

# **The videogame as prosthetic imagination:**

## **Immersion in *Mirror's Edge***

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## **Declaration**

I certify that this thesis contains no material which has been accepted for the award of any other degree or diploma in any tertiary institution, and that, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference is made in the text of this thesis.

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## **Abstract**

While studies on the behavioural effects of videogame play are plentiful, many researchers have pointed to a lack of research on the first-person experience of playing a game. This thesis studies immersion, the powerful sensation of total engagement with a virtual world. A case study analysis investigates how three distinct forms of immersion are created and maintained at the point of connection between videogame and player. The research uncovers spatial, sensory, fictional and ludic factors that influence the affective experience of immersion. It argues that the three categories of immersion are interdependent and intersupporting, but not equally powerful.

Through an academically rigorous analysis of immersive experience, this research aims to deepen the existing pool of knowledge on immersion in videogames, improve the tools of games studies and lay the foundations for further study in this emerging field.

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## Chapter 1: Introduction

### 1.1 The videogame as prosthetic imagination

This research begins with a question posed by Lev Manovich in *The Language of New Media* (2002). Manovich considers two oppositional aesthetic traditions: on one side, art that is designed to highlight its own artifice in order to prompt self-reflection in its audience, exemplified by the work of playwright Bertolt Brecht; on the other side, art that is designed to suspend its audience in a convincing illusion that allows them to lose their sense of self, seen in the traditional cinema of Hollywood.<sup>1</sup> Manovich nominates the videogame,<sup>2</sup> and specifically those videogames that offer a continuous experience, as the medium that most successfully blends these apparently contradictory practices:

Can Brecht and Hollywood be married? Is it possible to create a new temporal aesthetics, even a language, based on cyclical shifts between perception and action? In my view, the most successful example of such an aesthetics already in existence is a military simulator, the only mature form of interactive narrative. (pp. 209)

In comparison to older forms of popular media, the videogame and its audience<sup>3</sup> are both highly active, in a more literal, physical sense than the interpretive activity of active audience theory. The player of a videogame is required to engage in continual intensive

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<sup>1</sup>This mirrors Bolter and Grusin's dichotomy between hypermediacy and immediacy (2000), addressed in detail below.

<sup>2</sup>An extended definition of *videogame* is available in Appendix A.

<sup>3</sup>The term "audience" is an awkward one to apply to videogame players, as it implies a person or group whose primary act of engagement with the text is to witness and interpret it rather than physically co-author the experience through play. It is used here for ease of comparison with other media and discussion of audience theory.

planning, situational assessment and physical input in order to operate the game software successfully, and the medium itself is continually moving, recalculating and reorganising itself in response to its programming and the player's actions. From the physical movement of the material computing hardware to the graphical representations of the virtual objects within the game world, player and game push against each other constantly.

Manovich argues that this highly interactive nature of the medium affects the audience to such an extent that it even influences their own perception of self. In the same way that cinema and fashion ask their audiences to identify with the body of another person, interactive media ask their audiences to identify with the "mental structure" of its creator:

If the cinema viewer, male and female, lusted after and tried to emulate the body of the movie star, the computer user is asked to follow the mental trajectory of the new media designer. (p. 61)

Manovich's willingness to consider the form of videogames without being distracted by their novelty is rare, but his analysis is still somewhat limited by being framed in the context of cinema. It is telling that he describes videogames in terms of an "image". While videogames do present an image, this characterisation skims over how most videogames are perceived by their players: as deep, explorable *spaces*.<sup>4</sup> The virtual inhabitability of videogame spaces has the potential to give players a different, more tangible sense of "being there".

A more instructive frame of reference for games is used by games journalist and author Jim Rossignol (2010), who describes videogames as a "prosthetic imagination" through which

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<sup>4</sup>In my experience, when speaking about a videogame, non-players typically describe what they *see* on the screen. By contrast, players typically describe what they *do* within the three-dimensional space of the game world. The former is a literal superficial reading of the playing experience.

the player extends their experience into an imagined world that is not of their own creation:

You are not simply waving at passing spectres in the night, you are right in there, wrestling with the invented physics, unravelling the stories, ripping open alien monstrosities. The imagination is extended into this space, it spills back and forth from technology to mind. You can see this happening when you watch players at work. Their thinking is *right there* on the screen. [...] The new human which is emerging from the flows and processes that our technologies are surrounding us in is projecting itself into inner space, via physical space.

The concept of a “prosthetic imagination” captures an important additional quality: that objects within the game space become an extension of the player through which the player has influence over the game world, just as a prosthetic limb gives an armless person influence over their environment. Games journalist and critic Kieron Gillen (2007) describes this as a form of extended consciousness - the ability of humans to perceive tools and objects as extensions of themselves - in which players not only extend their consciousness into an avatar but also virtually inhabit its environment:

When playing *Tomb Raider*,<sup>5</sup> no-one says the accurate “that wolf killed Lara Croft”, but rather “that wolf killed me”.

In the idiom of videogame criticism, the experience of a “prosthetic imagination” is commonly described in the lexicon of videogame criticism as *immersion*. It is necessary at this point to define as it is used in this thesis, as the term has developed through common use rather than intentional formulation.

Janet Murray (1997) describes immersion as “the sensation of being surrounded by a completely other reality [...] that takes over all of our attention, our whole perceptual

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<sup>5</sup>*Tomb Raider* (Core Design 1996)

apparatus" (p. 98). It is the experience of near-total engagement with the game world, to the exclusion of the player's actual surroundings. To that extent, it is nearly synonymous with the term "immersion" used in the field of virtual reality, with slightly different implications.

To a virtual reality practitioner, immersion describes the substitution of sensory information from the actual world with sensory information from a virtual world. A person wearing virtual reality equipment that presents all five of their senses with the illusionistic feedback of a virtual environment is fully immersed, regardless of the extent to which their mind accepts these sensations as "real". The *immediacy* of a virtual environment is its ability to convince its audience to perceive it as an actual space rather than a representation. (Bolter and Grusin 1999, pp. 272-273) The perceived sensation that an immersive virtual environment with a high degree of immediacy is an actual space in which the subject is physically located is described in psychology as *spatial presence* (Wissmath, Weibel and Groner 2009).

Spatial presence is the closest concept to immersion in videogame terminology, in that it describes the subjective illusion of presence rather than the actual form or quality of the experience. However, videogame immersion emerges not only from sensory input but also from imaginative cues and the structure of gameplay,<sup>6</sup> and as such it does not always involve the player feeling physically embodied within the game world. It is possible to be immersed in a videogame in which one does not feel spatially located, particularly when the game assigns the player no single avatar with which to identify, as in *Civilization* (MicroProse 1991) or *Lemmings* (DMA Design 1991). In these cases, it may be

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<sup>6</sup>A definition of *gameplay* is available in Appendix A.

hypothesised that the player's awareness of their own physicality simply recedes from their consciousness, or that the interface becomes their spatial presence.

This research uses the model of immersion outlined by Laura Ermi and Frans Mäyrä (2005), which proposes that there are not one but three types of immersion at work in videogames: *sensory immersion*, *challenge-based immersion* and *imaginative immersion*. This is termed the SCI-model. These three distinct but overlapping effects are experienced by videogame players simultaneously, and combine to form the game experience gestalt:

- *Sensory immersion* comes from the “audiovisual execution” of the videogame, including the aesthetic presentation of the game world through screens and audio channels. Sensory immersion is supported by the presentation of a convincing, detailed world, although it need not be realistic.
- *Challenge-based immersion* comes from the difficult problems presented by the game, and the input required from the player. Challenges may require physical dexterity, cognitive acuity or both. Challenge-based immersion is supported by a level of difficulty that requires the player's full concentration, without frustrating the player to the point of significant anxiety.
- *Imaginative immersion* comes from the fiction presented or suggested by the game. Imaginative immersion is supported by all the elements that make a traditional narrative format engaging, such as satisfying story threads, inventive fictional worlds and believable characters that the audience can empathise with.<sup>7</sup>

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<sup>7</sup>A definition of *fiction* and *narrative* as they relate to videogames is available in Appendix A.

Challenge-based immersion is described in the psychological concept of *flow*: the sensation of total absorption in a task that is achievable only with sustained focus. A person enters a state of flow when their attention is absolutely engaged in an activity, bringing all of their effort and relevant skills to bear (Csikszentmihalyi 1990, p. 53). In flow, awareness and action merge in consciousness and perception of clock time becomes subordinated to the rhythms of the activity.<sup>8</sup>

## 1.2 Summary of the research

This research studies the experience of immersion in a single videogame: *Mirror's Edge* (DICE 2008). It investigates how sensory, challenge-based and imaginative immersion are created and maintained at the point of connection between the videogame as an active medium and the player as a participant and interpreter. It establishes how the affective<sup>9</sup> experience of immersion is influenced by spatial, sensory, fictional and ludic<sup>10</sup> factors. It argues that the three categories of immersion are interdependent and intersupporting but not equal, with challenge-based immersion significantly overpowering sensory and imaginative immersion in *Mirror's Edge*.

Through an academically rigorous analysis of immersive experience, this thesis aims to deepen the existing pool of knowledge on immersion in videogames, improve the tools of games studies and lay the foundations for further study in this emerging field.

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<sup>8</sup>A further definition of *flow* is available in Appendix A.

<sup>9</sup>*Affective* in the psychological sense, describing an emotional response to stimuli based on pre-conscious and post-conscious judgement.

<sup>10</sup>*Ludic* refers to the element of the game *qua* game.

### 1.3 The study of videogames

For an important and central aspect of human development and learning, play and games have been the subject of surprisingly little academic study over the years. Only a handful of significant studies of play and games predate the popularisation of videogames, most of them conducted from the perspective of anthropology.<sup>11</sup> Jesper Juul (2005a) describes the history of non-electronic game studies as a narrow field dominated by a few sociological, anthropological and philosophical enquiries:

[W]hile much space has been devoted to the study of people (other than the researcher) playing game, very little has been said about the first-person experience of playing a game. (p. 10)

Electronic games have existed in some basic form since 1947 and been widely available in the anglophone sphere since 1971, but garnered little academic scrutiny for the next three decades. The first academic, peer-reviewed journal dedicated to videogame studies and the first international scholarly conference on videogames were both set up in 2001 (Aarseth 2001), around which time there was a marked rise in interest in the study of videogames from a perspective other than that of a creator.

It is timely to consider a medium that is so engaging to so many people, particularly young people,<sup>12</sup> but is often treated with suspicion by news media and society at large.

The videogame is a complex and multifaceted medium. A truly thorough understanding of one videogame requires a study of many interlocking parts. Lars Konzack (2002), one of

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<sup>11</sup>The classic studies are Johan Huizinga's *Homo Ludens* (1938) and Roger Caillois' *Les Jeux et les Hommes* (1958) (translated as *Man, Play, and Games* in 1961). More recently, Brian Sutton-Smith has written extensively on the topic of play and non-electronic games from an anthropological perspective.

<sup>12</sup>According to a 2008 survey of Australian households conducted by Bond University (Brand et al 2008), videogames are played by 68% of all Australians and 84% of Australians aged between 16 and 25.

the few researchers to attempt a holistic method of videogame criticism, said that “an entire analysis of any computer game must be analysed [sic] from every angle” (p. 1), taking into account seven layers: hardware, program code, functionality, gameplay, meaning, referentiality and socio-culture.

The first great hurdle in game studies right now is the lack of a common language. The precise definition and applicability of even the most fundamental terms are actively contested, down to such basic components of discussion as “narrative” (Zimmerman 2004), “text” (Aarseth 1997), “gameplay” (Rollings and Adams 2006), “game mechanics” (Sicart 2008) and even “game” (Juul 2005a) and “videogame” (Whalen 2006). This difficulty in communication is attributable partly to the youth of game studies as an academic discipline and partly to the multifarious disciplines from which game studies researchers draw.<sup>13</sup>

Perhaps inevitably, given the complexity of the medium, there is much disagreement among game researchers as to how videogames should and should not be studied (Bogost 2009). To date, most of the research on videogames has been concerned with determining whether and how games affect the behaviour of their players. The central preoccupation of such psychological research has been whether playing violent videogames causes aggression and violence – a topic that has been the subject of far more game research than any other, yet so far lacks a conclusive answer. (Lee and Peng 2006; Ferguson and Kilburn 2010; Anderson et al 2010)

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<sup>13</sup> A full explanation of the lexical mismatches and misunderstandings in the brief history of game studies would fill a book. This thesis includes a short list of definitions in Appendix A.

While critical analysis of videogames has gradually increased over the past two decades, the authors of quantitative research on game effects are particularly conscious of the need for greater theoretical understanding of subjective game experiences in order to synthesise a more complete picture from their own quantitative research findings. For example, in a meta-review of the evidence for aggression and violence as effects of playing violent videogames, Kostygina et al (2006) write:

[N]o study has ever investigated how players understand the video games they play. [...] We still know very little about players' interpretations and feelings while playing video games. (p. 357)

In an extensive meta-review of all research into the effects of videogames on players, Lee and Peng (2006) express their concern that the lack of theoretical understanding of the videogame playing experience is detrimental to the reliability of quantitative player effects studies:

[T]here has been a paucity of research on the nature of game playing as an entertainment experience. [...] We believe that if we want to have a fuller understanding of this new form of media entertainment, we need to know what users actually experience while they are playing games. (p. 340)

The lack of a thorough theoretical model for how videogames are experienced is partly attributable to the diversity of the medium. Taken as media texts, videogames have the potential to contain a more disparate variety of content than exists in any other popular media form. A single videogame may contain all the words of a book<sup>14</sup> and the visuals and audio of a film<sup>15</sup> plus many more variables, including control input, game rules and

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<sup>14</sup>The script for Black Isle Studios' *Planescape: Torment* (Black Isle Studios 1999) ran to 800,000 words (Gillen 2010) - more than *War and Peace* (Tolstoy 1886) or the first five *Harry Potter* novels combined (Rowling 1997-2003).

<sup>15</sup>While it is difficult to imagine a film that contained a playable videogame, videogames regularly include non-interactive cinematic video sequences, known as *cutscenes*. It is not unheard of for a videogame to

mechanics, goals, real social interaction, procedural generation of content and persistently updated fictional worlds in online games. The differences between *Pong* (Atari Inc. 1972), *The Lord of the Rings Online* (Turbine, Inc. 2007) and *Rock Band* (Harmonix Music Systems 2007) are so great that they are barely recognisable as belonging to the same medium.

It is difficult to envision a theoretical model of games that could fully address all aspects of all conceivable games. What we can do is study how particular gamic situations are experienced by the player and observe the basic unit operations<sup>16</sup> that are correlated with specific experiences. Extrapolating these findings will help us to further our understanding of how videogames function as virtual experiences.

#### **1.4 Overview of *Mirror's Edge***

*Mirror's Edge* is a first-person videogame designed around the experience of free running through obstacles (an actual life activity similar to parkour). Fast running and climbing to traverse complex three-dimensional spaces in quasi-realistic ways has been a significant element of gameplay in other avatar-based videogames, notably *Prince of Persia* (Ubisoft Montreal 2008). However, notable design decisions were made with *Mirror's Edge* to give the player a heightened sense of spatial presence and immersion compared to these previous games.

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contain within it the equivalent of a full feature film. *Metal Gear Solid 4: Guns of the Patriots* (Kojima Productions 2008) contains roughly nine hours of non-interactive cinematic videos in total, including one continuous cinematic cutscene that runs for approximately 90 minutes.

<sup>16</sup>“Unit operations are modes of meaning-making that privilege discrete, disconnected actions over deterministic, progressive systems.” (Bogost 2006, p. 3)

Among the thousands of videogames, *Mirror's Edge* was chosen for a case study of immersion due to its recency and relevance to the form of modern videogames and its explicitly immersion-oriented design.

*Mirror's Edge* is in many ways a quintessential modern videogame. It was released in November 2008 and built on up-to-date, high-end software commonly used in big-budget games, including the Unreal Engine 3 game engine. Its core design reflects one of the prevailing styles of contemporary videogame design, in that the player:

- Controls a single avatar;
- Views the game-world from the avatar's perspective;
- Uses one controller input (mouse or thumbstick) to look around and another controller input (keyboard or thumbstick) to move;
- Navigates through a fully realised game world; and
- Progresses through a broadly linear, pre-determined story.

The gameplay challenges involve traversal of space, combat, exploration and puzzle solving - four of the primary concerns of popular modern videogames.

Most pertinently, *Mirror's Edge* has been designed and marketed with a particular emphasis on the creation of a flow experience for the player. For evidence of DICE's authorial intentions in making the game, it is instructive to look at the description on the official *Mirror's Edge* website,<sup>17</sup> as it describes the game in terms that closely reflect the three pillars of the SCI-model of immersion set out by Ermi and Mäyrä (2005).

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<sup>17</sup>Available at: <<http://mirrorsedge.com/ls/en/index.asp#/thegame/>> (*Mirror's Edge* n.d.)

The main advertising copy for the game is listed under four headings: “Move yourself”, “Immerse yourself”, “Challenge yourself” and “Free yourself”.

The copy addresses the audience as though they are the player-character, by saying “move yourself” and referring to “your speed and agility”, although in reality the player of *Mirror's Edge* need not move anything beyond their fingers. This places the audience’s perspective in the body of Faith, the perspective character, and establishes the idea of her as part of the audience’s extended consciousness.

The effect is extended in the heading “Free yourself”, which positions the audience’s perspective in the mind of Faith by attributing them her motivations. It also introduces the metaphor of Runner vision, which “allows you to see the city as they do”, which further filters the player’s perception of the environment through the mental processes of the character of Faith. This introduces the audience to the imaginatively immersive aspect of *Mirror's Edge*.

The section titled “Move yourself” describes the movements the player must execute within the game, while the section titled “Challenge yourself” describes the nature of the challenges that the player must overcome, including “puzzles” and “strategy”. These reflect the two variants of challenge-based immersion: that which requires motor skills and that which requires cognitive skills.

Finally, the section titled “Immerse yourself” describes the sensory immediacy of the videogame. It posits the player’s reaction as a feature of the design: “Heights create real vertigo” and “collisions and bullet impacts create genuine fear and adrenaline.”

## Chapter 2: A Review of Some Associated Literature

The discipline of game studies draws from numerous disparate fields, from information technology to comparative literature to psychology to applied game design. The following texts synthesise some of the most pertinent ideas that inform this study of videogame immersion.

**Bolter, JD and Grusin, R 1999, *Remediation*, The MIT Press, Cambridge, Massachusetts**

Jay David Bolter and Richard Grusin, professors at the Georgia Institute of Technology, challenge the common conception of new media that frames it in terms of its differences from what has come before. They present the theory that every media form by necessity repackages the forms that have come before it in order to achieve cultural legitimacy, a process they call *remediation*. The authors describe two primary strategies for remediation: immediacy and hypermediacy. Immediacy seeks to erase the medium in the user's perception to heighten the perceived realism of the text. Hypermediacy emphasises the presence of the medium to bring out its inherent qualities as part of the user's experience.

Immediacy and hypermediacy are primarily useful for addressing the sensory *presentation* of a media text. The subjective *experience* of mediation may not correlate with the mediacy game's surface-level presentation. For example, consider the cinema trope that is commonly used when a film character looks through a pair of binoculars: the edges of the

screen are blackened out, leaving a clearly visible space in the shape of two overlapping circles. This is a hypermediate presentation, as it does not match the real visual impression of looking through binoculars. Nevertheless, through familiarity and the established logic of this shot, contemporary audiences interpret it without hesitation as what the character using the binoculars is seeing. A more realistic film presentation of a view through binoculars, which somehow captured the sensation of oppressively constricted peripheral vision and weirdly elastic depth of focus, would be likely to unnerve the viewer into a greater awareness of the mediated nature of the image, reducing the perceived immediacy of the film despite its technical immediacy. Such audience reactions are heavily influenced by familiarity with the media form and its conventions.

The flexible relationship between presented mediacy and experienced mediacy is an important distinction in an analysis of videogame experiences, as most videogames are highly dependent on patterned design, repetition and learning.

**Bogost, I 2007, *Persuasive Games: The Expressive Power of Videogames*, The MIT Press, Cambridge, Massachusetts.**

Researcher, critic and videogame designer Ian Bogost examines the videogame as an expressive medium, situating it within a tradition of rhetoric that is documented as far back as Ancient Greece. He describes videogames' potential for a powerful new form of rhetoric that affords an effective way to demonstrate and mount propositions about how things work, particularly subjects that are composed of a complex array of interacting processes.

Bogost primarily addresses the ability of videogames to present rational arguments, whether in service of political ideology, advertising or education. The concepts are equally applicable to videogames designed to present fictional worlds and create entertaining experiences.

The acknowledged flaw in Bogost's argument is the difficulty of accounting for individual subjectivity and interpretation. We may see *Tetris* (Pajitnov, 1984) as "a perfect enactment of the overtasked lives of Americans" (Murray 1997, pp. 143-144), but another person playing the same game may find that interpretation absolutely laughable. Indeed, Markku Eskelinen used that particular metaphor as an example of the "interpretative violence" (2001) inflicted on videogames.

**Juul, J 2005a, *Half-Real: Video Games between Real Rules and Fictional Worlds*, The MIT Press, Cambridge, Massachusetts.**

Videogame theorist Jesper Juul seeks to resolve an argument that dogged game studies in the first few years of the twenty-first century: is a game a kind of narrative, or a system of rules?<sup>18</sup> Juul's answer is *yes*: a player's experience of a videogame is created from both an imagined fictional world and a real<sup>19</sup> set of rules that govern that world and by which she plays.

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<sup>18</sup>This debate, and a convoluted alternative answer to it, are covered in Bogost (2009).

<sup>19</sup>"Real" in the sense of not virtual or imagined. Whether imagined fictive worlds can be considered "real" is a question outside the scope of this research.

Much as Ian Bogost (2007) situates videogames within a long history of rhetoric, so Juul situates videogames within a long history of games, while examining how computer technology as a platform for games shapes the experiences afforded to players.

The primary concern of the book is how a videogame's rules and presentation plus a player's actual experience and imagination each contribute to the combined play experience, and how that experience should be interpreted.

While others have made the diplomatic point before that games can be analysed as narrative or as play, Juul provides a useful synthesis of the two vectors of interpretation, to consider the player's experience as simultaneously fiction and action.

**Consalvo, M and Dutton, N 2006, 'Game analysis: Developing a methodological toolkit for the qualitative study of games', *Game Studies*, vol. 6, no. 1.**

Communications professor Mia Consalvo and graduate student Nathan Dutton propose an approach to the qualitative analysis of games, citing the lack of a pre-existing clear and systematic method for examining how various game elements combine to form the game as a media text and for interpreting its larger significance. Consalvo and Dutton nominate four areas of analysis that should be subject to critical review.

### **Object inventory**

The object inventory is a pilot study of the objects that can be found, bought, stolen, collected, picked up, combined or otherwise interacted with during the game.

Characteristics of each object are catalogued in accordance with their relevance to the

game. The researcher must use their judgement to determine the significance of each object and its affordances to the player.

### **Interface study**

The game interface, as defined by Consalvo and Dutton, is “any on-screen information that provides the player with information concerning the life, health, location or status of the character(s)”, plus any menus that contain options which affect changes to anything within the game world.

A study of the interface shows what information is foregrounded for the player, what information is difficult or impossible to find, what options are open to the player and what options are not. These findings may illustrate what the player is guided to focus their attention on, and therefore what is assumed to be a significant element of the playing experience.

### **Interaction map**

The interaction map is a catalogue of the player’s ability to affect or be affected by other characters, potentially including both other players’ characters and non-player characters (NPCs). It facilitates an understanding of the player-character’s *active* relationships within the game world, as distinct from the narrative relationships.

To illustrate, consider the hand-to-hand fighting videogame *Super Street Fighter IV* (2010). The 35 playable characters in the game each have fictional biographies, most of which describe specific relationships with other characters as lifelong friends, mortal enemies, professional rivals and so on. However, the active relationships between the characters *within* the gameplay are identical: all are equally opposed as competitors. This

is determined by the map of possible interactions, which in *Super Street Fighter IV* are limited to damaging fighting moves within a head-to-head knock-out competition.

### **Gameplay log**

The gameplay log is the most fluid of Consalvo and Dutton's four categories for investigation. It is a record of the functional qualities of the game world and the "emergent gameplay" that comes into being through the operations of the player and the game's systems, including operators driven by artificial intelligence (AI).

Consalvo and Dutton's method is not sufficient for a complete case study of immersion. However, the discipline of addressing all four areas is expected to reduce the likelihood of analytical blind spots in the research due to overlooked details or an over-emphasis on certain parts of the subject.

### **Csikszentmihalyi, M 1990, *Flow: the Psychology of Optimal Experience*, Harper & Row, New York.**

Formulated through years of testing upon people in situations as diverse as rock climbing, ballet, chess tournaments and gardening, *flow* is psychology professor Mihaly Csikszentmihalyi's conception of a psychological state he also describes as "optimal experience". It is the point at which "all a person's relevant skills are needed to cope with the challenges of a situation, that person's attention is completely absorbed by the activity" (p. 53). Although not written with games in mind, some parts of this book are perfectly applicable to games, and immersion in particular. Flow is equivalent to *challenge-based immersion* in game design terms (Ermi and Mäyrä 2005).

**Ermi, L and Mäyrä, F 2005, 'Fundamental Components of the Gameplay Experience: Analysing Immersion', in *Changing Views: Worlds in Play*, University of Vancouver, Vancouver**

Psychologist Laura Ermi and professor of hypermedia Frans Mäyrä present a theory of immersive gameplay experience based on observations and interviews with game-playing children and their non-playing parents, which they name the SCI-model. The model presents immersion as not one but three overlapping phenomena, which combine to form the game experience gestalt.

Ermi and Mäyrä's SCI-model provides a more comprehensive understanding of the immersive experience than models derived from outside the field of videogames. While the SCI-model was developed through research on children, its wider applicability has since been supported by psychophysiological studies of adult players.<sup>20</sup>

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<sup>20</sup>A study by Lennart Nacke and Craig A. Lindley (2008) found positive correlations between videogame scenarios custom-designed to promote specific experiences from the SCI-model and the predicted levels of affective emotional arousal in players, according to measurement by electroencephalography, electrocardiography, electromyography, galvanic skin response and eye tracking equipment.

## Chapter 3: Methodology

### 3.1 Methodological considerations

There are two central problems that inform the design of the research method: the problem of reflective analysis and the paradox of self-conscious immersion.

#### 3.1.1 How can the experience and interpretation of a player be traced back to specific causal factors within the videogame?

There are several avenues for enquiry to determine how the game-playing experience is created. We can look for authorial intent, by considering how the game designers describe their game in advertising, interviews and their own writing. We can consider how changes in mechanics, aesthetics and fiction during play correlate with changes in the perceived experience of the player. We can compare the mechanics, aesthetics and fiction of the videogame to other similar games and observe the differences and how they correspond with a difference in the experience of play. And we can engage in a textual analysis of the mechanics, aesthetics and fiction, and particularly how they combine to create the perceived game-world.

There is a sub-issue within this question: to what extent is the whole of the game experience simply the sum of its individual elements? It is possible to consider an individual component of a game as a self-contained text, whether it be a cutscene, a game mechanic,<sup>21</sup> a character model, a menu screen or even something external to the game

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<sup>21</sup>A definition of *game mechanic* is available in Appendix A.

world, such as a pricing model or a marketing campaign. Each of these are interpreted by players (or potential players) and added to their understanding of the game. However, the meaning that a player gains from any one component of a game is greatly influenced by context, both within the game world as it is experienced and within the player's actual physical environment, social context, personal history and personality.

### **3.1.2 How can a researcher critically reflect on the experience of immersive engagement with a videogame without disrupting their own immersion through self-awareness?**

There is a paradox at the core of this research. The purpose of study is to bring analysis and interpretation to bear on the object of study, but in this case the object of study involves the dissolution of self-consciousness. As a formal challenge, an aesthetic presentation and an imagined world, immersiveness draws the player's attention away from their inner self to and into the game world.

To overcome this, the research approach for a case study of immersion must give the researcher latitude to *forget that they are conducting research* temporarily while playing, while still collecting information on their experience of, perception of and reaction to the game.

## **3.2 Method**

This research employs a case study of a single videogame, in order to delve deeply but narrowly into the experience of play.

### **3.2.1 Case study**

A case study is an in-depth investigation of a single example of a field of study, which closely analyses many aspects that affect the subject of the research. The case study method has the advantage of providing an in-depth analysis to the experience of playing the videogame. The wider aim of the research is to determine rules and trends of causation in game design that may be applicable to other videogames and to interaction design more widely. However, as the research is limited in scope to a single player's experience with a single game, this thesis does not claim to be able to provide broader insights to the wider study of games on its own. The case study is subject to the unique peculiarities of the game chosen to be studied, and the researcher's perception of the game may be influenced by overfamiliarity. These are recognised failings of the case study method (Eisner 1997). Rather than providing a definitive understanding of immersion in videogames, this research is intended to contribute to the greater pool of knowledge and point the way to promising avenues for future research.

### **3.2.2 Specific design of this project**

This thesis presents the result of a case study of *Mirror's Edge* undertaken from the perspective of a player. In collecting the data for this investigation, I began by following the method set out by Mia Consalvo and Nathan Dutton in "Game analysis: Developing a

methodological toolkit for the qualitative study of games” (2006). I recorded four categories of information about the game: interface study, object inventory, interaction map and gameplay log. I cross-referenced the information that related to common game elements and analysed its relation to the SCI-model of immersion. The results describe how the presentation of various elements of the game world support or disrupt the player’s sense of immersive engagement with the game, based on my own experiences and academic research.

Critical play presents a particular challenge in research on immersion, as immersion implies a lack of critical awareness. In order to allow for both the self-reflection needed for critical analysis and the lack of self-consciousness needed for immersion, a strict distinction was kept between play and note-taking. During each play session of *Mirror's Edge*, a timer was set to sound every 30 minutes.<sup>22</sup> At these intervals, the game was paused to reflect on the experience and record the experiences that had stood out during that timeframe, with particular attention paid to the researcher’s sense of connectedness to the game world; awareness of the physical interface; consciousness of actual physical surroundings; and perception of the passage of time.

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<sup>22</sup>It was hypothesised that 30 minutes was sufficient time to develop a sense of immersion with a game, but not so long that the majority of the experience between the intervals would be forgotten by the time it was noted down.

### 3.3 A note on platforms

*Mirror's Edge* is available on three game systems: Xbox 360, Playstation 3 and Windows PC.<sup>23</sup> The Windows PC version was used for this study. The results should be broadly applicable to all four, as only minor differences exist between them. To confirm this, the Xbox 360 version was also tested for similarity; the layout of the controls is somewhat different, but the game software itself is almost identical overall. However, the different physical context in which the variants of the game are typically played (on a sofa across the room from a television, or at a desk up close to a computer) and the difference in control interface is likely to affect the experience of play.

There are two play modes within *Mirror's Edge*: *story* and *race*. The story mode presents a cohesive linear progression through a series of narrative situations, interwoven with characters and plot developments. The race mode is a more free-form series of pure speed challenges, without narrative justification. Progress in the story mode unlocks race mode sections in increments. This research focuses on the story mode of *Mirror's Edge*.

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<sup>23</sup>There is also a version of *Mirror's Edge* available for the Apple iPad, and a free online Flash game, *Mirror's Edge 2D*, but these differ substantially from the original games on Xbox 360, Playstation 3 and Windows PC.

## Chapter 4: Results

### 4.1 The primary aesthetics

There are two primary visual styles in *Mirror's Edge*: one seen during cut-scenes and one seen in gameplay.<sup>24</sup>

During gameplay, the visual style is near-photorealistic. Objects are modelled in detail, although the colours of objects are minimal and in many cases abstract (see Figure 2). The perspective is that of Faith, the player-character, and remains consistent throughout each gameplay section, with no cinematic cuts or unseen gaps in time.

During cut-scenes, the visuals are presented in a highly stylised cartoon-like style (see Figure 1). Objects are picked out in simple blocks of flat, bright colour, cel-shaded to give a sense of shape while still appearing as a flat image. Boundaries between areas of shadow and light are sharp. The perspective is that of a third-person camera, with frequent cuts between “camera” positions in a traditional cinematic style.

There is a minor variation of the cut-scene visual style, seen in brief flashback montages. These sequences use simple, flat, cel-shaded shapes similarly to the primary cut-scene style, but replace the bright colours and clean outlines with large areas of grey and a blurry, old television look that reduces the immediacy of the image (see Figure 3).

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<sup>24</sup>Cut-scene: “Cinematic, non-interactive part of a game, conveying the game's backstory or fiction.” (Juul 2005b)

The *Mirror's Edge* Story mode begins with a cut-scene montage of “Runners” moving across the city, with a voice-over by the voice of Faith that describes some of the history of the city, its status as a police state and the existence of the Runners as illicit couriers. Following this cut-scene, the game cuts to a high establishing shot over the city in the gameplay visual style, at which point the “camera” perspective swoops down and left toward the figure of Faith, who is briefly visible at the corner of the screen, and stops once it reaches her perspective.

The two visual styles are thereby set in stark contrast. The cut-scene is emphasised as a non-interactive storytelling sequence by its cinematic editing, its lack of embodied perspective, its visual resemblance to a cartoon and its lack of realism. The detail and realism of the first-person perspective establishes it as the more “true” and therefore primary visual style. The swooping crane shot into Faith’s perspective shows the gameplay perspective to be that of Faith, but also that it is possible to consider the character’s perspective and the player’s perspective separately, as they are separate for the first few seconds of the game.

## **4.2 Interface and perspective**

The *Mirror's Edge* interface is unusual for its relative transparency. First-person videogames typically feature a heads-up display (HUD), which acts as a dashboard of critical information during gameplay. The HUD is normally displayed as a set of non-

diegetic icons and numbers around the edges of the screen that show the player-character's health status, their ammunition, a small map of the area or similar.<sup>25</sup>

In *Mirror's Edge*, the non-diegetic interface is minimal. Outside of menus and cut-scenes, the game displays an almost totally unobscured view from Faith's perspective, aside from a tiny white or blue dot at the centre of the screen. This creates a highly immediate experience, as it removes the elements of typical first-person videogames that directly highlight the mediated nature of the form.

The perspective in *Mirror's Edge* is also notable for its unusually wide field of view (Totilo 2008). This allows the player to take in most environments quickly; a narrower field of view would slow down the pace of play by forcing the player to look around more often in order to find a pathway through the space. It also heightens the player's impression that they are inside the world rather than at a distance looking in through the screen, as they have a good deal of peripheral vision.

### 4.3 Simulating the body of the avatar

The choice of first-person perspective unifies the viewpoint of the perspective character, Faith, and the player. This removes the seam between player and character found in third-person games, such as *Prince of Persia*.

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<sup>25</sup>Some games work out a diegetic explanation for the HUD, such as that it is projected in front of the player-character's eyes by their helmet visor, but even so it remains a virtual display within the game world.

Faith's body is unusually visible for a videogame perspective character. When Faith looks down, her body is clearly visible to above the hips, and she casts a realistic shadow on the ground (see Figure 4). The body is visible in a perspective that matches the player's proprioceptive map of their own body, reinforcing the illusion that Faith and they are one.

While Faith is running, the player can look down<sup>26</sup> and see her legs moving in a fairly accurate imitation of real human movement. However, even if the player is not looking down, four effects emphasise the physicality of Faith's body:

- Faith's footsteps can be heard, with a sound that matches the material she is running across. A footstep on concrete produces a dull tap, whereas a footstep on steel mesh produces a sharp clang.
- Faith's clothing can be heard to rustle with each step.
- Faith's hands swing in and out of view at the corners of the screen.
- Faith's breathing becomes clearly audible.

When Faith accelerates, each of these indicators changes to reflect her increased speed: the footsteps and clothing sounds become faster and louder, the hand swings speed up and the breathing becomes louder and heavier.

Faith's physicality is demonstrated to an even greater extent at other times. Faith often holds on to ledges (see Figure 5) or presses her hand against a surface she is standing in contact with (see Figure 6). When landing from a high fall, Faith can roll forward in parkour fashion, which tucks her legs and arms up into the player's view (see Figure 7) and causes a sound of the clothed body tumbling across the floor surface. Finally, Faith's body

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<sup>26</sup>When describing an action within the game, it is most correct to attribute the impetus for the action to the player but the action itself to the character - in this case, "the player can make Faith look down." This is cumbersome, however, so where the distinction is sufficiently clear, this thesis attributes in-game actions to either the player or character, whichever is more applicable.

is visible when she stands before reflective surfaces, such as polished glass or computer screens (see Figure 8).

#### 4.3.1 Simulator sickness

The simulation of first-person spatial presence and movement created by *Mirror's Edge* is sufficiently convincing to trigger a nausea reaction akin to motion sickness in many players. This sensation is in fact *simulator sickness*, which occurs when the brain receives sensory information that implies movement while the body remains still. The cause of the nausea is not known.<sup>27</sup>

While many first-person videogames have this effect on a small percentage of their players, *Mirror's Edge* is notorious for causing simulator sickness in people who are not normally prone to it (Thompson 2008). It may be hypothesised that the speed and variety of movement in *Mirror's Edge* compared to other first-person game, as well as the almost total lack of a stationary HUD interface, contribute to its tendency to cause simulator sickness.

I have rarely suffered from simulator sickness, but each time I played *Mirror's Edge* I felt strongly nauseated within one to three minutes. However, while the sensation did not fluctuate significantly in intensity, there were periods of time in which I was able to easily block it from my conscious thought, particularly when faced with clear objectives and relatively approachable terrain within the game space. When confused or frustrated by the

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<sup>27</sup> A common theory proposes that simulator sickness is induced by a conflict between the motion the brain perceives through the eyes and the lack of motion the brain perceives through the vestibular system (inner ear). However, tests have found simulator sickness occurs even among people with no vestibular system (Bertin et al. 2004).

game environment, the nausea was much more palpable. This corresponds with

Csikszentmihalyi's description of the flow state:

When all of a person's relevant skills are needed to cope with the challenges of a situation, that person's attention is completely absorbed by the activity. There is no excess psychic energy left over to process any information but what the activity offers. All the attention is concentrated on the relevant stimuli. (1990, p. 53)

Thus, simulator sickness is caused by a breakdown in sensory immersion, but may be overridden to some degree by flow, or challenge-based immersion.

#### **4.4 Simulating the vision of the avatar**

*Mirror's Edge* uses several tricks to recreate the vision, rather than just the perspective, of the player-character. The visual information is distorted under particular circumstances to imitate the ways in which the human mind sees its environment. A producer of the game described this approach as "simulating your eyes rather than your head" (Totilo 2008).

When the player directs the centre of the viewing area at an object close to them in the game world, the appearance of the space beyond the object becomes blurred (see Figures 5 and 6). This gives the impression of the player-character's eyes focusing on the object in the foreground, although in fact the near object comes into no clearer focus; the heightened focus is perceived only in contrast to the unfocused vision of the background. Nevertheless, this increases the perceived depth of the game space, denying the actual flatness of the images on the screen.

When Faith moves forward at a high speed, a radial blur appears around the sides and corners that smudges the field of view out toward the edges of the screen (see Figure 9). As well as replicating the visual effect of fast movement in the actual world that is familiar to players, it exaggerates the player's impression of the width of the field of view. Ordinarily, only scenery at the very corners of a runner's vision would be moving fast enough to blur significantly, but by bringing the effect in to the edges of the screen and applying it with a slight curve - so that it encroaches deeper horizontally into the field of view at the top and bottom than at the middle - *Mirror's Edge* creates the illusion that the flat screen shows a convex visual field, similar to the human eye.

At the same time as the blur appears, a light whooshing sound becomes audible which cues the player in to the air resistance felt by Faith. By fading in and out at the same times, the sound of air and the visual blur reinforce each other and become linked in the player's mind. (During play, I semi-consciously interpreted the noise of rushing air as "the sound of" the screen blur.)

A similar pair of effects occur when Faith falls beyond a safe distance, such as when she jumps from a ledge and misses her landing. As her body enters straight vertical free-fall, her vision doubles and becomes severely shaky (see Figure 10) at the same time as a much louder and more penetrating air-rushing sound becomes audible. A moment before Faith would hit the ground, the vision abruptly cuts to black and the audio is punctuated by a sharp crunch sound, followed by silence.

Interestingly, these falling effects start roughly one second after Faith begins a fall that will kill her. These effects do not occur if Faith falls for longer than one second over a safe

height. Therefore, the effects simulate not only the physical motion of falling, but also the panic that sets in as Faith realises she is falling to her death. The player recognises the falling effect as a sign of failure, and therefore reflects Faith's fictional panic with their own real frustration.

#### **4.5 Simulating the mind of the avatar: Runner vision**

*Runner vision* is the colour-coding visual aesthetic that picks out traversable pathways in red, or occasionally orange, yellow, blue or green, and washes out scenery that is deemed unimportant in white. This blurs the lines of diegesis, as it is not a literal representation of the game world, but a metaphorical representation of Faith's perception of the game world. It is "real" in the sense that it accurately depicts Faith's selective processing of her environment.

Although this is not stated within the game, the colours appear to be coded by ease of traversal. Red objects facilitate fast movement and often allow Faith to maintain momentum, as in the case of a ramp that can be leaped from. Orange objects impede Faith slightly, such as barriers that can be vaulted. Blue objects are not always useful; those that must be traversed often force Faith to lose her momentum, as with a short wall that she must pull herself up, or a railing that she must leap onto and grab. In Figure 12, the red ramp allows Faith to take a jump across the gap with a clear run-up, but the blue railing is tall enough that only a perfect jump will clear it smoothly; a slightly less well-executed jump will propel Faith only to the outside of the railing, from which she must pull herself up.

Red objects are also used as landmarks. In Figure 1, the player must cross the plaza and find a way into the building marked with the red logo.

This colour coding is highly effective at directing the player's attention. The boldness and distinctness of the colours allows the player to process their significance quickly and without much conscious thought, which keeps their stream of consciousness focused on *how* to get to the next point, and thereby orients their attention toward understanding the spatial composition of the game world.

Runner vision functions as a game *metaphor*. This represents the practiced skill of spatial awareness and familiarity with the environment that Faith has, but the player lacks.

Without it, the player would struggle to understand how to move in the environment; a failing that would create a schism between Faith as she is presented in the fiction of the game and Faith as she is played by the player.

At times, objects are coloured white when they first come into the player's view, but fade to red as the player approaches them and finds no other pathway. For example, in Figure 9 the top image shows a rooftop with a helicopter hovering several metres away; the bottom image shows the helicopter landing rail turning red as the helicopter moves closer to the roof, allowing Faith to jump to it. This simulates Faith assessing the space and finding a usable object only after a moment's consideration - a thought pattern that is immediately reflected in the player's mind.

Runner vision sacrifices objective realism for expressive subjectivism. It privileges the experience of Faith as a Runner over the "true" appearance of the environment; another move that unifies the perspectives of Faith and the player. It is a hypermediate quality,

emphasising the mediated nature of the videogame experience rather than offering an uninterpreted window into the game world. This sacrifices a degree of credibility of the visual information, but paradoxically heightens immersion by facilitating the player's interpretation of the space as a challenge-based environment.

#### **4.5.1 Difficulty as transferral of responsibility**

*Mirror's Edge* has three difficulty settings: Easy, Normal and Hard.<sup>28</sup> On the Hard setting, Runner vision is disabled: the game world still appears in the same basic aesthetic of white interspersed with solid colours, but traversable pathways and useful objects are no longer depicted in red. This transfers a greater share of the responsibility of assessing the environment from the mind of Faith to the mind of the player, trading a degree of imaginative immersion for a degree of challenge-based immersion.

This passing of a function from the in-game fiction out into reality illustrates the argument made by Juul (2005a): that games are simultaneously real and fictional, and the degree to which they are either one is fluid.

## **4.6 Colour as life**

Colour in *Mirror's Edge* represents vitality. That which promotes life is red; that which slows life down is blue; that which destroys life is black.

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<sup>28</sup>The primary effect of the difficult setting, aside from Runner vision, is to increase or decrease the danger posed by Faith's enemies.

Runner vision is one clear example of this, with helpful objects highlighted in red and hindering objects highlighted in blue as described above. The motif is repeated in the character design and in combat.

#### **4.6.1 Colour in character design**

Non-player characters are coloured-coded by their affiliation with Faith in a way that reflects the environmental colour-coding of runner vision. Those who are closely allied with Faith, such as the runners Mercury and Celeste, wear red. Jackknife, who both helps and hinders Faith, wears bright blue. Miller, who is impartial and uncommitted to a side, wears white. And both the enemies and the weapons they carry are black; the more black, the more threatening the character (see Figures 15 and 16). As runner vision suggests an interpretation of the environment, so too does the colour-coded appearance of characters give a clear indication of their relationship with Faith, which similarly unifies the player's understanding of the game world with Faith's without the need for expository dialogue.

Faith herself wears red only on her hands and feet, with white pants and a black top (see Figure 2). This is appropriate, as she is a violent, rebellious, destructive character, although her violence is all directed at the corrupt institutions of power.

#### **4.6.2 Enemy highlighting**

Enemies in *Mirror's Edge* who stand between Faith and her destination are surrounded by a red glow (see Figure 17). Enemies who chase Faith from behind are in most cases not highlighted. This suggests the glow is a form of Runner vision: it represents Faith's awareness of the threats she is approaching and - as red objects are targets in *Mirror's Edge* - tacitly suggests to the player that they should attack the highlighted enemies. As with

runner vision, this serves to process the environment through the filter of Faith's attention, unifying her perspective with that of the player to strengthen sensory and imaginative immersion, and streamlining gameplay to heighten challenge-based immersion.

#### **4.6.3 Weapon focus**

Enemies within arm's reach of Faith swing their guns at her rather than shoot. During this swing, for a period of roughly one second, the gun turns red rather than black (see Figure 15). This serves a dual function: it communicates a warning of the imminent attack, and it also demarcates the timeframe in which the player can perform a disarmament move (by clicking the right mouse button) which will stop the attack, steal the weapon and incapacitate the enemy. If the player fails to initiate the move while the gun is red, Faith is hit by the enemy and knocked back a step.

A form of weapon focus is a real, well-documented effect. Eyewitnesses to crimes involving a weapon typically remember details about the weapon, but fewer details of the rest of the scene than witnesses to situations that do not involve weapons (Kassin et al. 2001). This occurs because the witnesses focus their attention on the weapon to the exclusion of other details in the situation.

The use of red to represent weapon focus in *Mirror's Edge* is an example of hypermediacy used to achieve a deeper fidelity of experience than the superficial realism of immediacy. *Mirror's Edge* highlights and takes advantage of its mediated form to engage the player, rather than present the most diegetically "truthful" image, as an unfiltered view would not capture the same quality of the real-world experience of weapon focus. The player, not

being threatened by the weapon in reality, would not experience the same hyperfocus as a character in Faith's position.

#### 4.6.4 Colour as health

Unlike most first-person shooter videogames, *Mirror's Edge* has no health bar. When Faith is shot or hit with a weapon, the impact is communicated to the player in five ways:

- A red blood splatter appears on screen for a fraction of a second (see Figure 17).
- The field of view jolts away from the impact, as though moved by the force of the impact.
- The edges of the screen flash red.
- Faith can be heard to grunt in pain.
- The field of view darkens and constricts around the edges of the screen as the remaining view partially drains of colour.

The screen remains dark and desaturated for several seconds before fading back into full colour. If Faith is shot or hit again in this time, the field of view constricts tighter, and the screen darkens even more. If she is hit multiple times in close succession, all sound external to Faith herself cuts out and she topples to the floor as her vision desaturates completely and contracts until the entire screen is black (see Figure 18).

The hurt that Faith suffers is represented by a loss of colour; death is represented by a total loss of colour and light. The flash of red and the red blood splatter correspond with Faith's loss of colour, which unifies blood and colour as semiotic signifiers of Faith's life energy.

This situates the player within Faith's mind. The colour in the game world is not truly diegetic, as evidenced by the lack of colour on plants and fire hoses, but provided by Faith's processing of her world through the filter of her awareness. As she begins to lose consciousness, her awareness of her surroundings dims, and so the player's assisted awareness of the game world is hampered, both visually and audibly. When Faith loses consciousness completely, the player's link to the game world is severed; unlike many first-person games, *Mirror's Edge* does not continue to show vision from within the game after the character has died.

#### **4.7 The environment as hostile entity**

The environment in *Mirror's Edge* emanates an impression of coldness and opposition towards the player in all three of the sensory, the imaginative and the challenge-based perceptions of the game world. The game space seeks to subjugate the player through constriction of movement, as the player seeks to overcome the space through skillful movement.

##### **4.7.1 Architecture**

The buildings in *Mirror's Edge* are universally Modernist in design, dominated by strong vertical and horizontal lines, simple geometry and minimal ornamentation (see Figure 11). The construction materials appear to be predominantly concrete, glass and steel. Few external windows allow the player to see inside the building; most offer only a dull reflection, as if to say "don't look here, there's nothing to see" (see Figure 12). There is little movement across the skyline; although some areas feature construction cranes, all are

motionless and unoccupied. Looking down from the rooftops, the player can see nearly empty streets with very few cars driving on the road (all flat white and identical in make) and even fewer pedestrians.

The colour palette is dominated by white, interspersed with flat blocks of bright primary colours that bring to mind the abstract paintings of Piet Mondrian. These colours are initially pleasing to the player, but their inertness soon deadens the positive feeling. Their hard-edged evenness marks them as abiological and uncomfortable.

Similarly, the unified consistency of the architecture, colour palette and construction materials is striking at first, but the repetition and lack of individual flourishes give the city a machine-like, Apollonian quality. The strong impression is of an environment that is cold, sterile and unsympathetic to life.

There are no natural settings or areas of rough ground. Plants are rare, and all appear enclosed in pots or rectangular concrete garden beds. Through Faith's perspective, plants and other decorative objects appear in the same flat white as much of their surroundings (see Figure 13). The rarity and decolourisation of plant life further emphasises the sterility of the environment.

#### **4.7.2 Limitation of space**

The manner in which the environment facilitates the player's progress partially reinforces its hostility through its unforgiving difficulty, but also progressively instructs the player how it should be thought about and approached in order to turn it to their advantage.

The player is guided in how the game space should be used in two ways.

The narrative of the game tells the player explicitly: you are Faith, a Runner, and you must move through the areas you encounter. At each stage, there is a simple, urgent narrative motivation for Faith to move from where she is to the far point in this sub-section of the game world. For example, at the beginning of the Prologue mission,<sup>29</sup> Faith's goal is to deliver a bag; halfway through the mission, she is attacked by police, and her primary goal becomes to evade the police. As the player controls Faith and shares her perspective, they take on her goals as their own, at least by implication.

The space itself supports this reading through the affordances it allows to the player. Most of the environment is minimally responsive; few objects can be moved, picked up or otherwise altered. Few of the player's actions leave an impression on the space. A handful of exceptions are buttons that may be pressed and wheels that may be turned, each of which is located at a functional dead end and performs a simple action that opens a new pathway. Although some spaces appear wide open for exploration, each area is constructed as a unicursal labyrinth, with only one way for the player to progress other than to retrace their steps. Thus the possibility space<sup>30</sup> for the player is limited to: move from point to point through the level by traversing one clearly marked path between each position.<sup>31</sup>

The routes between each path typically require precise timing, accurate jumping and practiced mastery of the controls. This makes many areas forbidding at first encounter, as the player is constantly trying to make sense of the environment, plan their approach and

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<sup>29</sup>The Story Mode of *Mirror's Edge* is divided into 11 missions: Training Area, Prologue and Chapters 1-9.

<sup>30</sup>For further discussion of how the structure of a virtual spaces defines the possibility space for its players, see Chapter 11 of Michael Nitsche's book *Video game spaces: image, play, and structure in 3D game worlds* (2008, pp. 171-189).

<sup>31</sup>Many areas have one or two alternate paths between points that may be discovered by a skillful player, but these are momentary detours that bring the player back to the main path within a few seconds of travel.

execute the sequence of moves to navigate the space successfully. This compounds the impression of cold severity given by the environment's appearance.

However, as each area is limited in scope and affordances, the player can quickly familiarise themselves in a short space of time. Most spaces can be fully understood and modelled in the player's mind within a few minutes. As a result, a second play-through of *Mirror's Edge* has a dramatically different feel to a first: places that were once perceived as resistant and uncooperative are now viewed with confidence and understanding, which makes them much less threatening. Even on a first play-through, experience with the game quickly teaches the player that there *is* a path through each area; they simply have to find it.

Over time, the interpretation of the game world as a hostile, dangerous environment lessens, which draws the player away from imaginative immersion in the fiction of the game. Through repetition, the spaces become familiarised and comfortable in a way that contradicts the game's narrative and lessens imaginative immersion. However, challenge-based and sensory immersion are maintained as long as traversal of the space remains an engaging challenge.

#### **4.8 Controlled space and the player as nomad**

Two distinct types of level design alternate within *Mirror's Edge* and influence the player's attitude to the game world. In the schema of Gilles Deleuze and Félix Guattari (1980), these may be characterised as *striated* and *smooth* spaces. Striated space is boxed in,

constrained on all sides by barriers, resistant to movement; the player must engage with it slowly, overcoming obstacles and barriers as though being pushed back against by the architecture itself. Smooth space is unbroken, fluent, conducive to (in fact demanding of) movement; the player rushes through it at a sprint, feeling a kinetic thrill.

Within these spaces, the player takes on the role of Deleuzian nomad. The player, as Faith, moves against the constructed, confined spaces. Their objective is to move freely between points, and once at their destination, to move freely to the next. The player is inherently hostile to striated space, favouring the utopia of open space (Hourigan 2003). But their movement is controlled, either tightly and disruptively by the highly striated “puzzle” spaces or more gently by the smoother channelled spaces.

Striated spaces are constructed as puzzles. These areas appear closed at first, with no obvious route out or through, so the player must inspect the environment closely to discern a viable pathway. In Figure 14, for example, the player enters the space at ground level and sees high fences and walls blocking their progress on all sides, with no red landmarks to indicate the next point to move towards. Only when they climb onto the scaffolding (itself a task requiring creative thinking) are they able to see the strip of red at the top of the stairs at the right of the image, and thereby guided to look for a route over the fence toward it. In other highly striated areas, the environment is dominated by a single colour, which is disorienting to a player who has become accustomed to the careful colour highlighting of Runner vision (see Figure 19).

By presenting an initially inscrutable cognitive challenge, these highly striated spaces increase the perceived difficulty of the task. If the perceived difficulty increases beyond the

player's perception of their own ability to overcome it, the player is moved from a state of flow to a state of anxiety, breaking the challenge-based immersion (Csikszentmihalyi 1990). This prompts the player to consider the striated area as an artificially constructed space - as in "Why did the game designers make this area like this?" - which pulls the player's consciousness back from a sense of sensory immersion and distracts from the fiction of the game, dissipating the imaginative immersion.

Smooth spaces are constructed as high-speed obstacle courses. Many of these areas place a pursuer with a gun behind Faith, motivating the player to rush through the space as though fearful of their life. In contrast to the highly striated spaces, the paths through these pursuit areas are typically simple and intuitive; the player is seldom obliged to stop and look around while a helicopter gunship rains bullets down upon them. However, these spaces are still delimited in a narrow channel - still striated at the edges - but *within* the channel, movement is free. In this way, these spaces passively function as the architecture of the "society of control", like Deleuze's concept of a highway, on which "people can drive infinitely and 'freely' without being at all confined yet while still being perfectly controlled" (Deleuze 1998, p. 18).

Immersiveness tends to be higher in all three categories in the controlled, smooth spaces. Challenge-based immersion is increased as the player is forced to apply the skills they have learned in previous areas more quickly and continuously. Sensory immersion is reinforced by the increased perceptual stimulus of gunfire, bullet trails, enemy shouts and the evidentiality of the bullets that hit Faith.<sup>32</sup> Imaginative immersion is increased by the

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<sup>32</sup>A video example of one such area can be seen at: <<http://www.gametrailers.com/video/flight-level-mirrors-edge/41014>> (*GameTrailers.com* 2008)

simple dynamism of a strongly evocative conflict situation and the dramatic uncertainty of the outcome, as well as the harmony between the narrative of resistance to the controlled society and the experience of movement in controlled space.

## Chapter 5: Conclusion

### 5.1 Review

This thesis has focused on the point of connection between the videogame as an active medium and the player as a participant and interpreter. By examining *Mirror's Edge* as a channel of human experience, rather than a self-contained media text, it has been possible to show that its design has a powerful perceptual effect on its player, strong enough to induce real physical reactions such as nausea as well as complex emotions and a sensation of spatial presence in the virtual world.

The results determined that the game elements responsible for SCI-model immersion in *Mirror's Edge* are:

- Consistent presentation of the perceptual evidentiality of the game world, such as visual and audio cues, to maintain sensory immersion.
- Clear and evocative expressions of fictional goals, relationships and motivations to maintain imaginative immersion.
- Continual active development of mastery over demanding but readily understandable problems to maintain challenge-based immersion.

Each category of immersion supports the other two. Sensory immersion facilitates a sense of presence within the fiction of the game and an intuitive understanding of the game space. Imaginative immersion motivates the player to engage with the game challenges

and grants a sense of life and meaning to the sensory environment. Challenge-based immersion creates a feeling of urgency and immediacy, and sharpens the player's attention on the most relevant stimuli, such as the sensory perception of the game space.

When any one form of immersion is sufficiently disrupted, the total experience of immersion is at risk of evaporating. However, not all three are equally essential to a maintained immersive experience. The activities that require the heaviest investment of attention are most crucial to overall immersion. As *Mirror's Edge* requires the player to focus heavily on challenges, the sense of challenge-based immersion can be resilient enough to persist even when imaginative immersion is almost entirely dissipated, as long as an understanding of the basic fictional laws - such as the strength of gravity and the attitude of the police - is maintained. On the other hand, a disruption to challenge-based immersion, such as a frustrating experience that moves the player from a state of flow to a state of anxiety, is likely to "pull the player out of the game" and interrupt their sensory and imaginative immersion.

*Mirror's Edge* presents a highly streamlined sensory and fictional landscape. The semiotic coding of spaces, characters and fictional situations is clear and unambiguous. This simplifies the task of the player in internalising these factors to generate sensory and imaginative immersion, and allows the player to focus the majority of their attention on the gameplay challenges, which are more cognitively demanding.

## 5.2 The reinforcement principle

The central finding of this research is the interdependence between sensory, challenge-based and imaginative immersion. This suggests a design consideration for virtual world creators: the *reinforcement principle*. To deepen the experience of immersion, game design should be tuned to create experiences that harmonise the three categories of SCI-model immersion.

In *Mirror's Edge*, the reinforcement principle is found in the alignment of three forms of immersion to motivate the player towards their next goal. The player wants to move to the next location, because:

- It stands out in red against the white background.
- It can be reached through a series of enjoyable challenges.
- Faith wants to go there, and the player empathises with Faith.

The affective tone of the immersive experience is also harmonised by the recurring qualities of briskness and clarity found in the sensory environment, the imagined fiction and some of the gameplay challenges. However, some spaces, such as the highly striated “puzzle” areas, introduced a discordant challenge experience that disrupted immersion in all three categories.

### 5.3 Comments

The validity of any general conclusions from this study are dependent on two variables: the player and the game. If the experience of the researcher in conducting this case study is not typical, the findings will not be applicable to a broader population of players. If the specific design of *Mirror's Edge* causes it to be experienced differently from other first-person videogames, the findings may not be applicable to other games; in particular, the results are likely to be most relevant to videogames played in a first-person perspective and videogames that involve spatial and kinetic challenges.

However, due to the spatial design and highly immediate presentation of *Mirror's Edge*, the results may be somewhat applicable to the field of immersive virtual reality, to a greater extent than if the research had been conducted on a game with a less transparent interface and less spatially-focused gameplay.

### 5.4 Recommendations

Further research is required to test the general applicability of these findings. A quantitative study into the subjective experiences of players using game spaces designed for specific combinations of immersion would help to plot the interdependence of the three types of immersion. Research into immersion in non-first-person perspective videogames, or indeed videogames in which the player does not control a singular avatar, is needed to determine how broadly the research findings should be applied.

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## Appendix A: Definitions

### Fiction

Following Juul (2005b), this thesis uses *fiction* to refer to any imagined situation or world.

The fiction of a game is that which the player imagines to exist or occur within the game world. A game's story is part of its fiction. Its rules *operate* within the fiction but *are operated* outside it. (See also *Narrative*.)

### Flow

Flow is described by psychologist Mihaly Csikszentmihalyi in *Flow: the Psychology of Optimal Experience* (1990):

When all a person's relevant skills are needed to cope with the challenges of a situation, that person's attention is completely absorbed by the activity. There is no excess of psychic energy left over to process any information but what the activity offers. All the attention is concentrated on the relevant stimuli. (p. 53)

Csikszentmihalyi also refers to flow as "optimal experience". In game design terms, flow is equivalent to *challenge-based immersion* (Ermi and Mäyrä 2005).

## Game

The nature of what constitutes a “game” is somewhat ambiguous, is only becoming more ambiguous as videogame software and principles of modern game design are put to ever more varied uses. Game-like software such as *Second Life* (Linden Lab 2003) and competitive social media such as *foursquare* (foursquare 2009) are smudging the boundaries of what we might consider a game.

In his book *Half-Real* (2005a), Jesper Juul takes a survey of proposed definitions of “game” published between 1950 and 2003, from writers with backgrounds in sociology, psychology, anthropology, philosophy and videogame design. Beginning from the common elements in these definitions, Juul formulates the “classic game model”:

A game is a rule-based system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels emotionally attached to the outcome, and the consequences of the activity are optional and negotiable. (Juul 2005b)

A commonly cited characteristic of games and play that is missing from Juul’s definition is the “magic circle”: the notion that actions taking place within the bounds of the game are distinct from the world outside, subject to a different set of rules and expectations as established in the conventions of the game. The magic circle of a soccer match is delineated by the lines that draw up the rectangular field; within this space, as the game is underway, players are expected to conform to ultimately arbitrary codes of behaviour, such as obeying the commands of the umpire, who is likely to have no authority over the player outside the game.

## Game mechanics

This thesis follows the definition of *game mechanics* provided by Miguel Sicart (2008):

“game mechanics are methods invoked by agents, designed for interaction with the game state.”

Sicart notably does not make a fundamental distinction between game mechanics for the player and game mechanics for other agents within the game, such as computer-controlled opponents:

Game mechanics can be invoked by any agent, be that human or part of the computer system. For instance, AI agents also have a number of methods available to interact with the gameworld. On occasion, those methods will be other than the ones made available to the human player, which can have consequences worth of analysis.

A game may have many possible mechanics; in a complex game, it is unlikely they will all be employed with the same frequency or be equally useful to the player in achieving their goals. Sicart defines *core mechanics* as “the game mechanics (repeatedly) used by agents to achieve a systemically rewarded end-game state.” For complex games that feature many such mechanics, Sicart makes a further distinction between *primary* and *secondary mechanics*. He defines *primary mechanics* as “core mechanics that can be directly applied to solving challenges that lead to the desired end state” and *secondary mechanics* as “core mechanics that ease the player's interaction with the game towards reaching the end state. Secondary mechanics are either available occasionally or require their combination with a primary mechanic in order to be functional.”

## Gameplay

Gameplay is broadly defined as the collective term for elements of the game world that are responsive to the player's actions. Perhaps the most commonly accepted definition of gameplay is offered by game designer Richard Rouse III in *Game Design: Theory & Practice* (2001):

A game's gameplay is the degree and nature of the interactivity that the game includes, i.e., how the player is able to interact with the game-world and how that game-world reacts to the choices the player makes. (p. xviii)

## Game rules

*Game rules* are the instructions for what will happen in response to any state change during a game. Rules determine what can and cannot happen in a game. The borders of the term are necessarily fuzzy; every functional line of code in a videogame's software is a kind of game rule. For the purposes of this qualitative analysis, this thesis uses *game rules* (or simply *rules*) to refer to those identifiable higher-order rules that perceptibly define the possibility space of the game.

Miguel Sicart (2008) discusses the relationship between *game mechanics* and *rules*:

Game mechanics are concerned with the actual interaction with the game state, while rules provide the possibility space where that interaction is possible, regulating as well the transition between states. In this sense, rules are modeled after agency, while mechanics are modeled for agency.

## Hypermediacy

In *Remediation* (1999), Jay David Bolter and Richard Grusin define hypermediacy as:

A style of visual representation whose goal is to remind the viewer of the medium. One of the two strategies of remediation; the other is (transparent) immediacy. (p. 272)

## Immediacy

In *Remediation* (1999), Jay David Bolter and Richard Grusin define immediacy as:

A style of visual representation whose goal is to make the viewer forget the presence of the medium (canvas, photographic film, cinema, and so on) and believe that he is in the presence of the objects of representation. One of the two strategies of remediation; the other is hypermediacy. (pp. 272-273)

## Narrative

The relationship between games and *narrative* is disputed territory (Zimmerman 2004).

*Mirror's Edge* includes game elements that are “narrative” in that they are representative or suggestive of an authored story. However, the story is somewhat malleable according to the actions of the protagonist. (See also *Fiction*.)

## Videogame

By its strictest definition, *video game* refers specifically to an electronic game that operates on a raster display device, most commonly found in old video game arcades. Similarly,

*computer game* has the specific definition of an electronic game that operates on a personal computer. However, in recent years the popular usage of both terms has broadened. *Video game* in popular usage has come to mean electronic games in any format – sometimes contracted to a single word, *videogame*. *Computer game* still has a strong association with the personal computer, but is also frequently used to refer to “all games played using computer processing power” (Juul 2003, p. 30). For example, the peer-reviewed journal *Game Studies* describes itself as “the international journal of computer game research” and publishes articles on games in all digital formats.

Since the distinction between games platforms is not useful for this discussion, this thesis refers to all computer-processed games as *videogames*, or simply *games* where the distinction from traditional games is clear. Following Golding (2008), this thesis uses *videogames* rather than *video games* “in order to denote videogame’s [sic] significance as a new medium, rather than simply a new (‘video’) form of an old phenomenon (‘game’)” (p. 15). The definition of *videogame* for the purposes of this research is taken to be: “a game played using computer power and a video display. Can be computer, cell phone, or console game.” (Juul 2005b)

The borders of this definition are becoming increasingly fuzzy along two vectors: as computer technology permeates our lives through more and more devices, and as more and more examples of videogame-like interactive entertainment are created that bear little resemblance to traditional games. Consider *foursquare*: a distributed location-based massively multiplayer game in which players accumulate points and gain territory by visiting actual places and checking in with internet-connected portable digital devices, such as mobile phones. From the outside, *foursquare* looks nothing like conventional

games such as chess and soccer or ordinary videogames such as *Half-Life* (Valve Software 1998) and *Super Mario Kart* (Nintendo EAD 1992), but it is played using computer power with video displays and it meets all the criteria of the classic game model: a rule-based system with variable and quantifiable outcomes (visit a place more often than anyone else and you become the Mayor), where different outcomes are assigned different values#, the player exerts effort in order to influence the outcome, the player feels emotionally attached to the outcome and the consequences of the activity are optional and negotiable.

Furthermore, *foursquare* crosses Huizinga's magic circle: players gain points by checking in to their account during visits to places they have some extra-game reason to attend, so a trip to the library is integrated into an ongoing game of *foursquare* and vice versa.

Conversely, consider *Second Life*: a massively multiuser software program in which players control unique avatars within a shared, persistent virtual online world. From the outside, it looks exactly like a conventional videogame, and it uses videogame software,# but it has no explicit game rules, no specified quantifiable goals or outcomes and no values assigned to outcomes that may occur. The magic circle of *Second Life* is porous: players can trade currency between the virtual world and their actual bank account, and any property the player creates or purchases within the virtual world is their legal property.

So contrary to first appearances, *foursquare* fits comfortably within a fairly strict definition of a videogame and *Second Life* stretches any definition that does not entirely do away with the traditional nature of games as we have understood them for millenia. Yet as *Second Life* more closely matches the typical media form of videogames, much of the present research on videogames will be relevant to the latter and not the former.

## Appendix B: Figures



**Figure 1.** An open plaza in front of a shopping centre.



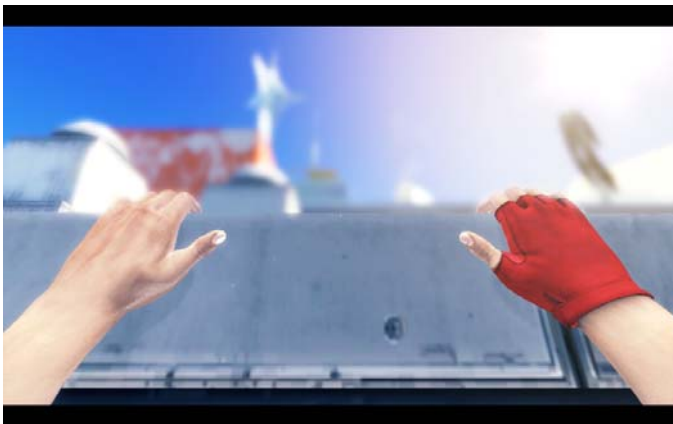
**Figure 2.** A moment from one of the game's cut-scenes. The character on the right is Faith. The character on the left is Celeste, one of Faith's Runner allies.



**Figure 3.** A moment from a flashback sequence in one of the game's cut-scenes.



**Figure 4.** Faith, looking down at her body and shadow.



**Figure 5.** Faith's hands, holding on to a ledge above her head. The background is blurry, as though out of focus.



**Figure 6.** Faith's right hand resting on a wall in the foreground. The background is blurry, as though out of focus.



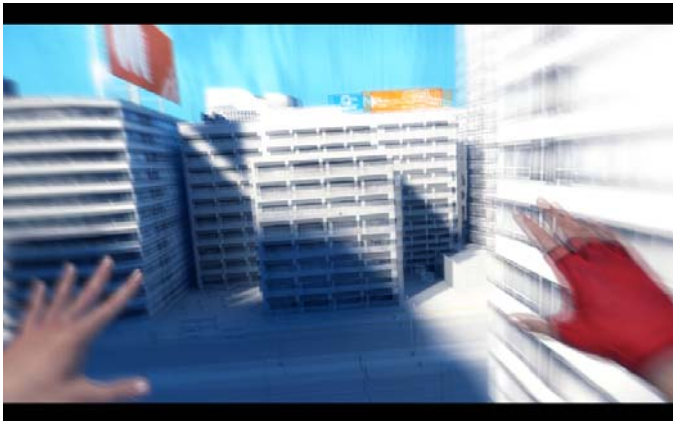
**Figure 7.** Faith rolling forwards across the ground after landing from a high jump.



**Figure 8.** A computer screen, showing Faith's reflection as she types on the keyboard.



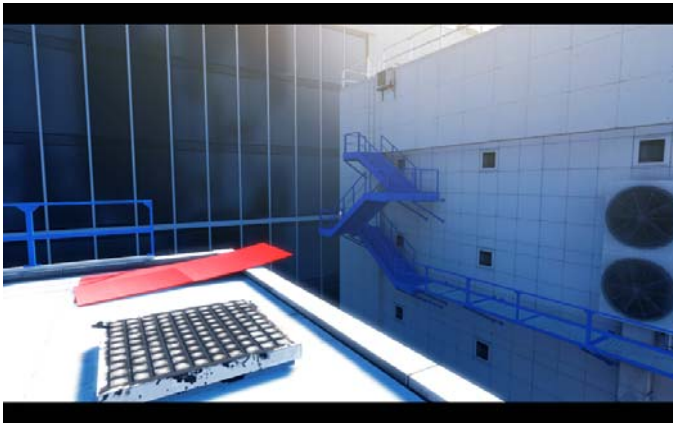
**Figure 9.** Two images of a helicopter next to a rooftop, taken seconds apart. The landing rail of the helicopter turns red as it nears the roof.



**Figure 10.** Faith falling from a rooftop, showing the picture distortion.



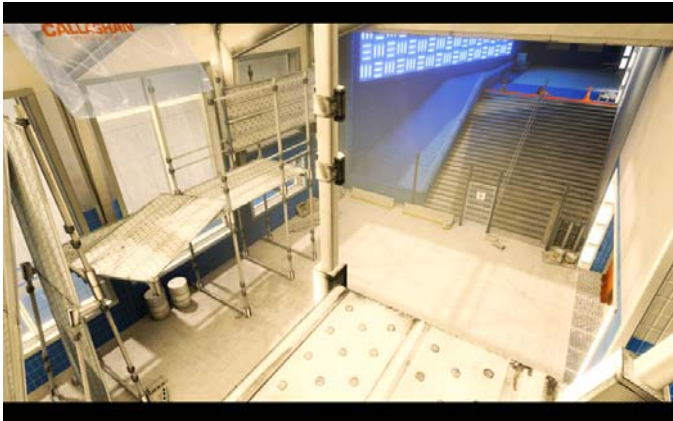
**Figure 11.** A moment from the opening credit sequence of the Prologue mission. The production credits are integrated with the city environment.



**Figure 12.** A gap between buildings that Faith may jump using the ramp, in red.



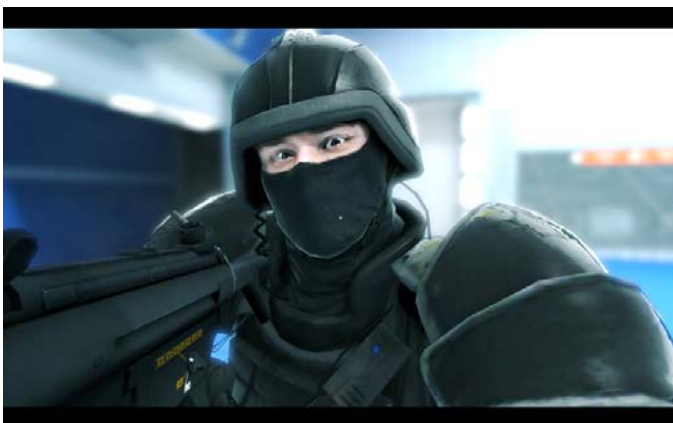
**Figure 13.** A colourless plant and fire hydrant.



**Figure 14** A puzzling area. A strip of red is barely visible at the top-right, above the stairs.



**Figure 15.** A City Protection Force officer - one of Faith's enemies - about to strike at Faith with his gun. The gun has just turned red to telegraph the attack.



**Figure 16.** A Pirandello Kruger private security contractor - one of Faith's enemies.



**Figure 17.** City Protection Force officer has shot Faith. Blood is visible for a millisecond.



**Figure 18.** Six images, to be read left to right and down. The player is taking damage.



**Figure 19.** A puzzling area, dominated by a bright, even orange colour.