03, 05, 07, 08, 12, 13, 14, 15, 16, 17, 21, 24
Nicole	01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17
Rose	01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 20, 24
Max	01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17
Leo	01, 02, 03, 05, 07, 08, 12, 13, 14, 15, 16, 17, 20, 21, 24

In *The Visual Display of Quantitative Information*, Edward Tufte presents a relational graphic of a dog's response to cusp catastrophe (2004, p. 50), which Tufte explains as being based on catastrophe theory research. It is a coordinate space with rage as the x-axis and fear as the y-axis. Nine drawings of the profile a dog's face are laid out in a grid pattern, and the dog's facial expression changes according to where his

emotional response lies within this coordinate space. This coordinate space of changing emotions inspired my ideas on developing an emotional coordinate space for each character.

This emotional coordinate space for the characters' behaviours was designed based on this graphic, as well as Clifford Nass' (Nass & Bethune, 2010) assertion that there are two polemics for ascertaining someone's emotional state: happy/sad, and aroused/calm. In the coordinate space for this software, aggressive/peaceful and attention-seeking/disinterested are used as the axes in order to reflect characters' range of appropriate behaviour performances in the space of the elevator.

Each module occupies a set area in this emotional coordinate space with the x-axis indicating level of aggressiveness and the y-axis indicating level of desire for attention. The entire coordinate space is covered with these behaviour modules. Two of these spaces are built for each character, one for behaviours that he/she may only perform when accompanied in the elevator (Accompanied condition), and one for behaviours that he/she can perform regardless of being accompanied or not (Dontcare condition). The coordinate spaces for each character can be found in this document in Appendix A. These coordinate spaces were translated into code that determines their behaviour towards each other and functions as a personality made from software.

The code also determines how the characters express behaviours and how they are impressed upon by others, referring to Goffman (1959, p. 2) as discussed in Section 2.3.1. The bumpFactor can be equivocated to expression and contains instructions to change the behaviour of the other person in the elevator by nudging them in a particular direction along both x- and y- axis. The bumpFilter facilitates impression and contains instructions

for how a character will perceive the behaviour of others. It takes the received bumpFactor values and adds aggressiveness and attention-seeking points, then multiplies these by a set amount that is different for every character. Following this, the code looks to the coordinate space to determine the next behaviour.

For example, one instance of behaviour 24, “Antagonize/obnoxious aggressive” (shown in Table 2), for the character of Kevin, has an aggressiveness bumpFactor of 10 and an attention-seeking bumpFactor of 2. If Kevin is in the elevator with Rose and performs his behaviour 24 while Rose is performing her behaviour 04, “Neutral Behaviour 1”, the software will first check to see if she is alone or accompanied in the elevator. Since she is accompanied, the software will then retrieve the aggressiveness bumpFactor of 10 from Kevin’s behaviour, combine this with the aggressiveness bumpFilter, which adds 2 and then multiplies the sum by 0.5, which will move her emotional coordinate in the direction of more aggressive by six points. The same operation is applied to the attention-seeking value, which results in her emotional coordinate rising on the attention-seeking axis by 10 points. Depending on what her initial coordinates were, Rose will likely end up in the area of behaviour 14, “frustrated”, or behaviour 15, “openly angry”. Visually, this plays out as Kevin turning up the speakers on his iPod and dancing around, which in turn causes Rose to get frustrated or angry at this obnoxious display.

When he reaches the end of his image sequence for his behaviour, Kevin will collect the bumpFactor values from Rose’s updated behaviour to determine which behaviour to perform next. At the end of her behaviour image sequence, Rose will collect the bumpFactor values from Kevin’s new behaviour to determine her next behaviour.

This process, which I refer to in Figure 3-14 as the “staggered behaviour model”,¹⁶ continues until one or both characters exit the elevator. An example of this personality code can be found in Appendix B.

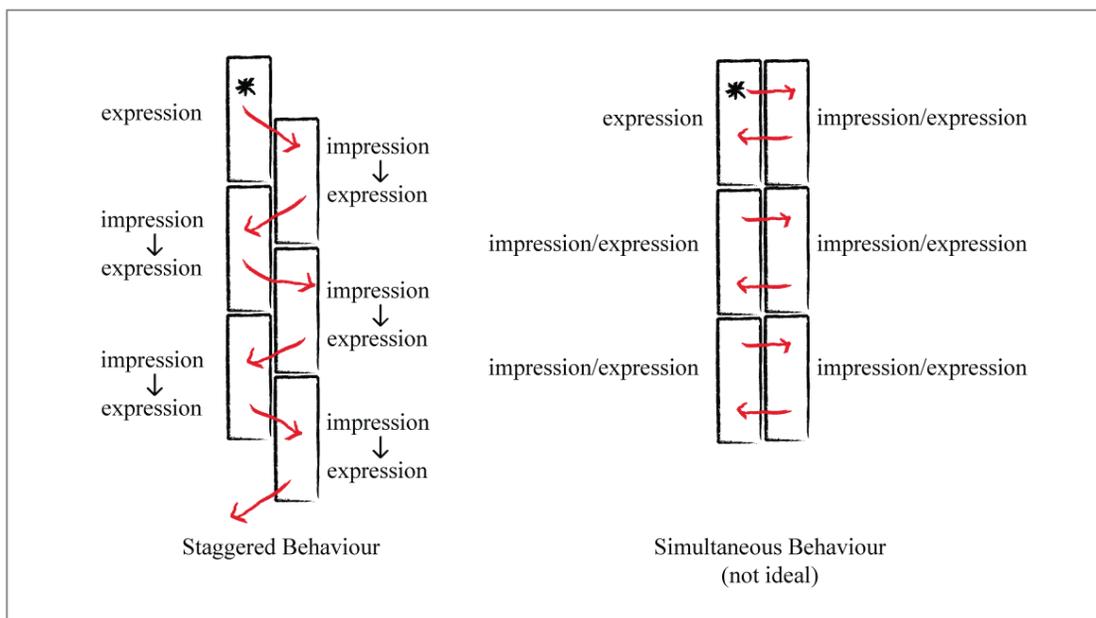


Figure 3-14 Staggered versus Simultaneous Behaviour Models.

The characters maintain their mood for a certain length of time while they stay on their destination floor in the building, then will perform the behaviour again when they re-enter the elevator, affecting whomever they happen to be riding with.

3.5.2 Elevator mechanism

The elevator mechanism software tells the elevator to move and stop, determines which characters should get on or off on each floor, remembers which characters are on which floors, and functions as a means of time progression in this piece.

The elevator, like a typical elevator, moves up and down within an eleven-floor building. A visual indicator of the position of the elevator is located directly above the

¹⁶ An audience requires time after an initial action to decide how they will react before they perform a reaction. The simultaneous model illustrated in Figure 3-14 would appear unrealistic to viewers.

space where the characters are interacting with each other, so that the viewers may see where the elevator is at any given time. When the elevator travels from floor to floor, the sound of a soft beep is played, and, when it reaches the main floor, a bell sounds.

When the piece is first switched on, by default, all of the characters are on the main floor. The software randomly chooses two to ride together, and then randomly decides which floor each character should exit on. It is configured so that the elevator will very rarely make a trip without any passengers, and when it is empty, its movement between floors is accelerated.

The animation is played back by the software at a rate of one frame per 400 milliseconds. When the elevator stops at on a floor, the character disembarking will finish his or her current behaviour before exiting the elevator.

3.5.3 Gaze interface

The gaze-tracking software collects input from two gaze-tracking devices, one mounted on the back of the left elevator door, one on the back of the right. The gaze trackers are described in Section 3.5.3.1 There are five separate areas on the image that trigger the trackers, shown in Figure 3-15: looking at nothing, looking at left top, left bottom, right top, and right bottom.

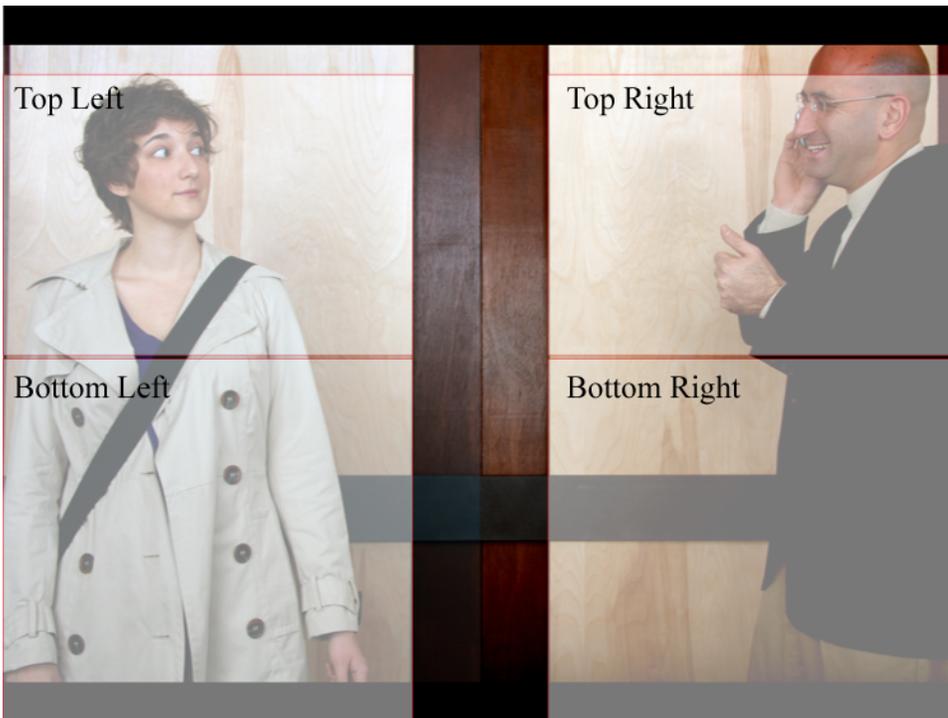


Figure 3-15 The four possible gaze-triggered areas. The fifth, “looking at nothing”, is the area not covered by the translucent white squares in this diagram.

The tracker first determines if a gaze is present, then determines where, out of the five areas, the gaze is directed. It will count the number of times each area is looked at over the course of each character’s behaviour sequence, and then, before each character transitions into the next behaviour, determine which area received the most gaze. The characters, in addition to having bumpFilters for impression and bumpFactors for expression of behaviour performances as discussed in Section 2.3.1, are allocated further bump values for receiving the gaze of the viewer. Each character’s aggressiveness and desire for attention will shift based on if the viewer is looking at their upper or lower body, or at the other character’s upper or lower body. If both viewers simultaneously look at the same character when the software collects the gaze values, that character will recognize that he/she is being looked at and react directly to the viewers instead of the

other character in the elevator by first returning the viewer's gaze. Each character performs this reaction differently. In her video piece *Mirror Mirror*, media artist Paula Levine (1987) takes a voyeuristic look at a handsome young man flirting with a group of young women. Levine positioned her camera some distance away from the scene and used a zoom lens. After some time has passed, the young man realizes Levine and her camera are observing him and his facial expression and body language transform from being happy and charming to being shocked and angry.

In the next section, I will describe the gaze-trackers developed for *A Delicate Agreement*.

3.5.3.1 Gaze trackers

Gaze- or eye-tracking systems are normally used for usability evaluations in computer science (A. T. Duchowski, 2002; Karn, Ellis, & Juliano, 1999). A manufactured system is quite expensive and requires users to keep their heads perfectly still by either bite a fixed piece of plastic in front of the camera or placing the chin into a holder and strapping the head in (SR Research, 2010). The calibration process for these devices can also be complicated and lengthy. This type of system collects very precise data about the position of the user's pupil: exactly where on the screen they are looking and for how long. In the case of this thesis, it is not necessary to collect and use such precise data to drive the art piece, and the cost and intrusive interface design make this sort of device unfavourable for using as a means of interacting with the piece in a gallery.

A gaze-tracking system was developed specifically for use in *A Delicate Agreement*. It is based on an open-source platform called ITU Gaze Tracker,¹⁷ which was developed by the ITU Gaze Group at Copenhagen, Denmark (San Agustin, Skovsgaard, J. P. Hansen, & D. W. Hansen, 2009). Unlike its more expensive counterparts, this software uses any digital camera that is enabled with infrared vision, which drastically reduces the overall cost. The camera must be positioned directly opposite the viewer's eye. In order to determine the direction of the viewer's gaze, the software specifically looks for the position of the pupil. The software pinpoints the pupil by looking for the darkest part of the eye. Two glints of light projected into the eye by two infrared LEDs positioned on either side of the camera lens (see Figure 3-17). The direction of the gaze is determined by the relationship between the location of the pupil and the location of the glints. Figure 3-16 shows the image of a viewer's eye as seen by the gaze-tracking software.

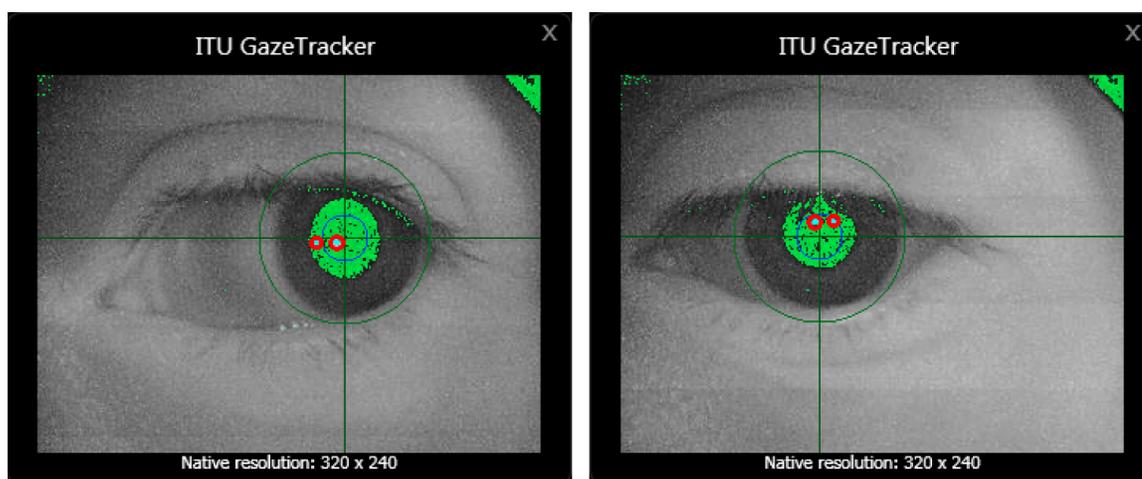


Figure 3-16 The viewer's eye as seen by the gaze-tracking software. The pupil has been found and is indicated by the green crosshairs. The red circles indicate the position of the glints.

¹⁷ <http://www.gazegroup.org/downloads/23-gazetracker>

Several adaptations were made to the original software developed by the Gaze Group in order to address the design challenges of this project, specifically, to make the gaze trackers physically undetectable by the viewers. In its original form, the software requires device calibration by getting the viewer to follow a moving dot around the screen for about 25 seconds. The adapted version of the software for this project does not require calibration with each new viewer, providing an unobtrusive, uninterrupted experience for viewers. The calibration process is run during the installation of the piece in the gallery, and then again periodically when no viewers are present. It is not necessary to have the level of detail that a commercial gaze- or eye-tracker can provide; there are only five possible gaze-triggered areas for viewers to look at. The tracking software provides an aggregate measure of where the viewer has been looking at, which is used when a behaviour is finished being performed to determine the next emotional state.

The cameras used in the trackers are modified web cameras, which are commonly available in electronics stores for less than one hundred dollars. Since positioning the camera directly in front of the peek hole would obscure the view of the interior of the elevator, a camera housing was designed that places the camera at a 90° angle to the peek hole, invisible to the viewer.

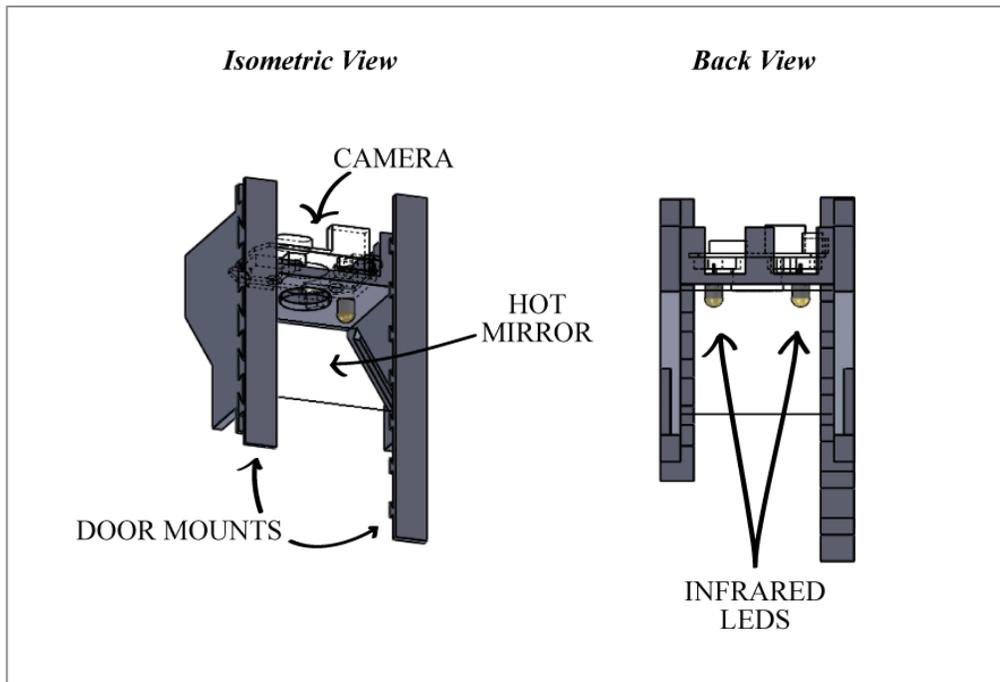


Figure 3-17 Isometric and back views of the gaze-tracker, showing position of camera, hot mirror and infrared LEDs.

A hot mirror¹⁸ is placed at a 45° angle to the peek hole, which reflects the infrared image of the viewer's eye directly into the camera, as shown in the illustration Figure 3-18. Figure 3-19 and Figure 3-20 show, respectively, the prototype and finished versions of the gaze-tracker.

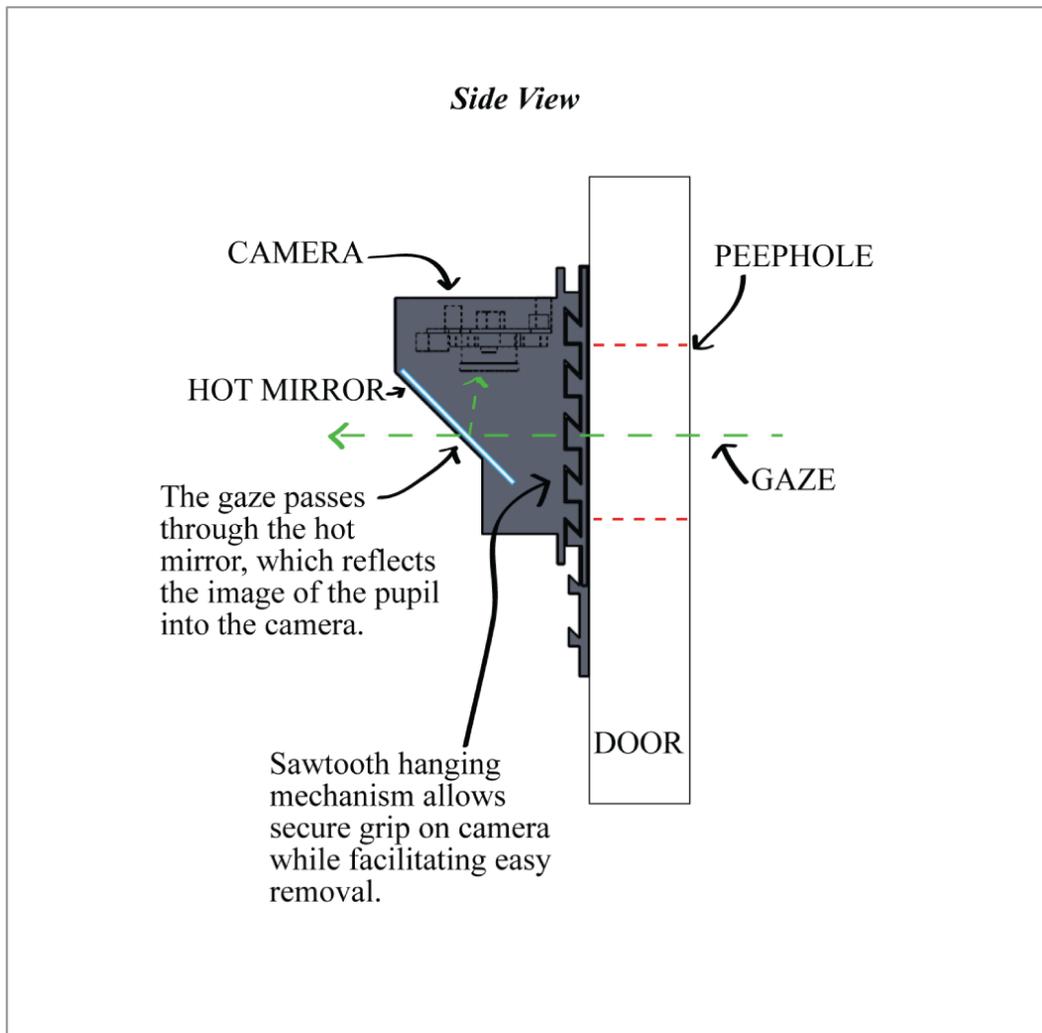


Figure 3-18 Side view of gaze tracker mounted on the back of the elevator door, receiving the gaze.

¹⁸ A hot mirror is a mirror that allows the visible light spectrum to pass through, but reflects the infrared. To the naked eye, it looks like a regular piece of glass.

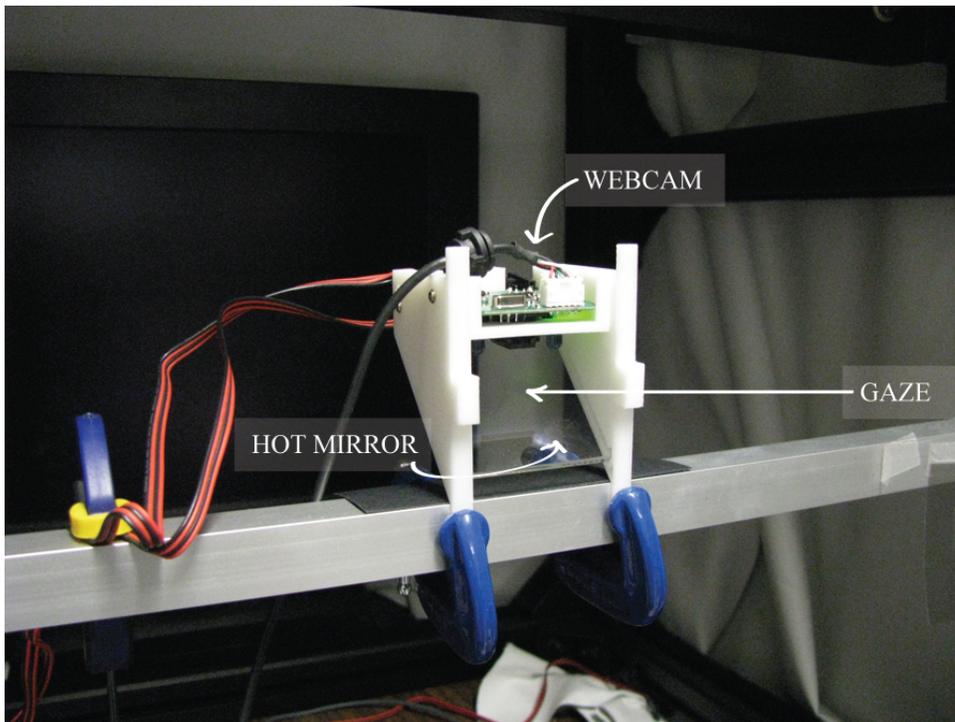


Figure 3-19 Prototype of gaze tracker. Shows position of hot mirror and webcam relative to the gaze of the viewer.

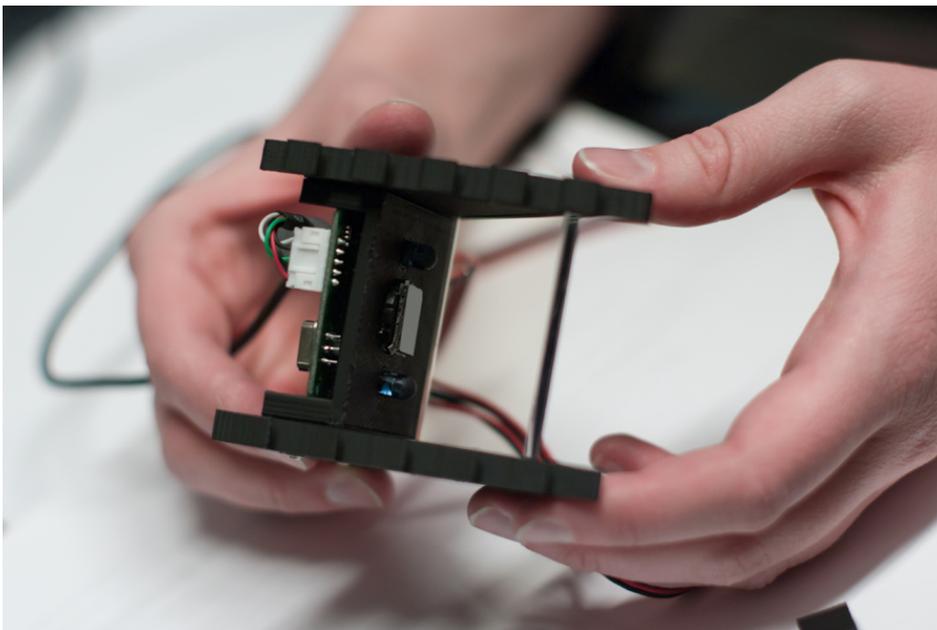


Figure 3-20 Final version of gaze tracker.

The trackers are attached to the backs of the elevator doors, one positioned behind each peephole, in a manner that makes them inconspicuous to viewers.

3.6 Summary

This chapter described the process and challenges of realization of *A Delicate Agreement*. These challenges were developing methodology, establishing the viewer experience through passive and active gaze interaction, designing the characters and behaviours, and creating the installation itself through image production, software and hardware development and the design and construction of the physical form.

In Chapter Four, I present an example viewer experience.

Chapter Four: Viewer Experience

4.1 Introduction

In this chapter I will provide a visual explanation of the experience a viewer might have while visiting “A Delicate Agreement” in a gallery setting. I will provide a walk-through of what you, as the viewer can expect to see and be able to do.

4.2 Example viewer experience

You enter the Taylor Family Digital Library and walk towards the elevator bank. There are four elevators: one marked for public use, two designated for contractor use only and a fourth, slightly removed from the other three; this fourth one’s doors are set in a wall that projects out from the main wall by three feet, but is otherwise just like the other elevators (Figure 4-1). Or is it?

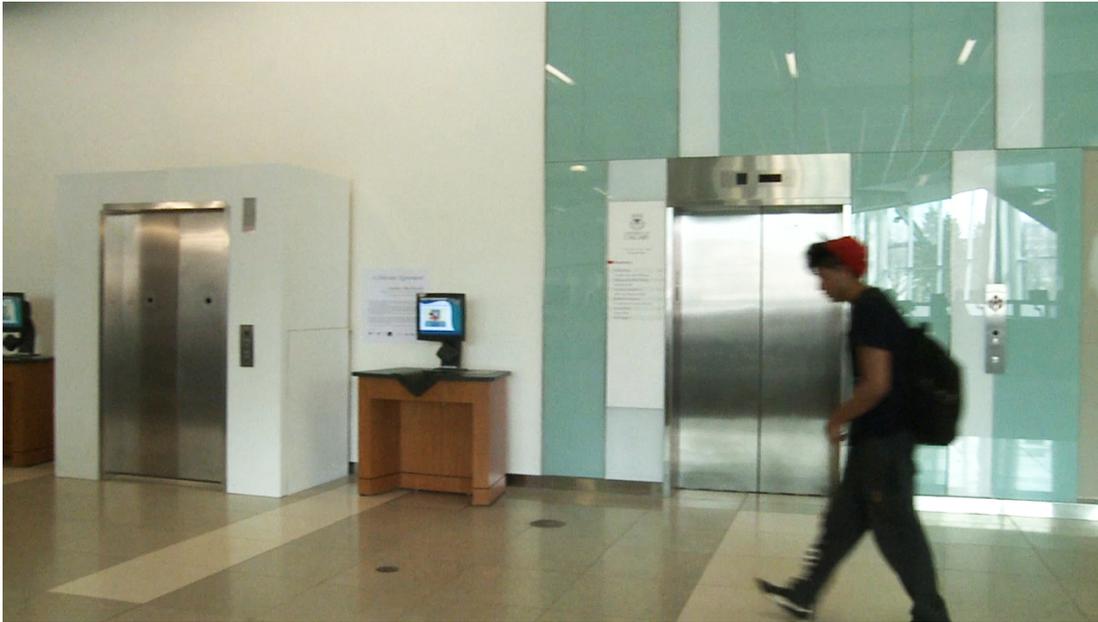


Figure 4-1 *A Delicate Agreement*, situated in the elevator lobby of the Taylor Family Digital Library at the University of Calgary

As you approach the elevator doors, they appear at first to be exactly as they should be - regular call buttons with up and down arrows positioned to the left of the doors and indicator lights above, but these don't seem to work. You dismiss this because it's typical for these things to malfunction, and you take a step back to examine the elevator to see if it's actually running (Figure 4-2).



Figure 4-2 A viewer approaches *A Delicate Agreement*

You turn your gaze to the doors themselves, seven-foot tall stainless steel doors set about eight inches back into the wall, and notice that there is something slightly unusual about them: there is a hole, about three centimetres wide and five feet off the ground, cut into each door. Around the hole on the left, there is a translucent label that reads “left eye”, and, similarly, “right eye” is written on the label around the right hole. These are obviously peepholes that have been cut into these doors. You lean your left eye close to the hole on the left and peer in (Figure 4-3).

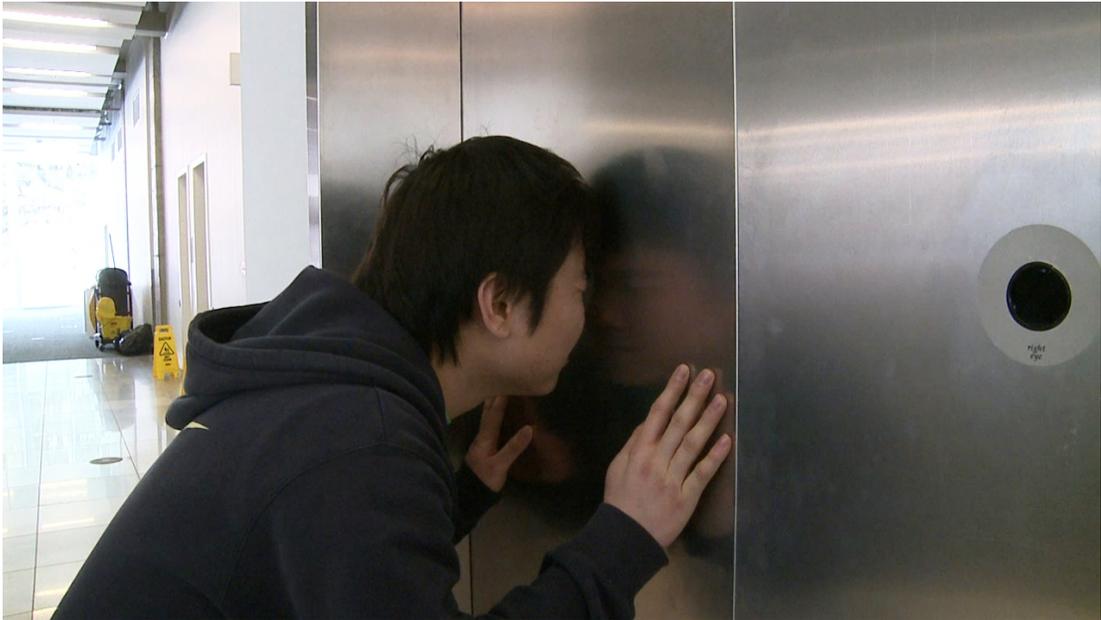


Figure 4-3 Peering into the left peephole.

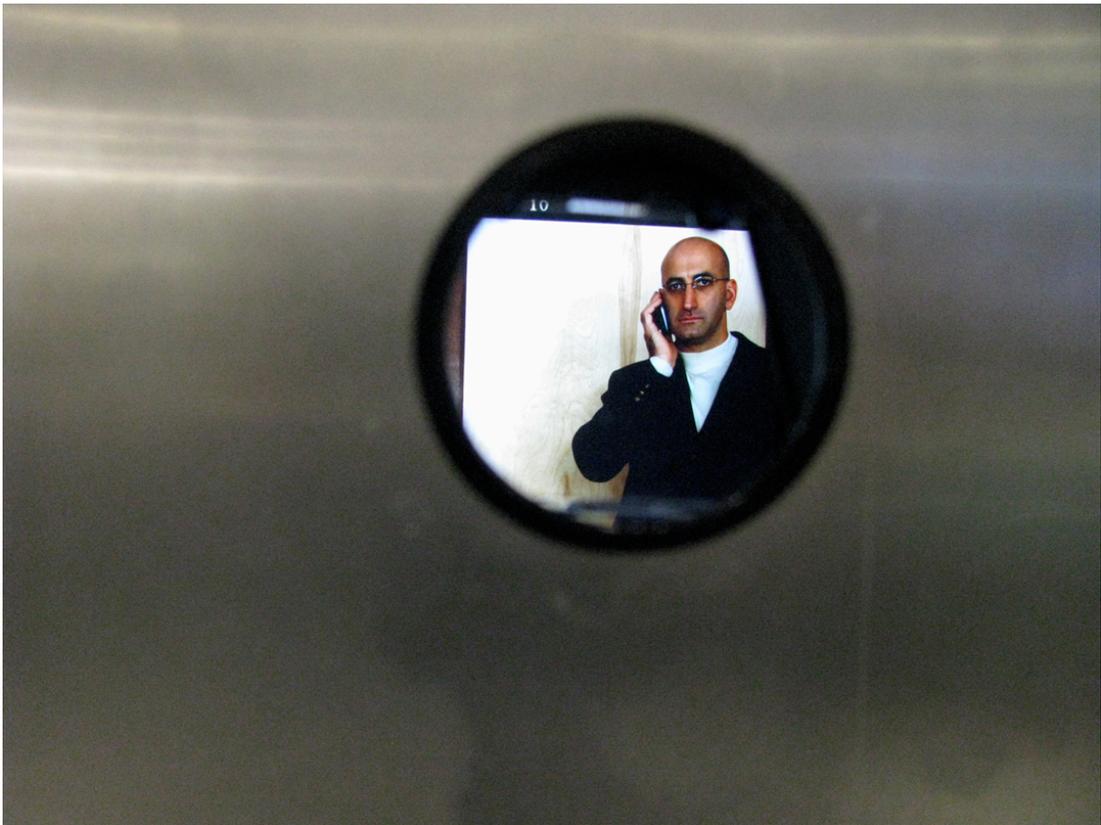


Figure 4-4 Detail of peephole, with Robert visible on the inside.

The scene revealed to you is the inside of this elevator and the people traveling within. It almost seems like surveillance footage - it's not quite like a video since the frame rate is so slow, typical of a security-type camera, and reads more like stop-motion animation. At the top of the image you notice a series of numbers, starting with the letter 'B', which indicates which floor the elevator is on. The elevator car itself has a wood-paneled interior with a dark handrail spanning the back wall. You notice from the numbers at the top of the image that the elevator has arrived on the main floor, and two people get on and push the button for their destination floors (the button panel is obscured from your view) (Figure 4-5).



Figure 4-5 Nicole and Robert get on and push the floor buttons

The person directly in front of you, on the left side of the elevator, is a woman, probably in her late twenties, carrying a travel mug and a shoulder bag. Perhaps she is on her way to work or school? On the right side of the elevator is a tall man wearing a blazer and designer glasses, talking on his mobile phone (Figure 4-6). He looks like he could be some kind of executive businessman.



Figure 4-6 Nicole and Robert riding together

He turns to face the woman on the left and it seems like he is trying to impress her with his telephone conversation. At first, she doesn't pay attention to him at all, but then she starts actively avoiding his gaze and pretending that she's lost something in her bag (This makes the businessman even more interested in capturing her attention, and he seems to be curious about what is in her bag. Is he trying to flirt? The woman is feeling very intimidated and starts inching away from him (Figure 4-7).

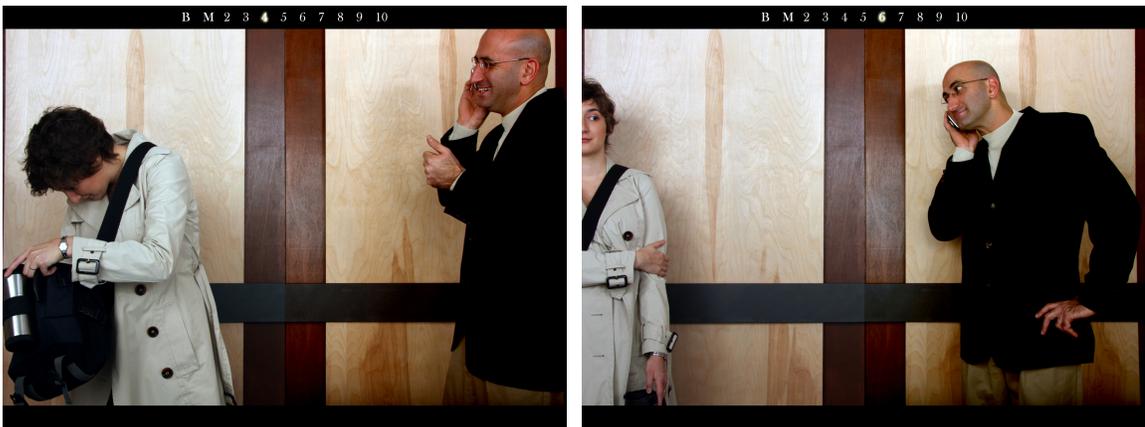


Figure 4-7 Robert tries to impress Nicole with his phone conversation and flirts

The elevator arrives at the businessman's destination floor and he exits. Now alone in the elevator, the woman visibly relaxes a bit, and glances up to watch the progression of the floors (Figure 4-8).



Figure 4-8 Nicole watches the progression of floors

You look at her face and she suddenly looks back at you. Does she know you are looking at her? Something is starting to make her nervous again, though, so you look at her face closer to try and figure out what is causing this. The more you look, the more she inches away from view. Could it be that she is avoiding your gaze?



Figure 4-9 Nicole looks back at the viewer, then hides

The elevator arrives at her destination floor and she exits, and a young man in his late twenties enters. He is carrying a shoulder bag and wearing a red jacket. At first, he too seems to be relaxed, but as you look at him more, he starts fidgeting - digging in his bag, looking at the ceiling.



Figure 4-10 Max is comfortable at first, then starts fidgeting.

The elevator stops and a teenage girl dressed up in goth-style clothing gets on. You, and the young man, glance over at her.



Figure 4-11 Max glances at Rose

Irritated, she puts on her headphones and starts to dance around aggressively (Figure 4-12).



Figure 4-12 Rose dances aggressively, while Max avoids getting hit

The young man backs away towards the left side of the elevator to avoid being hit, but you stare at her. This time, it's very obvious that she is responding to your gaze, because she looks directly at you, then suddenly becomes shy, and inches away from view (Figure 4-13).



Figure 4-13 Rose looks back at the viewer, then shies away, while Max avoids her

When you look away from her, she moves back towards the centre. The young man is also staring at her, curiously, examining her clothing (Figure 4-14). The elevator arrives at the main floor again and both people exit.



Figure 4-14 Max checks out Rose's outfit

While you were watching this scene through the peephole, another gallery visitor has entered the space and is now watching through the peephole in the right hand door of the elevator (Figure 4-15). You verify with each other that the view behind both peepholes is identical.



Figure 4-15 Two viewers peer through the peepholes in the elevator doors

A teenage boy with a skateboard and crooked baseball hat gets on the elevator alone, and pushes a button. Since he is alone in the elevator, both you and the other viewer are looking at him. After a second, he realizes he is being watched and looks back at both of you, with a shocked look on his face. He angrily gives both of you “the finger”, and goes back to watching the floors go by (Figure 4-16).

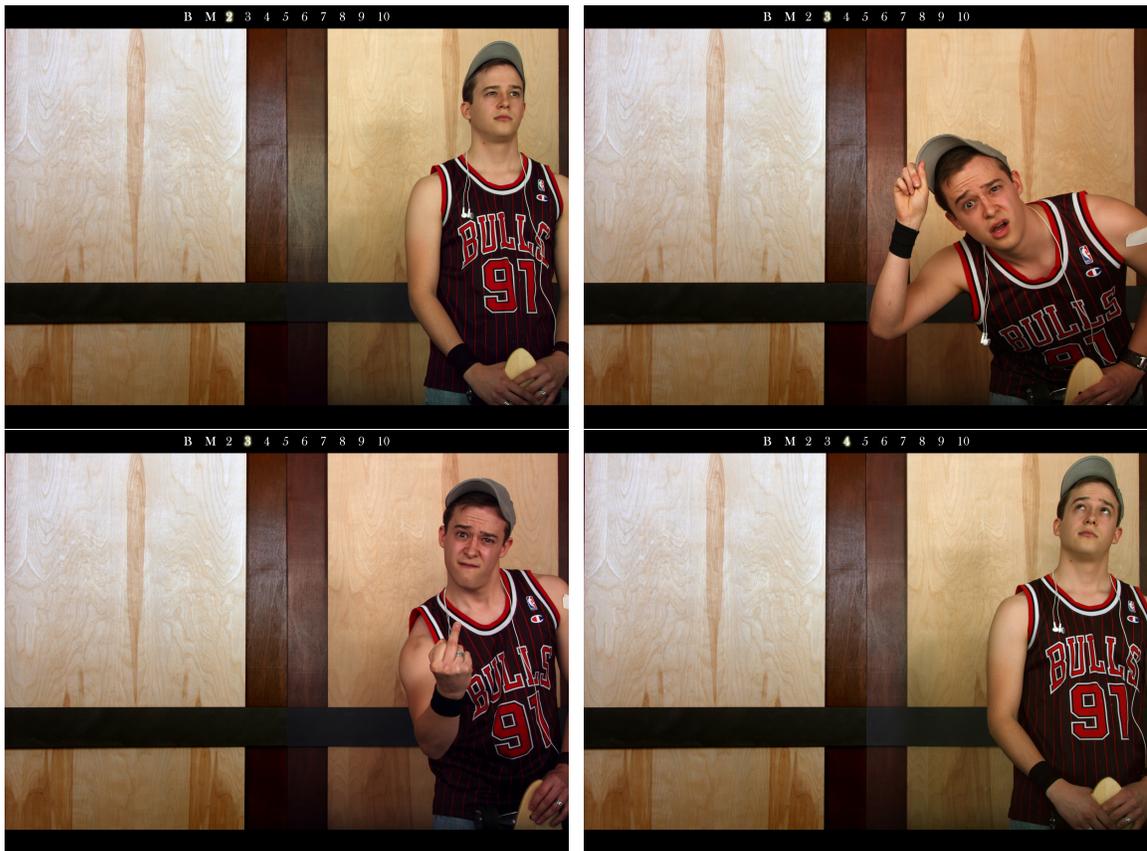


Figure 4-16 Kevin realizes he is being watched and has a rude reaction

He exits the elevator and a tough-looking man wearing a leather jacket and aviator sunglasses gets on. Is that a gun in his belt (Figure 4-17)?



Figure 4-17 Leo enters the elevator

Both you and the other viewer stare at him, and, just like the teenage boy, he realizes he is being watched, pulls out his gun and points it in your direction.



Figure 4-18 Leo realizes he is being watched and pulls out his gun

The elevator stops, and an elderly woman gets on. She seems to be in a pleasant mood, and is smiling.



Figure 4-19 Phyllis and Leo

The man, who is still angry, begins acting aggressively towards her. She turns to him and begins making angry gestures at him - it looks like she is telling him to get off the elevator. This makes him even angrier and he pulls out his gun and starts waving it in the air. The elderly woman backs down and makes placating motions with her hands (Figure 4-19).



Figure 4-20 Leo threatens Phyllis, who at first is angry at him, then becomes frightened

The elevator arrives at the tenth floor and they both get off (Figure 4-21).



Figure 4-21 Phyllis and Leo leave the elevator

At this point, you and the other viewer realize that you each affect the behaviour of the people in this elevator just by looking at them, in addition to the people affecting each other by how they behave. You and the other viewer decide to work together to see how you can affect the storyline of the piece.

Some time later, you decide to visit the gallery again and check out what is going on inside the elevator. There is already another viewer there, so you look in the other peek hole.

The tough guy in the leather jacket appears to be upset again, and, as he reappears in the elevator minutes after leaving, still appears to be upset. It seems like it doesn't take

very much to set him off. As other people travel with him, his angry behaviour makes them all become defensive (Figure 4-22). Your gaze and the gaze of the other viewer seem to be making things worse.



Figure 4-22 Leo frightens Robert and Rose

Only after this tough guy has spent some time away from the elevator do the other characters collectively calm down. When he eventually appears in the elevator again, he too has calmed down. Each time you revisit this piece, the overall mood of the piece and the interaction between the people inside the elevator is slightly different.

4.3 Summary

This chapter presented an example of what a viewer might experience while interacting with *A Delicate Agreement*.

Chapter Five: Conclusion

In this chapter, I discuss some of the current limitations and possible future iterations of *A Delicate Agreement*, and to conclude, I reiterate how the challenges outlined in Section 1.3 were addressed.

For the convenience of the reader, I will first provide a brief summary. In this supporting document I have described *A Delicate Agreement*, my thesis project for my Master of Fine Art degree with a Specialization in Computational Media Design. In Chapter One, I introduced the installation, the motivation behind its creation and how it relates to my previous work. In Chapter Two, I provided a context for the piece by discussing related work in interactive art and a formalistically similar piece by Marcel Duchamp. Then I presented the theoretical context of this research as viewed through the lenses of performance, gaze and interactive narrative. Chapter Three established the challenges in the development of *A Delicate Agreement* and describes how each challenge was met. Chapter Four offered an example scenario of viewer interaction with the installation.

5.1 Future Work

This iteration of *A Delicate Agreement* presents an interactive art installation that contains an interactive narrative facilitated by eight characters with coded personalities

and affected by viewers. Currently, there are some limitations to the piece that can be addressed in future iterations.

First, all eight of the current characters appear to be of the white, middle-class Canadian socioeconomic bracket, and their personalities are designed with this in mind. In the future, characters of different racial and cultural backgrounds, with different personalities and reactions, could be added to the piece. This could increase relatability of the characters to a wider audience outside the University community and present more possibilities for different narratives to emerge.

Second, the current gaze-tracking interface does not always track the viewer's gaze. If a viewer has deep-set eyes, or dense eyelashes that partially cover his or her iris, the tracker cannot find glints to determine the direction of his or her gaze. There is a similar issue with viewers who wear glasses: the tracker cannot get a clear image of the viewer's eye behind the lenses. This means, that the gaze of these viewers will not affect the characters inside the elevators, and no character will return their gaze. There is subsequently no interaction with the piece, and the viewers become observers instead of participants. In a possible future iteration of *A Delicate Agreement*, sensors could be installed by the peepholes in the doors that would indicate to the piece that a viewer is present at a peephole, even if his or her gaze cannot be tracked, and cause the characters to look back at the viewer and be affected simply by his or her presence.

5.2 Conclusions

To conclude this document, I include a brief description of the piece and then revisit the challenges I outlined in Chapter One.

A Delicate Agreement is a gaze-triggered interactive art installation consisting of a constructed set of elevator doors, a gaze-triggered interface that has been designed, built and implemented specifically for this installation, and a complex interactive stop motion animation. Viewers peer into the peek holes in the elevator doors and observe the characters in the stop motion animation while simultaneously using their gaze to affect the behaviour of these characters. Within the structure of interactive narrative, this piece examines performance as applied both to the characters in the elevator and the viewer. These characters are also wary of employing gaze in excess so as not to upset the delicate agreement that exists between strangers inside an elevator. They will only exchange glances unless affected by viewers to stare at each other. Their reactions also vary depending on if one, two, or no viewers are peering in at them. Thus, the viewers' gaze is participatory, resulting in the emergence of a rich and complex narrative.

In the process of realizing *A Delicate Agreement*, there were several challenges that needed to be met.

A methodology was needed that fit with the interdisciplinary nature of this research, which was discussed in Section 3.1. As a result, a braided methodology was developed based on the iterative design cycle (Beyer & Holtzblatt, 1998) used in the Human Computer Interaction area of Computer Science. In addition to this, the method of collaboration implemented by me, Miguel Nacenta and John Brosz facilitated understanding and learning about each other's process, which is described in Section 3.1.2.

The challenge of establishing the viewer experience was addressed by using the gaze as a means of interaction. This allowed for both passive and active viewer

interaction experiences, discussed in Section 3.2. In the case of passive interaction, the viewer need only peer through the peepholes to affect the piece, not requiring any extra effort beyond what is normally needed to view an artwork. Once the viewer realizes she is affecting the piece with her gaze, she may choose to switch to a more active mode of interaction by intentionally casting her gaze upon different parts of the image.

The eight characters appearing in this piece were developed from within my own socioeconomic setting of a middle class Canadian city. They are presented in Section 3.3. Two of them, the young man and woman, are intended to be relatable to the current audience of the exhibition, which mostly consists of people from the University community. Every character has a range of behaviours available to them through their programmed personalities, the more behaviours available, the more complex the character.

The challenge of creating the installation was broken down into acquiring and processing the images of the characters, and designing and constructing the physical form of the installation. A full description of how this challenge was met can be found in Section 3.4.

The final challenge was developing the software response for *A Delicate Agreement* to serve the purposes of giving the characters personalities and enabling their interaction with each other and the viewers, facilitating gaze interaction and giving logical movement to the elevator. These aspects of the necessary software response are explained in detail in Section 3.5. The personality code was developed based on the exchange of expression and impression as defined by Goffman (1959, 2) to allow the characters to affect each other's behaviour while also being affected by the gaze of the

viewer. The gaze interface and tracker hardware were designed to be unobtrusive and facilitate both passive and active gaze interaction for one or two viewers. The elevator mechanism not only moves the elevator from floor to floor, but also serves as a means of keeping track of which floors the characters are located on, and deciding who embarks and where they disembark.

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APPENDIX A: PERSONALITY GRIDS

For the convenience of the reader, Tables One and Two are repeated here for reference.

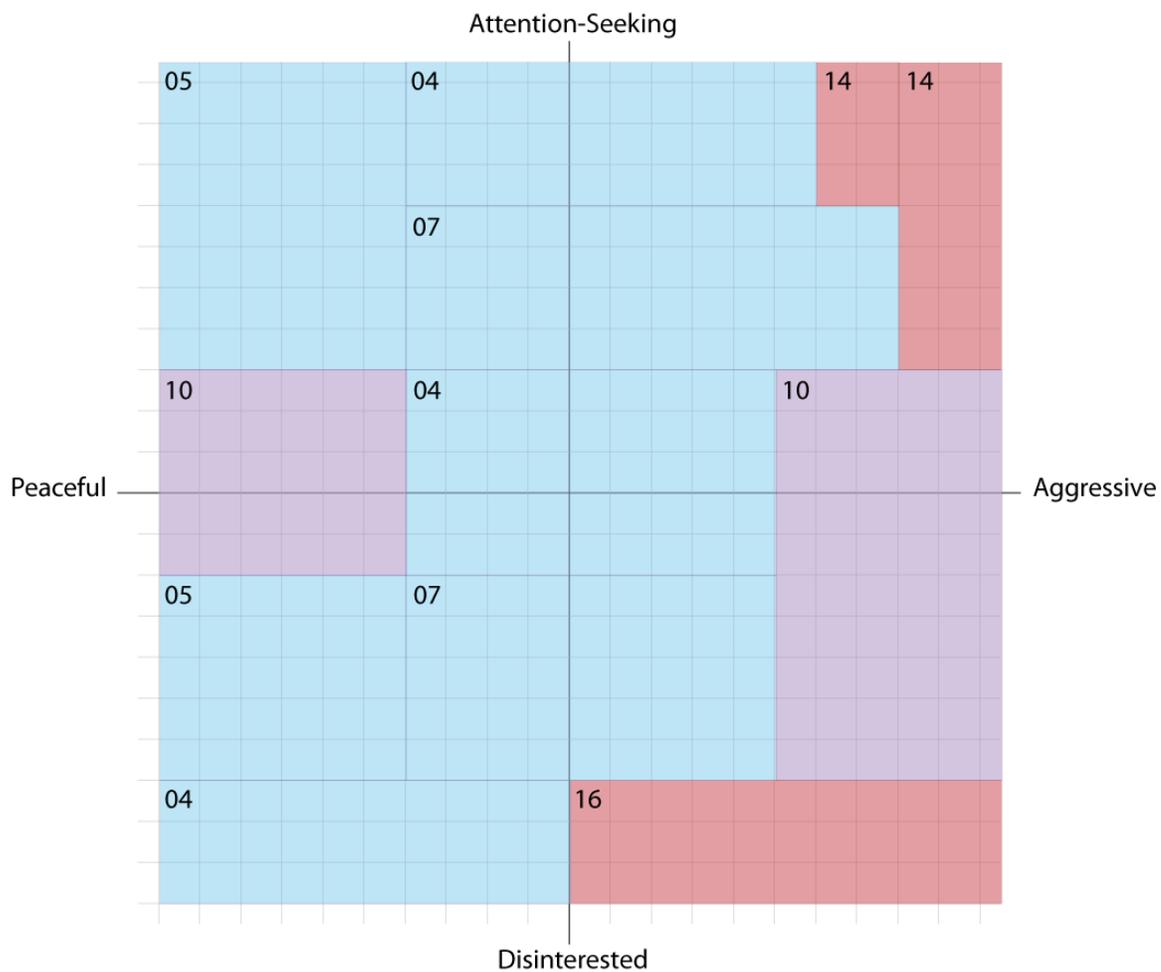
Table 1: Assignment of numbers to behaviours

Behaviour Number	Description	Applies to
01	Getting on the elevator	All
02	Leaving the elevator	All
03	Recognizing the viewer	All
04	Neutral Behaviour 1	Nicole, Rose, Max
05	Bored	Robert, Kevin, Nicole, Rose, Max, Leo
06	Mild shock/Avoiding	Robert, Nicole, Rose, Max
07	Looking up/Neutral	Phyllis, Kevin, Nicole, Rose, Max, Leo
08	Glance at other	Robert, Phyllis, Kevin, Nicole, Rose, Max, Leo
09	Blocking out the other person	Nicole, Rose, Max
10	Actively avoiding the other person	Robert, Phyllis, Nicole, Rose, Max
11	Hidden laugh - mild disbelief	Nicole, Rose, Max
12	Defending self/placating other	Robert, Phyllis, Kevin, Nicole, Rose, Max, Leo
13	Disgust	Robert, Alice, Kevin, Nicole, Rose, Max, Leo
14	Frustration	Robert, Alice, Kevin, Nicole, Rose, Max, Leo
15	Openly angry	Robert, Phyllis, Alice, Kevin, Nicole, Rose, Max, Leo
16	Ignoring other person	Robert, Phyllis, Kevin, Nicole, Rose, Max, Leo
17	Attracted to other	Robert, Kevin, Nicole, Rose, Max, Leo
18	Emergency exit*	Nicole
19	Cute reaction*	Nicole and Phyllis, Alice
20	Obnoxious-attention seeking	Rose, Leo and Robert
21	Passive aggressive	Phyllis, Kevin, Leo
22	Neutral Looking at other	Alice
23	Neutral alone	Alice
24	Antagonize/Obnoxious aggressive	Rose, Leo and Kevin
		<ul style="list-style-type: none"> • Not implemented in this version of the piece

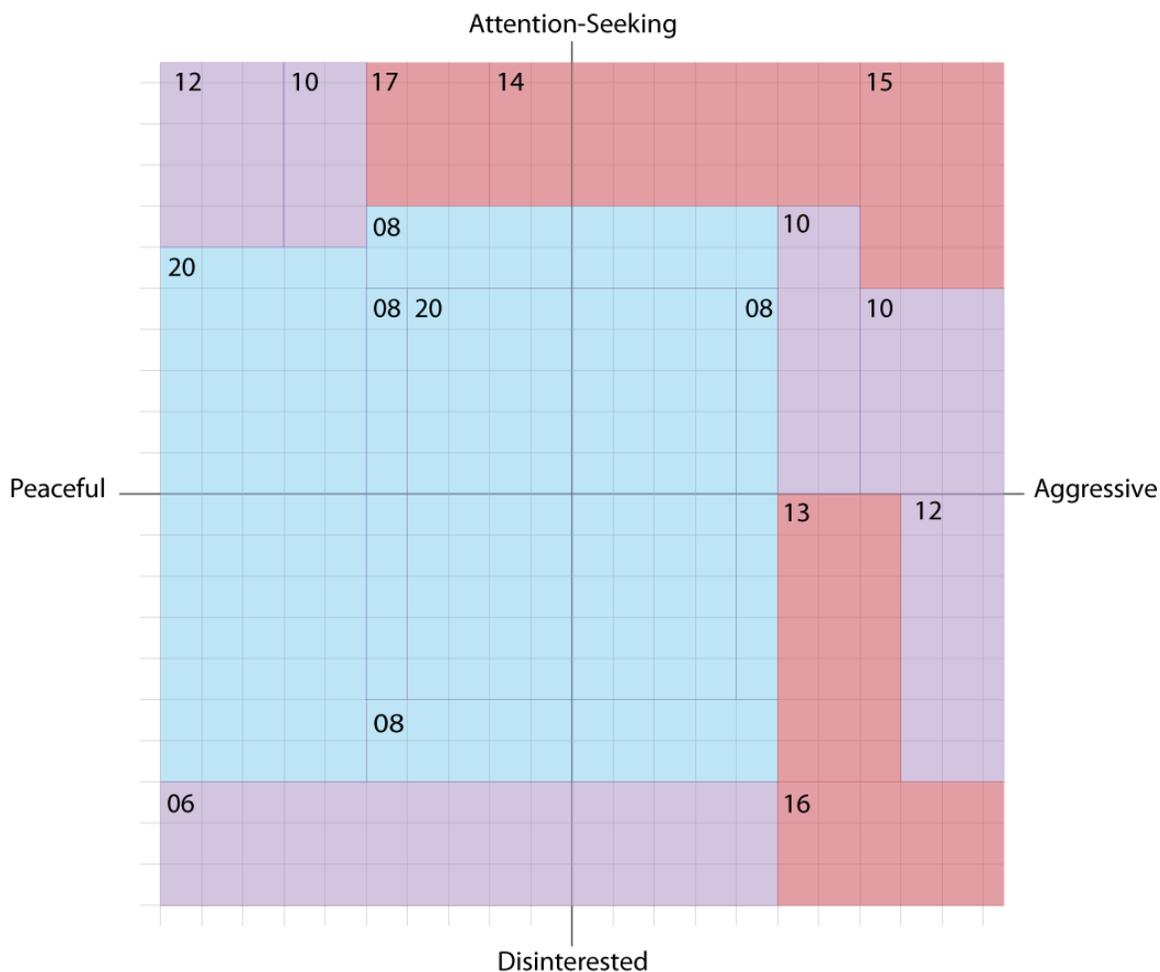
Table 2: Behaviours available to each character

Character	Possible Behaviours
Robert	01, 02, 03, 06, 08, 10, 12, 13, 14, 15, 16, 17, 20
Phyllis	01, 02, 03, 07, 08, 10, 12, 15, 16, 21
Alice	01, 02, 03, 13, 14, 15, 22, 23
Kevin	01, 02, 03, 05, 07, 08, 12, 13, 14, 15, 16, 17, 21, 24
Nicole	01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17
Rose	01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 20, 24
Max	01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17
Leo	01, 02, 03, 05, 07, 08, 12, 13, 14, 15, 16, 17, 20, 21, 24

Max (young man)
Condition: Dontcare



Robert (businessman)
Condition: Accompanied

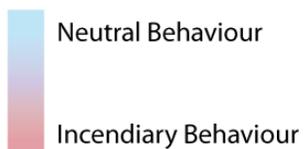


Fixed Behaviours: 01, 02, 03.

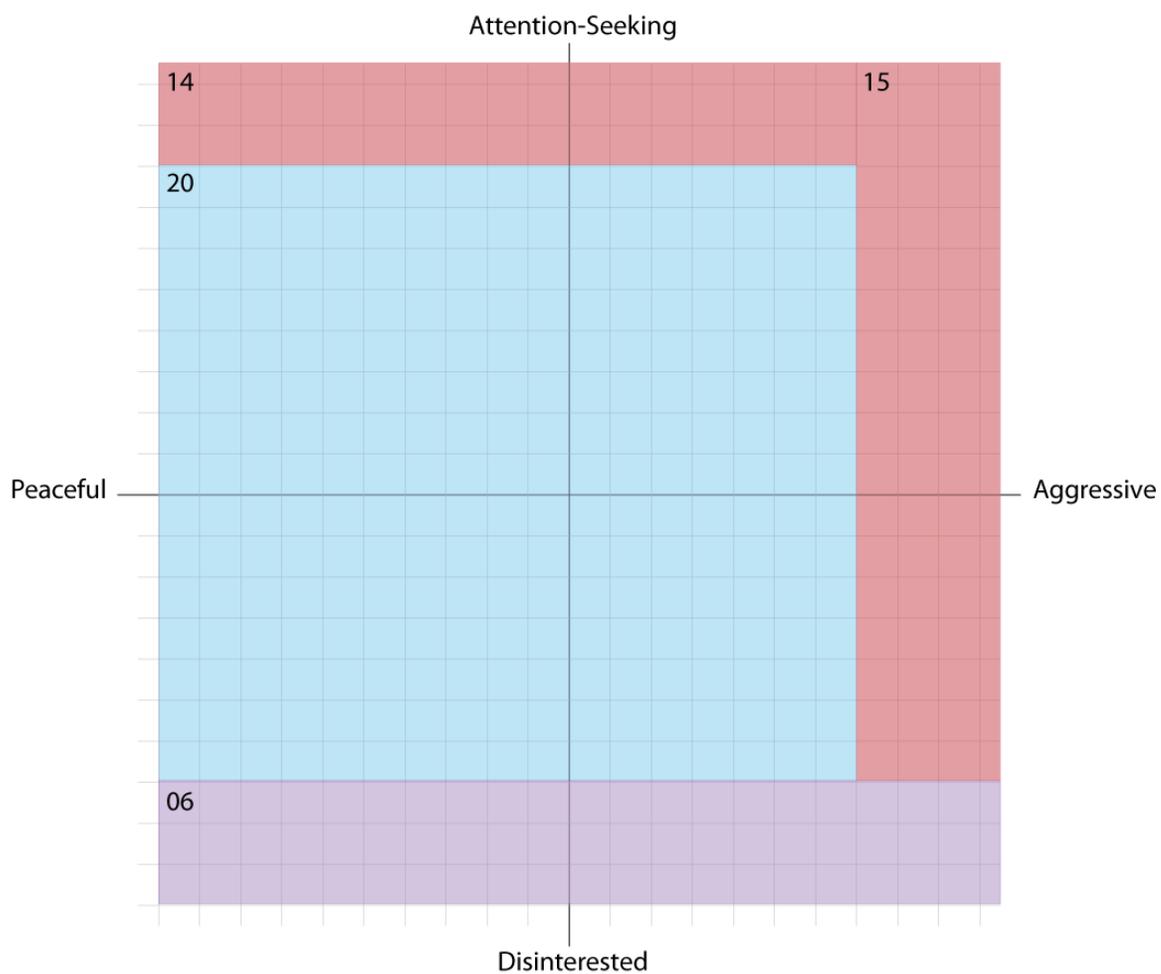
Behaviour 20 is the default state.

Behaviours 06, 14, 15 and 20 are not conditional on being accompanied.

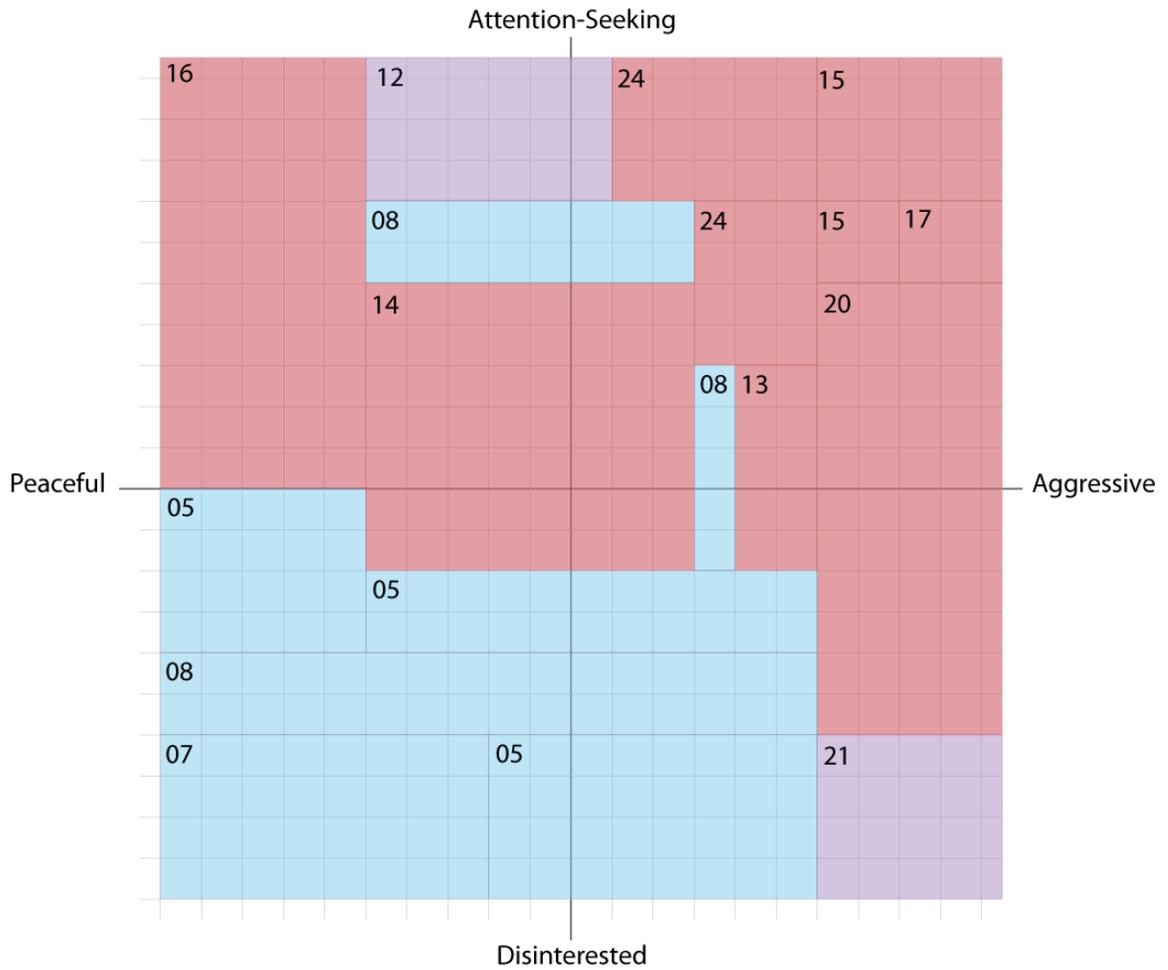
All other behaviours are conditional on being accompanied.



Robert (businessman)
Condition: Dontcare



Leo (mobster)
Condition: Accompanied

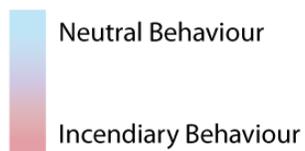


Fixed Behaviours: 01, 02, 03.

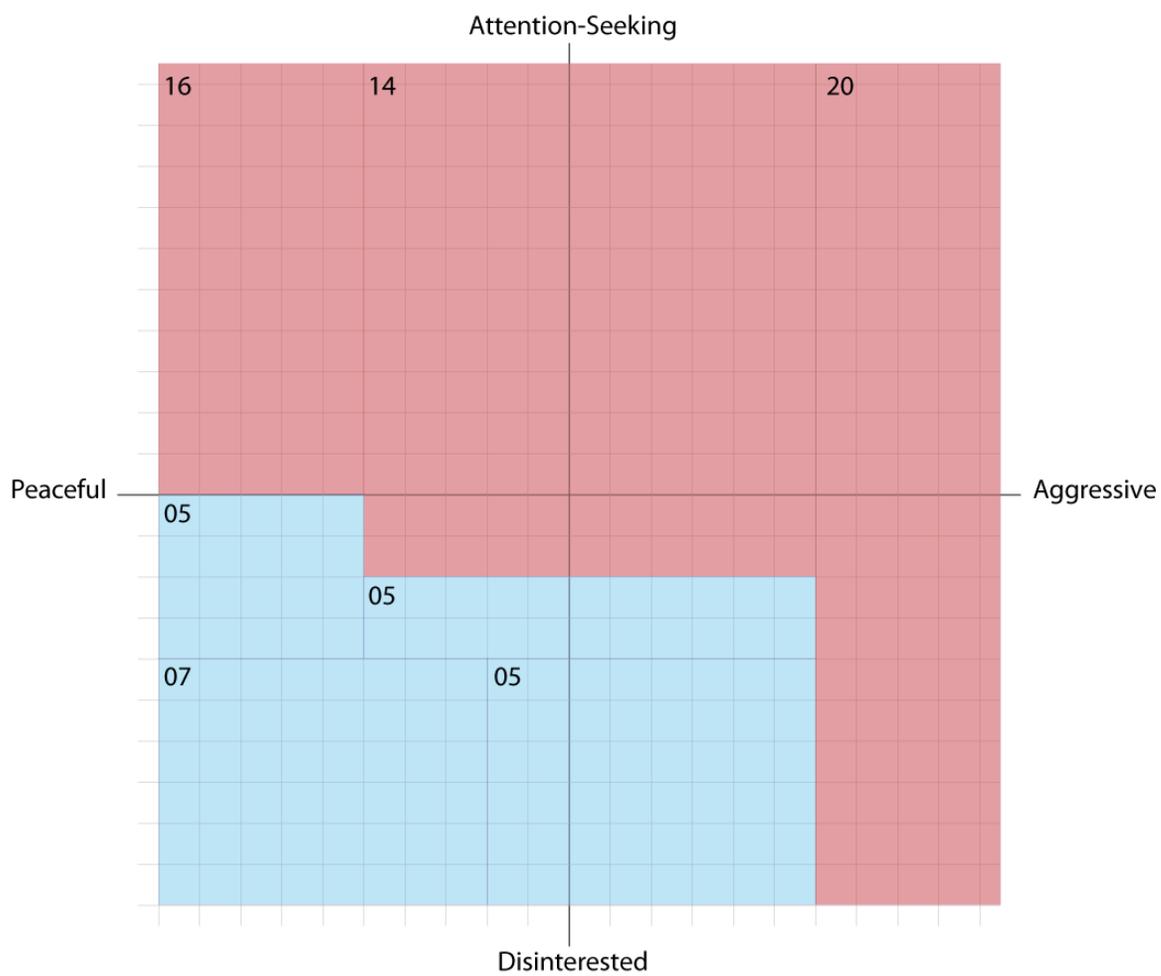
Behaviour 14 is the default state.

Behaviours 05, 07, 14, 16 and 20 are not conditional on being accompanied.

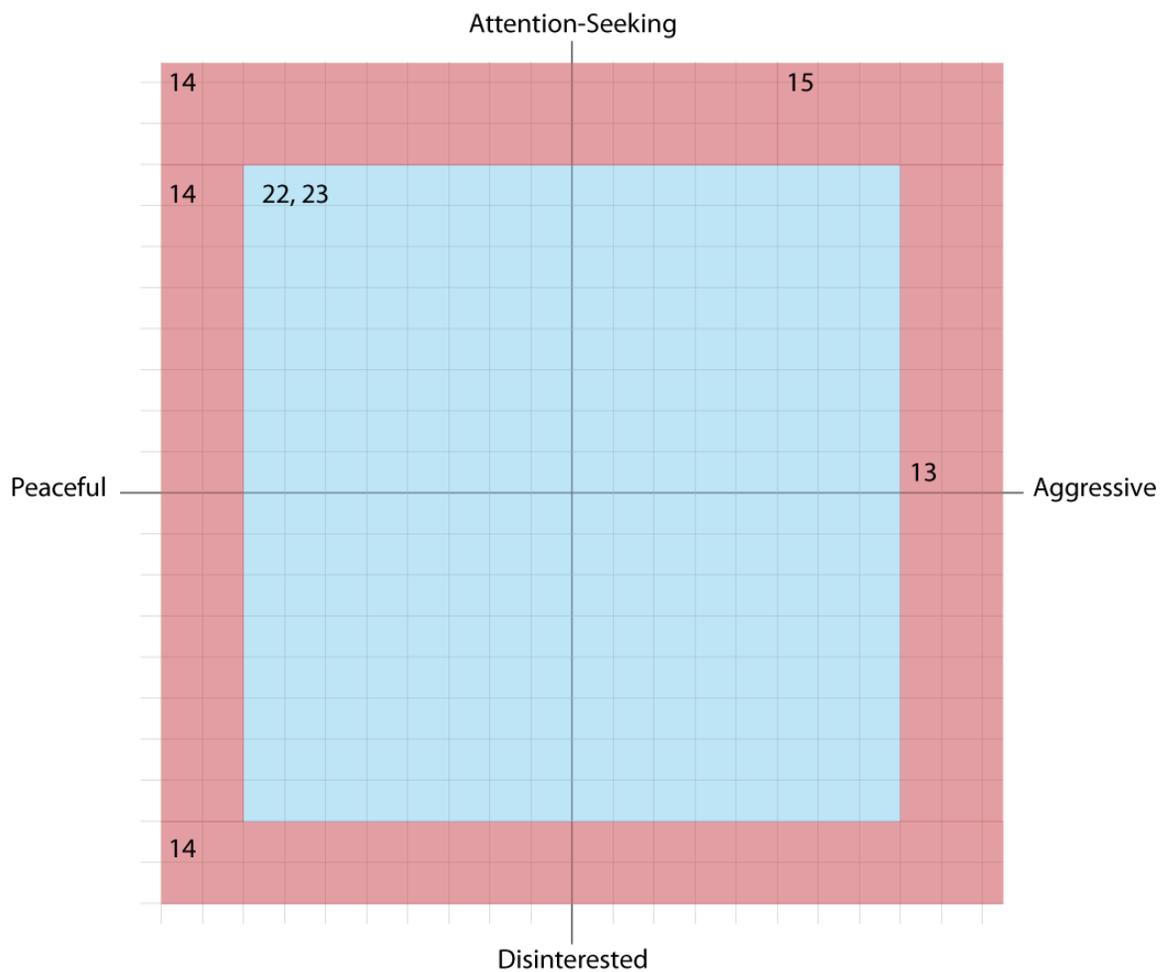
All other behaviours are conditional on being accompanied.



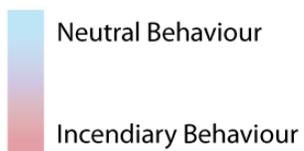
Leo (tough guy)
Condition: Dontcare



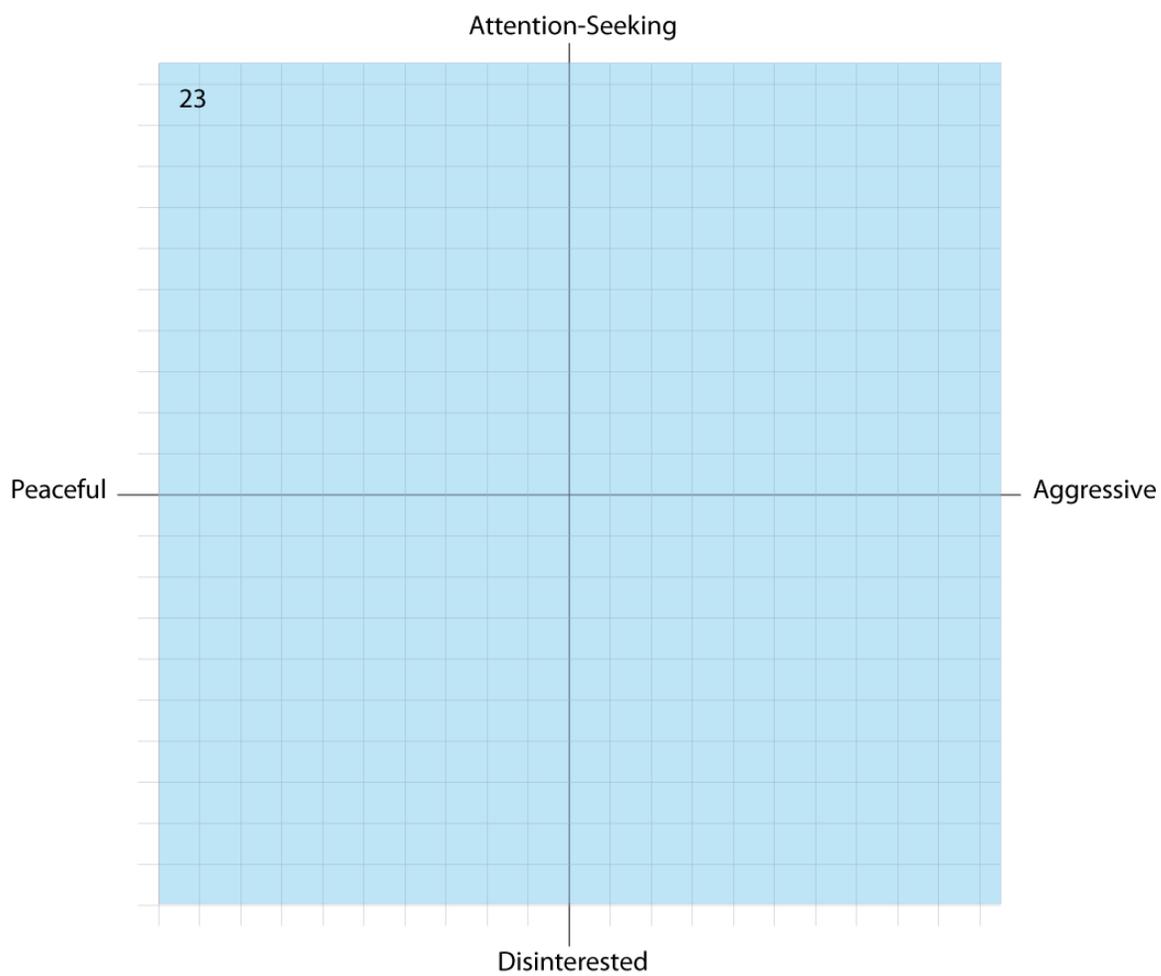
Alice (little girl)
Condition: Accompanied



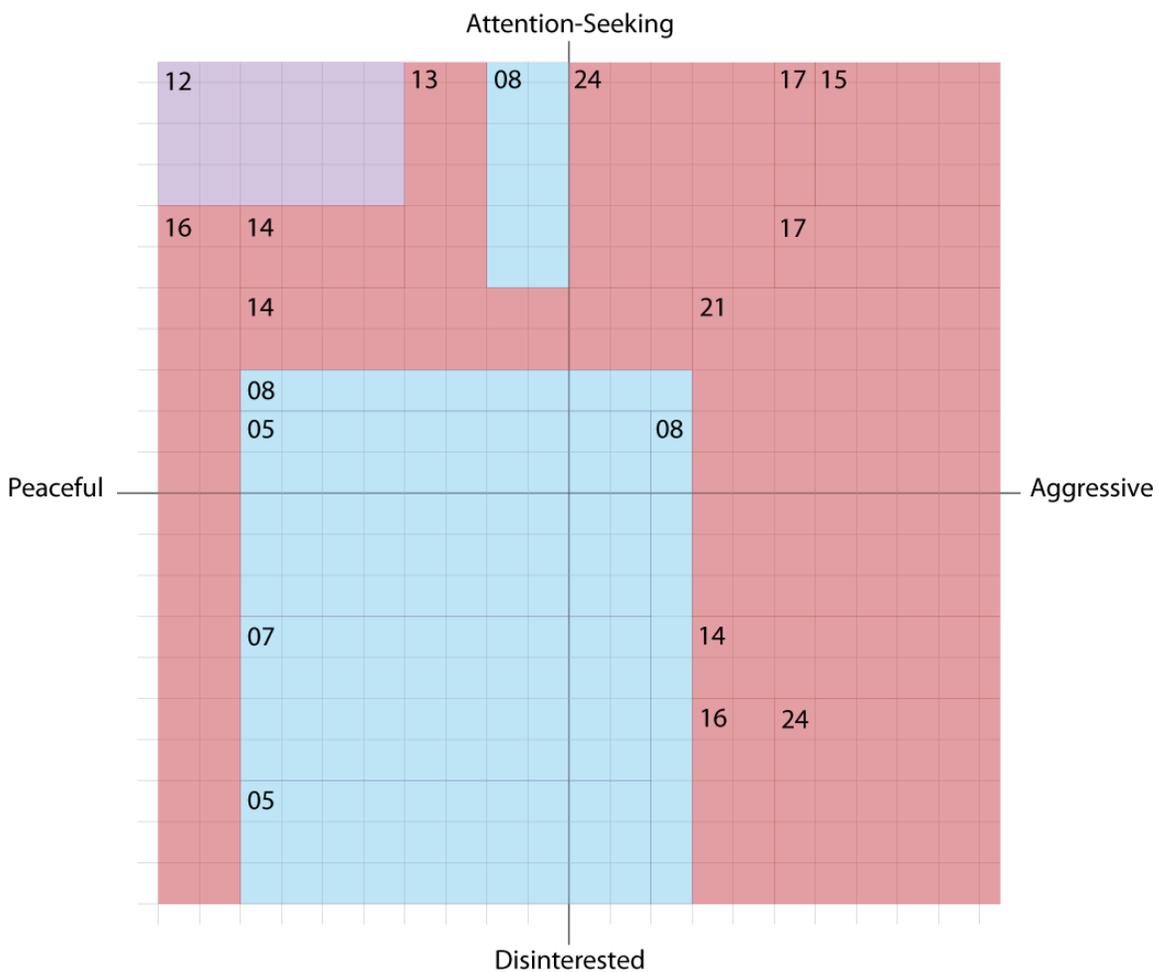
Fixed Behaviours: 01, 02, 03.
Behaviour 23 is the default state.
Behaviour 23 is not conditional on being accompanied.
All other behaviours are conditional on being accompanied.



Alice (little girl)
Condition: Dontcare



Kevin (teenage boy)
Condition: Accompanied

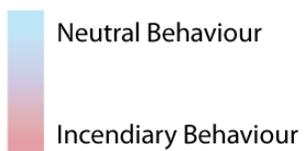


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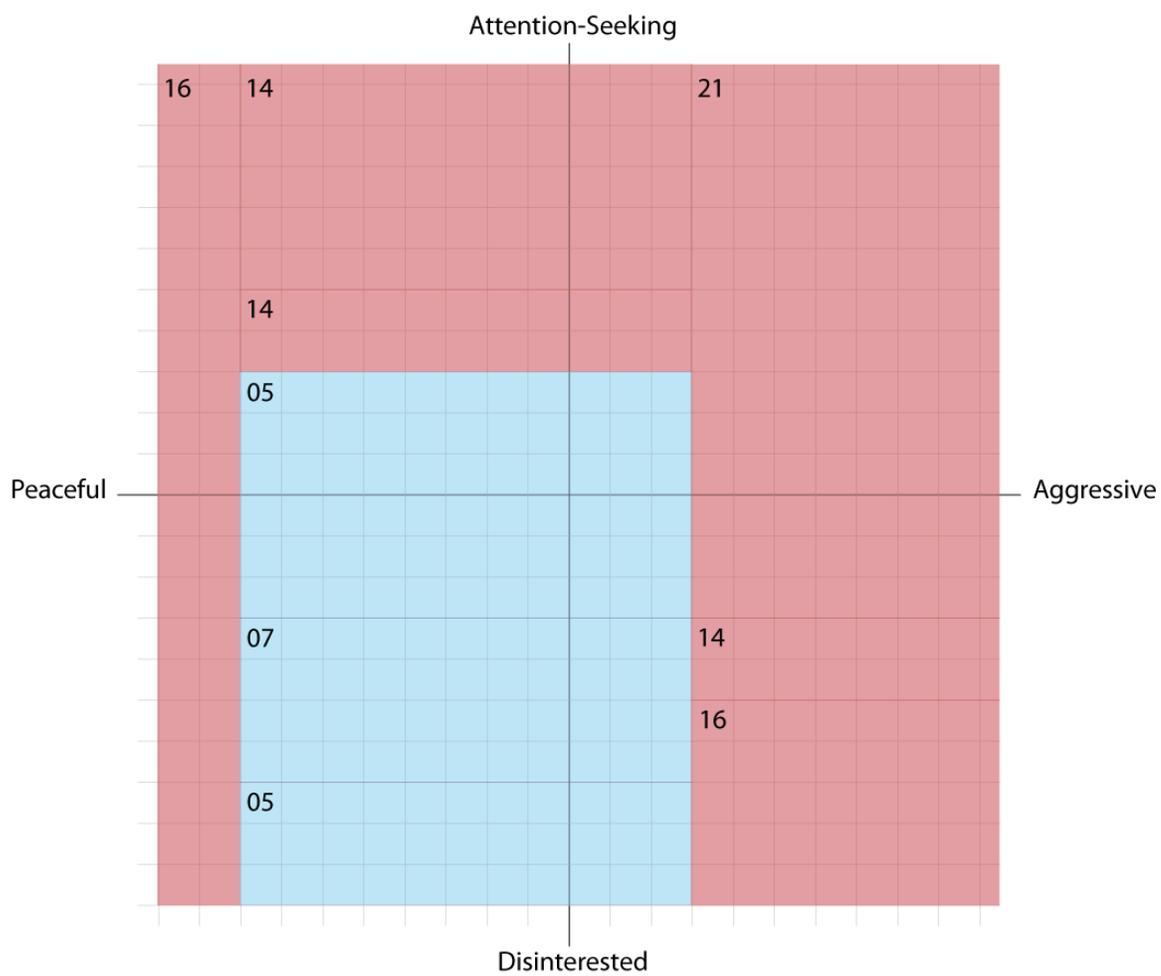
Behaviour 05 is the default state.

Behaviours 05, 07, 14, 16 and 21 are not conditional on being accompanied.

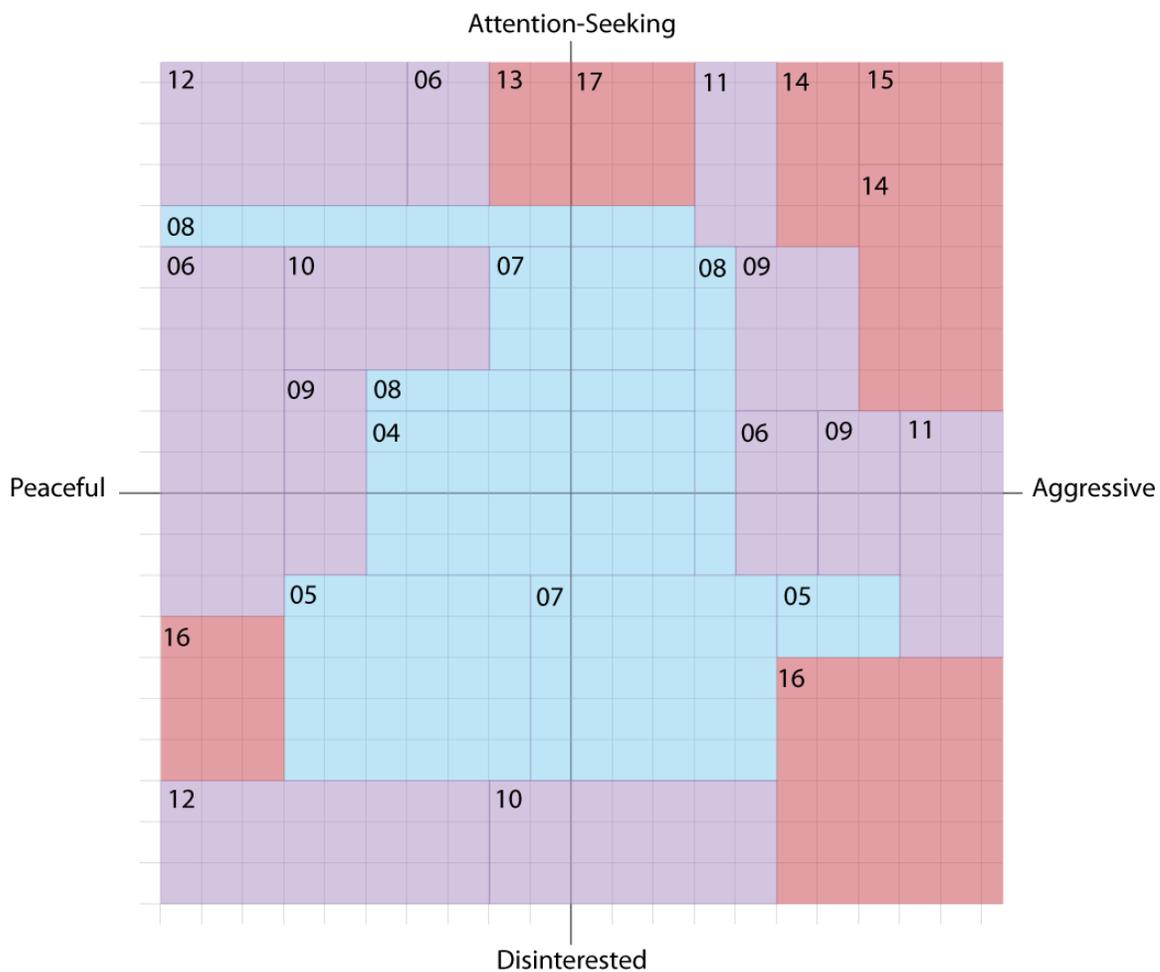
All other behaviours are conditional on being accompanied.



Kevin (teenage boy)
Condition: Dontcare



Nicole (young woman)
Condition: Accompanied

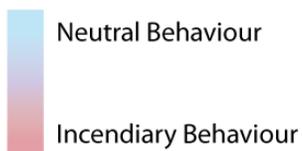


Fixed Behaviours: 01, 02, 03.

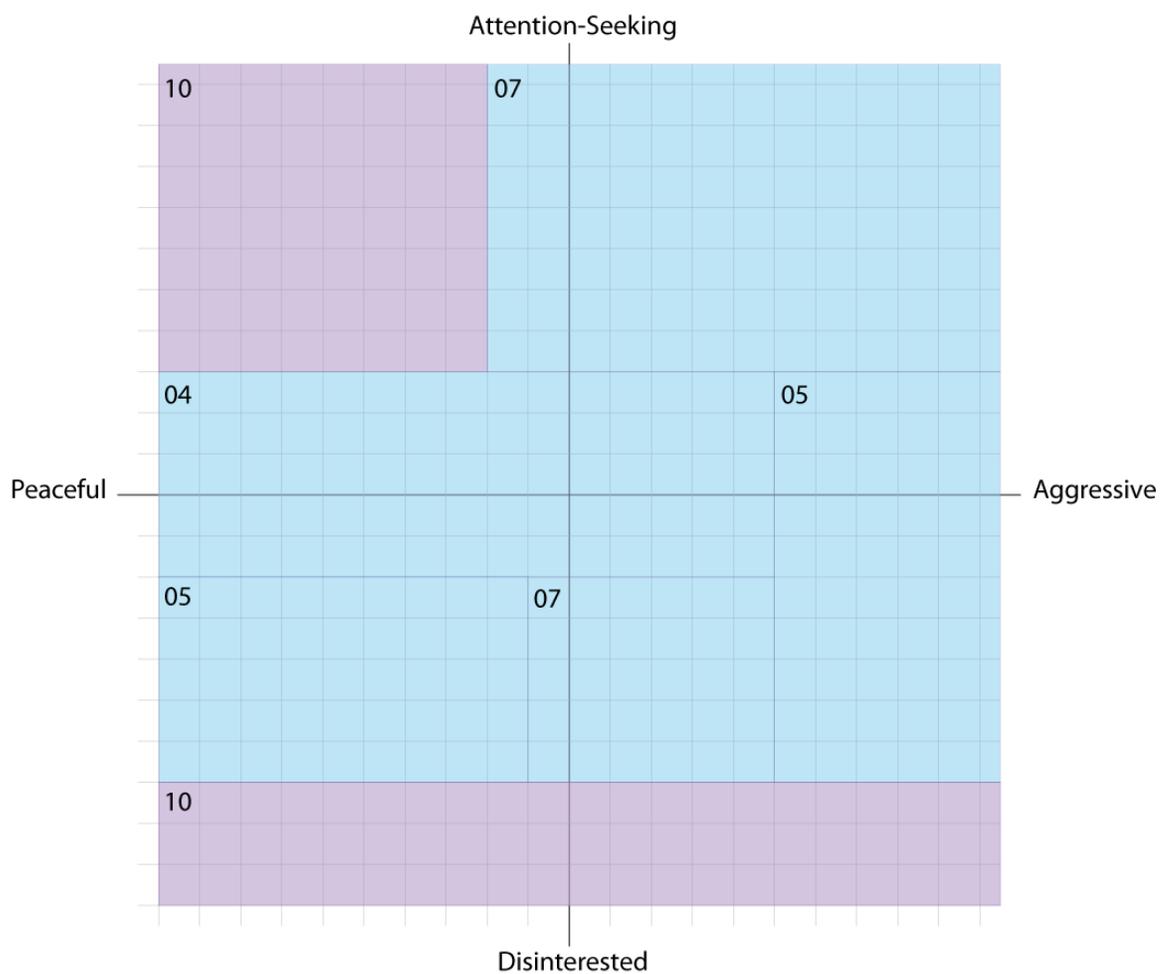
Behaviour 04 is the default state.

Behaviours 04, 05, 07, 10 and 16 are not conditional on being accompanied.

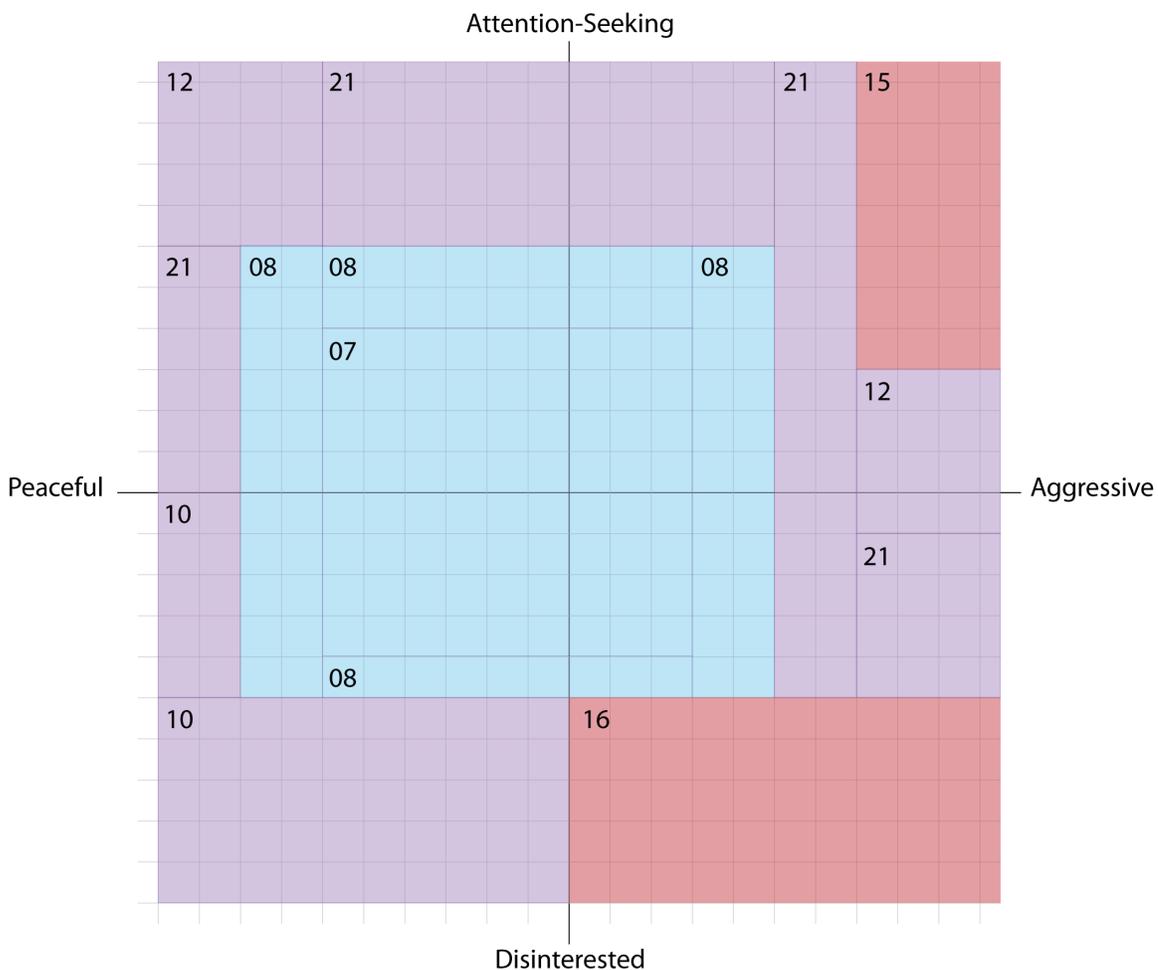
All other behaviours are conditional on being accompanied.



Nicole (young woman)
Condition: Dontcare



Phyllis (elderly lady)
Condition: Accompanied

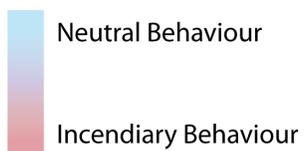


Fixed Behaviours: 01, 02, 03.

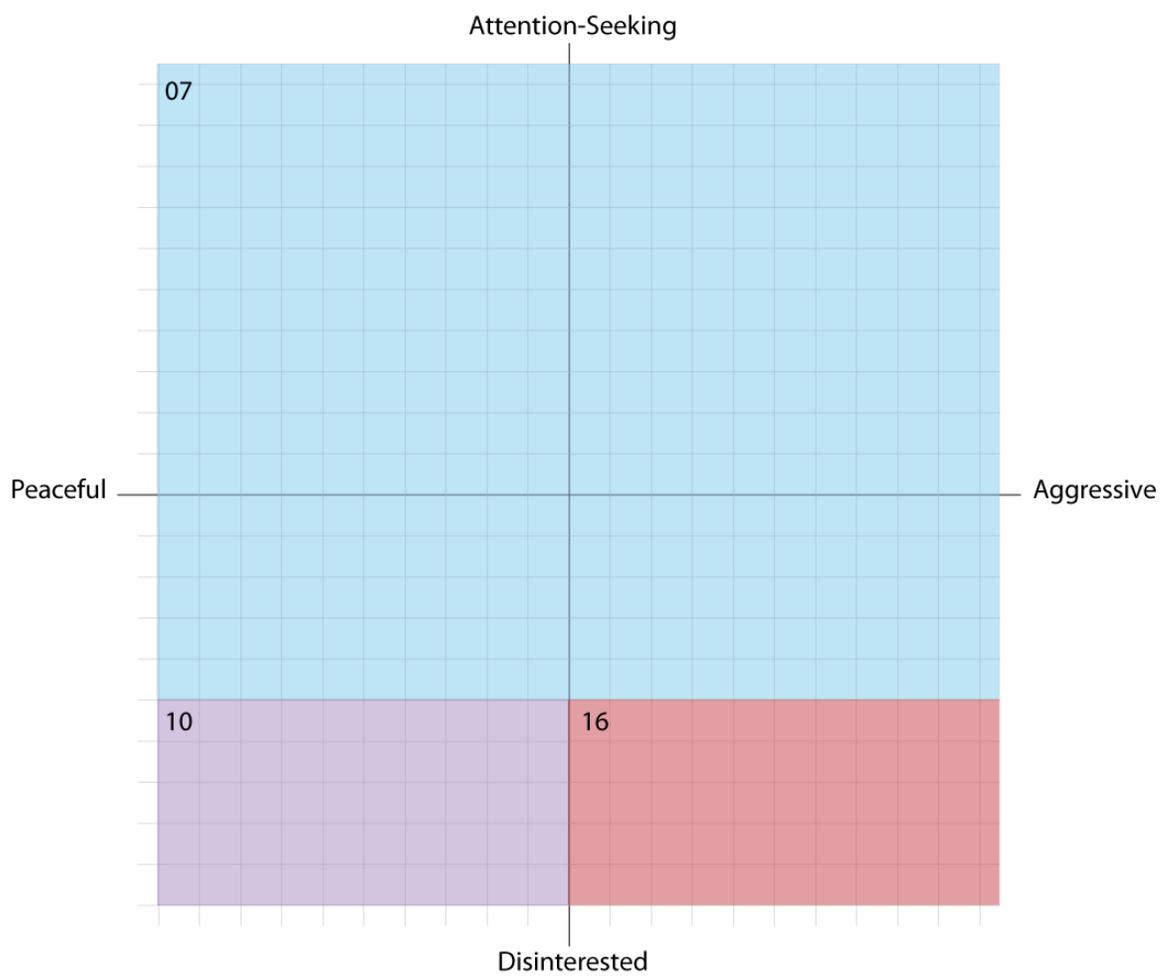
Behaviour 07 is the default state.

Behaviours 07, 10 and 16 are not conditional on being accompanied.

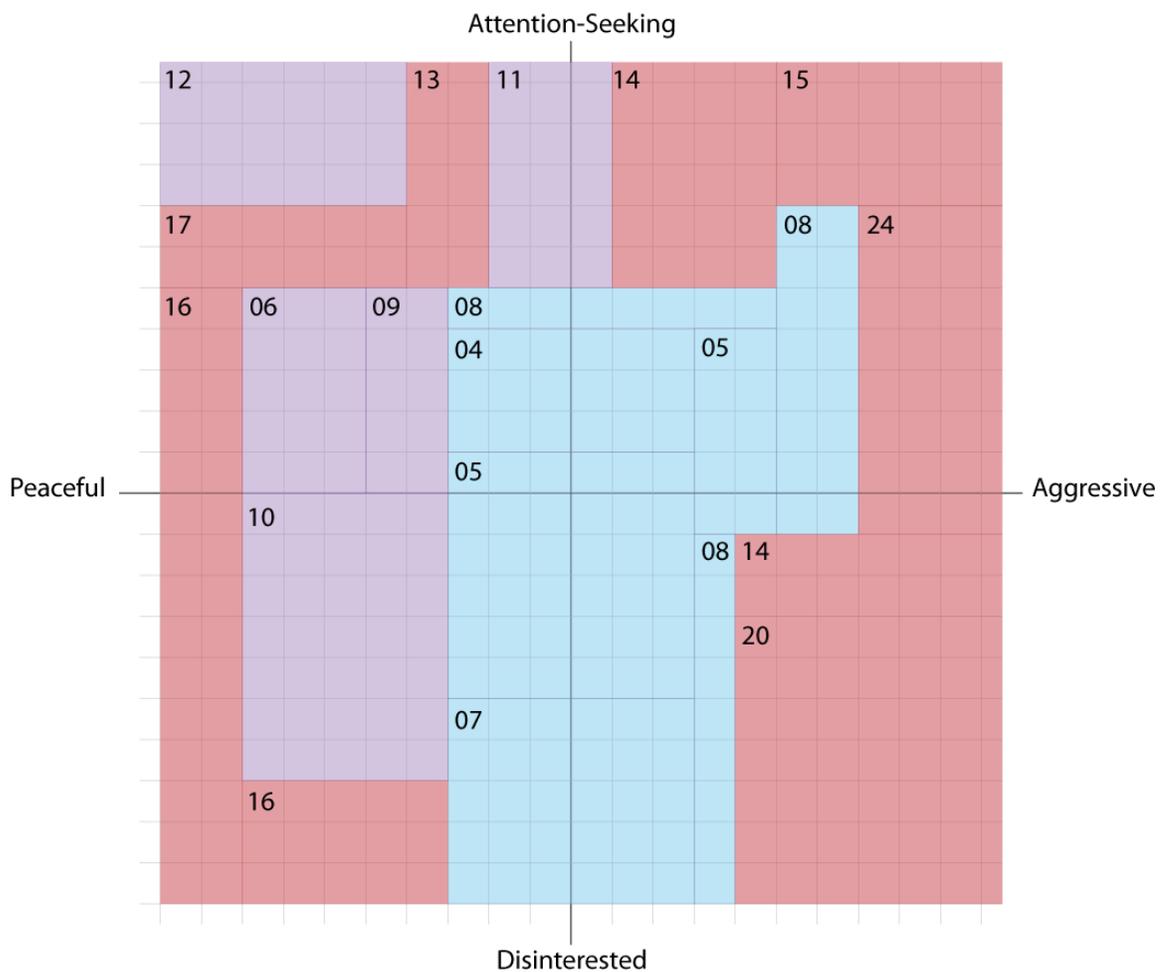
All other behaviours are conditional on being accompanied.



Phyllis (elderly lady)
Condition: Dontcare



Rose (teenage girl)
Condition: Accompanied

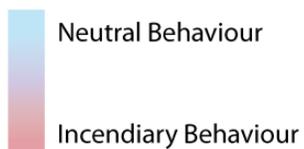


Fixed Behaviours: 01, 02, 03.

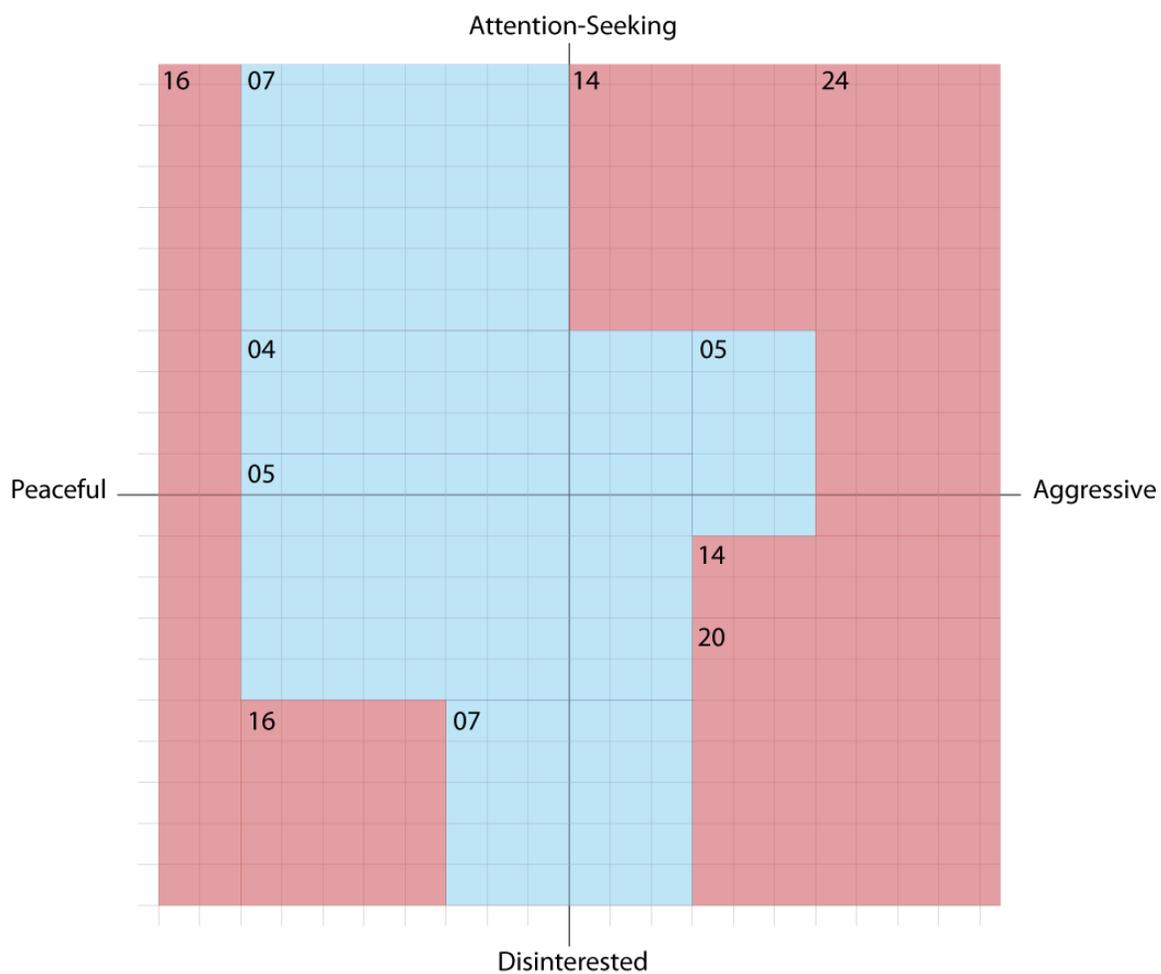
Behaviour 05 is the default state.

Behaviours 04, 05, 07, 14, 16, 20 and 24 are not conditional on being accompanied.

All other behaviours are conditional on being accompanied.



Rose (teenage girl)
Condition: Dontcare



APPENDIX B: EXAMPLE OF PERSONALITY CODE: NICOLE

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<character id="05" bumpFilterAggressivenessAdditive="0"
bumpFilterAggressivenessMult="1"
bumpFilterAttentionAdditive="0" bumpFilterAttentionMult="1"
```

```
bumpLookAtMeHighAggressiveness="3"
bumpLookAtMeHighAttention="-5"
bumpLookAtMeLowAggressiveness="3"
bumpLookAtMeLowAttention="-5"
bumpLookOtherHighAggressiveness="-3"
bumpLookOtherHighAttention="0"
bumpLookOtherLowAggressiveness="-3"
bumpLookOtherLowAttention="1">
```

```
<behavior pictureSet="06" minAggressiveness="-10"
maxAggressiveness="-7" minAttention="-3" maxAttention="6"
otherPeople="Accompanied" bumpFactorAggressiveness="0"
bumpFactorAttention="1"/>
```

```
<behavior pictureSet="06" minAggressiveness="-4"
maxAggressiveness="-2" minAttention="7" maxAttention="11"
otherPeople="Accompanied" bumpFactorAggressiveness="0"
bumpFactorAttention="3"/>
```

```
<behavior pictureSet="06" minAggressiveness="4"
maxAggressiveness="6" minAttention="-2" maxAttention="2"
otherPeople="Accompanied" bumpFactorAggressiveness="1"
bumpFactorAttention="3"/>
```

```
<behavior pictureSet="08" minAggressiveness="-10"
maxAggressiveness="3" minAttention="6" maxAttention="7"
otherPeople="Accompanied" bumpFactorAggressiveness="2"
bumpFactorAttention="2"/>
```

```
<behavior pictureSet="08" minAggressiveness="-5"
maxAggressiveness="3" minAttention="2" maxAttention="3"
otherPeople="Accompanied" bumpFactorAggressiveness="2"
bumpFactorAttention="1"/>
```

```
<behavior pictureSet="08" minAggressiveness="3"
maxAggressiveness="4" minAttention="-2" maxAttention="6"
otherPeople="Accompanied" bumpFactorAggressiveness="2"
bumpFactorAttention="3"/>
```

```
<behavior pictureSet="09" minAggressiveness="-7"
maxAggressiveness="-5" minAttention="-2" maxAttention="3"
otherPeople="Accompanied" bumpFactorAggressiveness="-1"
bumpFactorAttention="1"/>
```

```
<behavior pictureSet="09" minAggressiveness="4"
maxAggressiveness="7" minAttention="2" maxAttention="6"
otherPeople="Accompanied" bumpFactorAggressiveness="2"
bumpFactorAttention="4"/>
```

```
<behavior pictureSet="09" minAggressiveness="-2"
maxAggressiveness="1" minAttention="5" maxAttention="11"
otherPeople="Accompanied" bumpFactorAggressiveness="4"
bumpFactorAttention="6"/>
```

```
<behavior pictureSet="11" minAggressiveness="3"
maxAggressiveness="5" minAttention="6" maxAttention="11"
otherPeople="Accompanied" bumpFactorAggressiveness="2"
bumpFactorAttention="2"/>
```

```
<behavior pictureSet="11" minAggressiveness="8"
maxAggressiveness="11" minAttention="-4" maxAttention="2"
otherPeople="Accompanied" bumpFactorAggressiveness="2"
bumpFactorAttention="2"/>
```

```
<behavior pictureSet="12" minAggressiveness="-10"
maxAggressiveness="-4" minAttention="7" maxAttention="11"
otherPeople="Accompanied" bumpFactorAggressiveness="-3"
bumpFactorAttention="7"/>
```

```
<behavior pictureSet="12" minAggressiveness="-10"
maxAggressiveness="-2" minAttention="-7" maxAttention="-10"
otherPeople="Accompanied" bumpFactorAggressiveness="0"
bumpFactorAttention="5"/>
```

```
<behavior pictureSet="13" minAggressiveness="-2"
maxAggressiveness="0" minAttention="7" maxAttention="11"
otherPeople="Accompanied" bumpFactorAggressiveness="5"
bumpFactorAttention="-2"/>
```

```
<behavior pictureSet="14" minAggressiveness="5"
maxAggressiveness="7" minAttention="6" maxAttention="11"
otherPeople="Accompanied" bumpFactorAggressiveness="4"
bumpFactorAttention="-1"/>
```

```
<behavior pictureSet="14" minAggressiveness="7"
maxAggressiveness="11" minAttention="2" maxAttention="8"
otherPeople="Accompanied" bumpFactorAggressiveness="4"
bumpFactorAttention="-2"/>

<behavior pictureSet="15" minAggressiveness="7"
maxAggressiveness="11" minAttention="8" maxAttention="11"
otherPeople="Accompanied" bumpFactorAggressiveness="5"
bumpFactorAttention="3"/>

<behavior pictureSet="16" minAggressiveness="-10"
maxAggressiveness="-7" minAttention="-10" maxAttention="11"
otherPeople="Accompanied" bumpFactorAggressiveness="0"
bumpFactorAttention="0"/>

<behavior pictureSet="16" minAggressiveness="5"
maxAggressiveness="11" minAttention="-10" maxAttention="-4"
otherPeople="Accompanied" bumpFactorAggressiveness="0"
bumpFactorAttention="0"/>

<behavior pictureSet="17" minAggressiveness="0"
maxAggressiveness="3" minAttention="7" maxAttention="11"
otherPeople="Accompanied" bumpFactorAggressiveness="6"
bumpFactorAttention="-2"/>

<behavior pictureSet="04" minAggressiveness="-10"
maxAggressiveness="5" minAttention="-2" maxAttention="3"
otherPeople="Dontcare" bumpFactorAggressiveness="0"
bumpFactorAttention="1"/>

<behavior pictureSet="05" minAggressiveness="-10"
maxAggressiveness="-1" minAttention="-7" maxAttention="-2"
otherPeople="Dontcare" bumpFactorAggressiveness="1"
bumpFactorAttention="1"/>

<behavior pictureSet="05" minAggressiveness="5"
maxAggressiveness="11" minAttention="-7" maxAttention="3"
otherPeople="Dontcare" bumpFactorAggressiveness="2"
bumpFactorAttention="2"/>

<behavior pictureSet="07" minAggressiveness="-1"
maxAggressiveness="5" minAttention="-7" maxAttention="-2"
otherPeople="Dontcare" bumpFactorAggressiveness="0"
bumpFactorAttention="0"/>
```

```
<behavior pictureSet="07" minAggressiveness="-2"  
maxAggressiveness="11" minAttention="3" maxAttention="11"  
otherPeople="Dontcare" bumpFactorAggressiveness="0"  
bumpFactorAttention="0"/>
```

```
<behavior pictureSet="10" minAggressiveness="-10"  
maxAggressiveness="11" minAttention="-10" maxAttention="-7"  
otherPeople="Dontcare" bumpFactorAggressiveness="1"  
bumpFactorAttention="2"/>
```

```
<behavior pictureSet="10" minAggressiveness="-10"  
maxAggressiveness="-2" minAttention="3" maxAttention="11"  
otherPeople="Dontcare" bumpFactorAggressiveness="2"  
bumpFactorAttention="0"/>
```

```
</character>
```