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An investigation of ambient gameplay

By

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Abstract

Inspired by Brian Eno's ambient music, which is persistent and supports different levels of engagement, this research explores ambient gameplay in computer, video and pervasive games. Through the creation of original games containing ambient gameplay and looking for ambient gameplay in existing commercial games, this research focuses on gameplay that supports a range of depths of player engagement. This research is not concerned with ambient intelligent environments or other technologies that might support ambience, but focusses on gameplay mechanisms.

The definition of ambient music is used as a starting point for developing a tentative set of properties that enable ambient gameplay. A game design research methodology is initially used. Two very different research games, Ambient Quest (using pedometers) and Pirate Moods (using RFID, radio-frequency identification, technology) are analysed. The resulting qualitative ambient gameplay schema contains themes of persistence, discovery, engagement, invention, ambiguity and complexity. In order to confirm the wider applicability of this result a case study of an existing commercial game, Civilization IV, is undertaken. Ambient gameplay properties of engagement, complexity, abstraction, persistence and modelessness identified in Civilization IV, and other commercial games, are combined with the ambient gameplay schema to develop a definition of ambient gameplay. This definition is the basis for a set of investigative lenses (lenses of persistence, attention, locative simultaneity, modelessness, automation and abstraction) for identifying ambient gameplay.

This research creates a deeper understanding of computer games and hence gives game designers new ways of developing richer gameplay and gives games researchers new ways of viewing and investigating games.

'It is another world entirely and is enclosed within this one; it is in a sense a universal retreating mirror image of this one, with a peculiar geography … composed of a series of concentric rings, which as one penetrates deeper into the other world, grow larger … each perimeter of this series of concentricities encloses a larger world within' (Crowley, 1981, p. 11)

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Declaration

Whilst registered as a candidate for the above degree, I have not been registered for any other research award. The results and conclusions embodied in this thesis are the work of the named candidate and have not been submitted for any other academic award.

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Dissemination

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Keywords

Ambience, ambient, ambient music, game design, gameplay, game mechanism, game mechanic, pervasive, pervasive games, game analysis, engagement, interaction, locative, persistence, modeless, attention, automation, abstraction, complexity, design research, video games, computer games, games, playfulness.

Chapter 1 Introduction

1.1 The problem

In this thesis 'computer games' include video games, console games, pervasive games and any other games that use computing technology.

Computer games are played by many people. In America in 2011 49% of households own at least one dedicated game console, and on average own two (Entertainment Software Association, 2012). McGonigal argued that computer games have the power to change the world we live in: 'Game design…[is] a twenty-first century way of working together to accomplish real change' (McGonigal, 2011, p. 13). Computer games that move beyond being played only on a console or computer have been pervading society as everyday life becomes 'interlaced with games' (Montola, Stenros, & Waern, 2009, p. xix). These 'pervasive games' are important in offering people ways to interact and change the world. Gaining a deeper understanding of pervasive and other types of computer games is a way of giving designers better control over the games they are creating, better ways of accomplishing positive change through games. Additionally, a deeper understanding of games will result in richer gameplay experiences and player enjoyment.

The inspiration for this research followed a thought experiment carried out in 2004 in which ideas were considered of how underlying properties of ambient music could be used in the understanding and design of games. In particular the properties of pervasive games seemed to partially match with the properties of ambient music (see Chapter 2), except that the ability to have a range of levels of engagement was not a defining property of pervasive games, but was a defining quality of ambient music (see Chapter 2).

Very quickly it became apparent that many questions were raised by this sublime collision of ideas and a more rigorous, methodical process of investigation was started, initially to determine if a game could be produced that explicitly had a range of levels of engagement as a main property (see Chapter 4).

1.2 The aims

This research builds on a 22-year career in the games industry as a game designer, bringing game design and development expertise to bear on a problem space that requires both academic perspective and pragmatic approaches to practice based research. In particular, the building of games within rigid resource constraints, but that nevertheless enable examination of very specific types of gameplay is important. The research also builds on an interest in ambient music that started in 1978 on first hearing Brian Eno's Music for Airports (1978) album.

The research will develop a deeper understanding of games, specifically of ambient gameplay and develop a way of not only defining but also investigating ambient gameplay. Since the research is explorative, identifying and focussing on key areas is important; there are many

tangential areas of interest that could have caused the research to spiral out of control in a multitude of directions. Early research was aiming to create an understanding of 'ambient games', but once it became clear that ambience was present in many different games the aim of the research switched to focus on ambient gameplay.

Once the properties of ambient gameplay are established, they are then used to produce 'lenses'. Schell explains the concept of lenses: "Good game design happens when you view your game from as many perspectives as possible. I refer to these perspectives as lenses, because each one is a way of viewing your design…They are not blueprints or recipes, but tools for examining your design." (2008, p. xxvi) This research is not primarily aimed at producing lenses (or tools) for design, but rather to create lenses for investigating ambient gameplay. There is a discussion of future applications in game development in Chapter 9.

The lenses developed in this research are guidelines for focussing attention on specific game properties that support ambient gameplay; these lenses can be applied to any game. They are presented as statements with accompanying questions for interrogating a game in order to reveal ambient gameplay.

Before attempting to meet the overarching aim of producing investigative lenses there are a number of prior aims that must be met:

- defining ambient music
- developing a description of the properties of ambient music
- identifying types of games that are likely to contain similar ambient properties
- studying games that contain those ambient properties

By investigating games containing ambience, based on the definition of ambient music, a set of underlying properties are identified. These properties are then used to develop ways of analysing games for ambience and hence extending knowledge of games and possibly providing an approach that could give fresh insights and inform game design. These ambient gameplay properties can be applied more widely to many types of game, thus providing the possibility of developing new gameplay and more fully understanding existing gameplay.

1.3 The research program

The thread of research starts with a definition of ambience in music that is then used to build and investigate games in order to create a way of analysing games for ambient gameplay.

A first question to address is the nature of games that have properties based on the definition of ambience revealed in the literature review (Chapter 2). Exploratory studies using research games are carried out (Chapters 4 and 5). A schema describing games that exhibit ambient gameplay is developed. The central question being addressed at this point is whether games with ambient gameplay can be produced, and then, assuming this is possible, developing a robust analysis of them.

The schema produced from the research games describes a particular type of ambient gameplay and this schema is at a high-level, describing general properties rather than specific mechanisms. Although this schema describes games that were expressly built to demonstrate ambient gameplay, a further investigation is necessary to discover if this schema has a wider applicability and can be used in the meaningful analysis of games that were not explicitly built to demonstrate ambience.

A new study of an existing commercial game that exhibits some of the properties that were used when developing the research games (Chapter 6) is conducted next. The gameplay mechanisms of the chosen game are investigated to determine which ones facilitate the ambient gameplay properties derived from investigating ambient music (which was used in the development of the research games). These ambience supporting gameplay mechanisms are then analysed to determine their underlying properties.

In this way an initial idea about games that exhibit a 'gameplay ambience' (as distinct from aesthetic, non-gameplay ambience, such as rippling water or atmospheric sound effects) is first investigated through a 'top down' approach by building and playing research games that contain this gameplay ambience. Then a 'bottom up' approach of looking at detailed mechanisms within a particular commercial game is applied.

The 'top down' high-level schema and 'bottom up' set of properties are then brought together to determine how they relate to each other (Chapter 7). Establishing what they have in common, how well the properties support the schema elements and the extent the schema describes the properties.

A definition of ambient gameplay is derived and applications of ambient gameplay are discussed before finally giving concrete, practical analytical guidelines, or lenses (Schell, 2008), for investigating ambient gameplay (Chapter 8).

This research is not about technologies that might support ambience, such as ambient intelligent environments, but rather about gameplay properties. This research is not about arriving at a definition of 'ambient games' or of developing 'ambient games', but rather of looking for ambient gameplay. Although initially the idea of developing a definition of ambient games was pursued, during the research it became clear that ambience could be present in many different genres of games. The idea of looking for a definition of ambient games was set to one side (see Chapter 9). As previously mentioned at the beginning of this chapter, one of the game types considered has been pervasive games (see Chapter 2), though this research is not specifically about pervasive games. Pervasive games are just one type of game in which ambience is found (see the third study, in Chapter 6, for a very different game in which ambient properties were found).

1.4 Contribution to knowledge

This research makes an innovative contribution to the analysis of computer games. There are no other descriptions of methods for analysing ambient gameplay in computer games.

Suggestions for altering gameplay experiences to introduce ambient gameplay show how they have a practical use in game development, though the extent of their precise future usefulness in this area is yet to be determined. See Chapter 9 for a discussion of this.

The main contributions to knowledge of this research are a definition of ambient gameplay and six investigative lenses for identifying ambient gameplay for use by game designers and researchers to analyse games. They are far reaching and can be applied to any game, old, new or future, to give new insights into gameplay. They are of particular relevance given the rapid increase in processor power and the already high quality of graphics in games. The extra processor power available in modern gaming systems is available to create more sophisticated and animate worlds and also to increase the extent and complexity of the artificial intelligence in games. A number of modern open world games have produced extremely rich worlds, but still the gameplay is often confined to a small bubble around the player's character. The use of investigative ambient gameplay lenses can reveal important directions for game development to create much richer and more compelling experiences for players. Real-time gameplay may be extended beyond the area immediately surrounding the player, possibly building on the use of intelligent agents able to roam far beyond the player's immediate vicinity (for example, as was tried in S.T.A.L.K.E.R. Shadow of Chernobyl (GSC Game World, 2007)). The lenses also show ways in which a variety of levels of player involvement may be implemented. Suggestions of both uses of ambient gameplay and how to implement ambient gameplay are more contributions to knowledge; see Chapters 8 and 9.

A There are theoretical definitions of properties of ambience, see Chapter 2, and descriptions of a particular application of design research methodology, see Chapter 3, that are also contributions to knowledge.

1.5 Structure of thesis

1.5.1 Chapter 2 - Literature review

Ambience, particularly as found in music, is described and a set of properties applicable to games derived from this are outlined. Pervasive games, that seem relevant to the properties, are described in order to set this research in context and inform the development of ambient gameplay. The ambient properties of games are used later in the design of the research games as described in Chapters 4 and 5.

1.5.2 Chapter 3 - Design research methodology

A design research methodological approach for this research is described. The qualitative methods employed in each of the studies are described later, in each study chapter (Chapters 4, 5 and 6).

1.5.3 Chapter 4 - Study one: Ambient Quest game

The first exploratory study is described in which a game based on the ambient properties described in Chapter 2 is developed and used to explore the applicability of functional ambience

to games. The study is run in two phases between which the game is updated. Qualitative data is gathered and used to inform the design of the game developed for the second study.

This first study confirms that making and playing a game with a high degree of functional ambience, or ambient gameplay, as described in Chapter 2, is possible. A number of additional properties that support ambient gameplay are discovered.

1.5.4 Chapter 5 - Study two: Pirate Moods game

A new game featuring ambient gameplay, as previously defined, is developed and used to gather more qualitative data on the nature of ambient gameplay, testing the results of the first study and filling in gaps. Properties discovered in the first study are either supported, clarified, extended or discarded.

The results of the first two studies are then used to develop a schema describing important properties of ambient gameplay. This schema is based on the properties of ambient gameplay confirmed as actually present in the research games, rather than being based on the provisional description of gameplay ambience outlined in Chapter 2.

1.5.5 Chapter 6 - Study three: Civilization IV

In order to discover the applicability of the findings, from the first two studies, to games that were not expressly developed to exhibit ambient gameplay properties, a third study is run in which an existing commercial game, Civilization IV (Firaxis Games, 2005), is investigated to determine ways in which ambient gameplay might be present in it. In this investigation, the original description of ambient gameplay from the second chapter is used. This enables the triangulation of results, thus establishing that ambience is not only present in games that have been explicitly designed to contain ambience, but also is present in games that have not been explicitly designed to contain ambience.

A set of properties that support ambient gameplay are developed from the data derived from this study. A discussion of these properties includes reference to other games, demonstrating that they are widely found in games.

1.5.6 Chapter 7 - Findings

The high-level schema, developed at the end of the fifth chapter, and the properties of ambience, from the previous chapter, are then compared, contrasted and combined to create a single set of properties of ambient gameplay.

1.5.7 Chapter 8 - Discussion

The properties discovered in the previous chapter are now framed as a definition of ambient gameplay. Building on this definition, six investigative lenses for identifying the presence of ambient gameplay are created. Uses of ambient gameplay are considered.

1.5.8 Chapter 9 - Conclusion

Following a contextual statement, limitations and future directions for research are given. Practical applications of ambient gameplay are discussed.

Chapter 2 Literature review

2.1 Properties of ambient music

'Ambient' has been used to describe a particular type of unobtrusive music. The term 'ambient music' was used by Brian Eno to describe the music on his 1978 album Ambient 1: Music for Airports. In the sleeve notes Brian Eno gives a definition of ambient music: "Ambient Music must be able to accommodate many levels of listening attention without enforcing one in particular; it must be as ignorable as it is interesting." (Eno, 1978).

The roots of ambient music can be seen in pieces like Eric Satie's 1917 Furniture Music (musique d'ameublement) composition which was written 'not to be listened to; one should be no more aware of its presence than of the furniture around one' (Wilkins, 1975, p. 294). In 1937, speaking to Kostelanetz, John Cage said: 'Wherever we are, what we hear is mostly noise. When we ignore it, it disturbs us. When we listen to it, we find it fascinating.' (Cage, 2004; Holmes, 2008, p. 381). In 1968 David Behrman created a film soundtrack of environmental sounds and electronics which he called 'collage music', but which had much of the 'atmosphere and flavour' of what had been labelled 'ambient music' (Holmes, 2008, p. 398). In 1972 Wendy Carlos released a record called Sonic Seasonings combining synthesized sounds with environmental sounds consisting of 'quiet, subtle sounds, carefully composed to gently bob the imagination' (Holmes, 2008, p. 399).

A wide range of music is described as ambient, for example: ambient dance, ambient drum-n-bass, dark ambient, hard chill ambient (McLeod, 2001), ambient dub, industrial ambient, space music (Holmes, 2008, p. 403). The fact that so many pieces of music are considered to be ambient is indicative of the imprecision of the idea of ambience in music. Holmes tells us that 'it is difficult to draw a line showing where ambient music ends and "other" music begins', 'the current definition of "ambient" embraces a diverse sonic range of music' (Holmes, 2008, p. 402).

However, there are some core features of ambience as described by Brian Eno that seem axiomatic and form the basis for the working definition of ambience used in this research:

- Engagement: the music is both ignorable and in the background and interesting and in the foreground. The listener may focus their attention on the music if they wish, shifting it from ignorable/background to interesting/foreground.

- Affect: the ambient music creates a mood and may affect the way the listener is perceiving, or thinking about, the location. In the liner notes to Music for Airports Brian Eno says: 'Ambient Music is intended to induce calm and a space to think' (Eno, 1978). That music creates a mood is also true of other types of music, but is a stated intention of ambient music. With ambient music the listener may not be fully aware of the music, 'an ambience is defined as an atmosphere, or surrounding influence: a tint' (ibid.). Toop quotes Eno writing in a paper called 'Street Life in November 1975: 'we might use it [music] to modify our moods in almost subliminal ways' (Toop, 2001, p. 9).

- Persistence, and continuance: the ambient music continues in the background adding a 'tint' to the location. Although listeners could stop the music, there is an idea of the music continuing in the background and listeners being able to dip in and out of it as it 'accommodates many levels of listening attention' (Eno, 1978). For Eno one of the driving forces behind creating ambient music was to create something that did not conform to the assumption that people had short attention spans; he wanted to create something longer and continuous (Eno, 2004, p. 94). Carlos had taken a similar approach in 1972 with her double LP Sonic Seasonings (Carlos, 1972) which featured a track a side of mood pieces intended to 'invoke the essence of the four seasons' (Holmes, 2008, p. 398).

- Context: although all music self-evidently is played in some location and the location may have some influence on the listeners experience, the relationship between ambient music and the location it is played in is particularly significant since the stated intention of ambient music is to be 'environmental' and to create an 'atmosphere' (Eno, 1978) in an environment.

The first two properties, Engagement and Affect, are concerned with the experience of the listener, the second two, Persistence and Context, are concerned with easily measurable physical properties of the music. Each of these features are also applicable to other types of music. However, with ambient music the dials on each of these properties are turned to a relatively extreme position:

Engagement: the music is both intensely interesting and attention grabbing while simultaneously being ignorable and in the background; the listener is able to shift their attention along this spectrum. A great deal of music is primarily designed to be both very engaging and in the foreground (see the comments on Beethoven below in 'Location'). Lift music and muzak is designed to be unengaging and in the background. Ambient music is intended to be simultaneously both engaging and unengaging: 'There is no longer a sharp distinction between foreground and background' (Eno, 1982). The listener can choose how much of their attention they invest in the music and the music is written to support a range of attention investment.

Affect: the primary function of the music is to create a mood, to evoke a sense of place, to create 'an atmosphere, or surrounding influence: a tint' (Eno, 1978). 'Affect' is deliberately used here, rather than 'emotion', to suggest a more embodied perception: affect 'is a full-body, multisensory experience, temporally and corporeally delocalised, incorporating emotions but not reducible to them' (Shinkle, 2005). Massumi argues emotion is a 'sociolinguistic fixing of the quality of an experience' whereas affect has an 'irreducibly bodily and autonomic nature' (2002, p. 28). The idea of 'affect' being more visceral than 'emotion' seems to be a good fit for the experience of listening to music (or of playing games).

Persistence: an argument could be made that all music is persistent. A piece of music starts playing and continues to the end (assuming it is not paused), while playing the music might be considered as persistent. However, the persistence that ambient music evokes is implied by the

description Brian Eno gives of listening on headphones to the background sounds while sitting on the patio while in Ghana: 'I wanted to be situated inside a large field of loosely-knit sound, rather than placed before a tightly organised monolith' (Eno, 1982). The sounds of Ghana wildlife persist beyond Brian Eno's listening experience. While listening to the sounds on the headphones he started to perceive them as music. The idea that there are a collection of sounds that the listener may tune into is at the heart of ambience as described in the previous discussion of engagement. Ambient music is persistent in a slightly different way to other music. The listener may dip into the ambient music, while it plays in the background; other music is often written to fully engage the listener's attention throughout.

Context: ambient music is 'environmental music' (Eno, 1978) designed to affect the space that it is played in. Ambient music, according to Eno, is inextricably linked to the space it is played in: 'it has to have something to do with where you are' (Eno, 2004, p. 96). 'It [ambient music] blended with the sounds of the environment, and seemed to invite one to listen musically to the environment itself' (Tamm, 1995). Music exists in a 'listening space' that is a composite of spatial characteristics as well as the emotions elicited, and ambient music exists in a very different listening space from, say, Beethoven (Demers, 2010, p. 116). A recording of Beethoven is mixed to give the impression that the listener is at a concert, whereas ambient music, such as Eno's Ambient 1: Music for Airports is mixed so that it 'lacks foreground and thus easily melts into its surroundings' (Demers, 2010, p. 117). For example, KLF's ambient Chill Out album 'seems to position itself in the background of any space in which it is played' (ibid.). However, as well as blending into the background ambient music also 'creates the impression of an acoustic cocoon that surrounds the listener' including moments that seem incredibly close (Demers, 2010, p. 119). Music for Airports has been described as 'not music *from* the environment but music *for* the environment' (Holmes, 2008, p. 400).

Many of the properties described are present to a lesser or greater degree in all music; however in ambient music these properties are present in particular ways that enable it to be differentiated from other music. Ambient music facilitates a wide range of listener engagement while playing persistently in an environment with the intention of creating a specific mood or atmosphere for affecting that environment.

Ambient music has been used in virtual worlds. The Second Life wiki lists a number of ambient music stations that users can listen to (Linden Research Inc, 2012) while within the Second Life virtual world. Ambient music has also been explicitly designed for virtual worlds, for example the AudioSquare (also known as the MediaSquare, see figure 1) in which the user can move around a virtual environment amongst 3D objects emitting spatial sound (Frank, Lidy, Peiszer, Genswaider, & Rauber, 2008; Lidy, 2009).

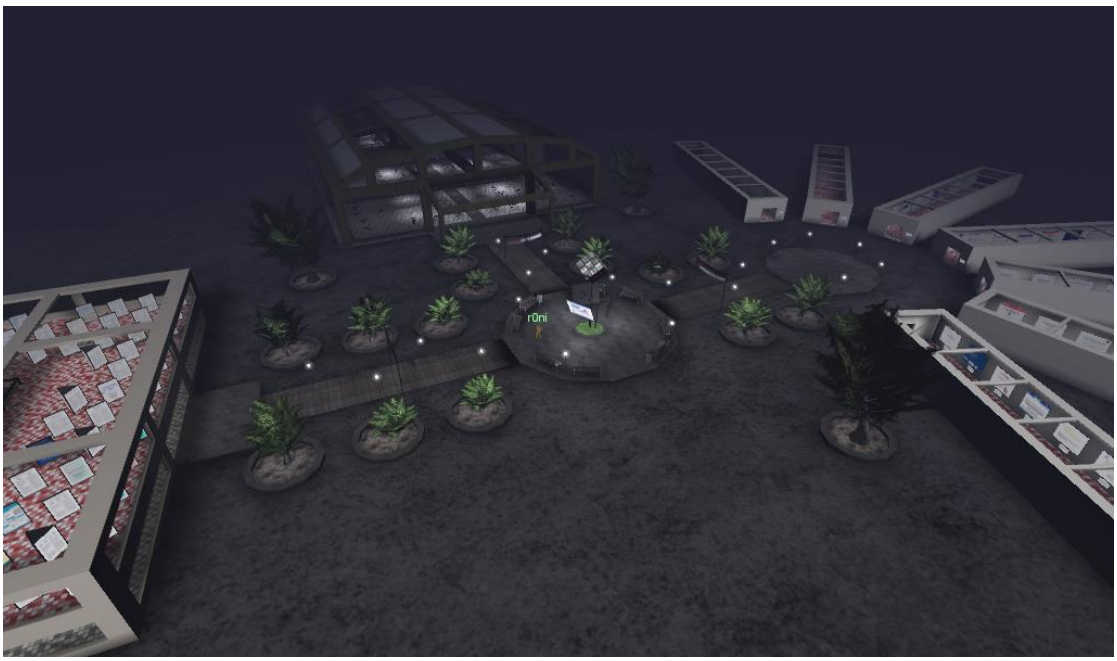

Figure 1: AudioSquare/MediaSquare 3D multimedia environment

Background music has been used extensively in games and has been explicitly labelled as 'ambient music'; for example talking about their game Osmos the developer, Hemisphere Games, says: 'Progress from serenely ambient levels into varied and challenging worlds' and suggests players wear headphones to get the full experience (Hemisphere Games, 2012). One of the defining features of Myst (Cyan Worlds Inc., 1994) was its 'minimal ambient music' (Collins, 2008, p. 66). The composer, Robyn Miller said: 'the main focus became making the music as atmospheric or "environmental" as possible' (ibid.). In Myst the ambient music was used to create moods in specific environments, for example the Myst sound track includes Fortress Ambience Parts I and II (R. Miller, 1998) which sets the atmosphere in The Mechanical Age in the game. In many games, changes in ambient sounds and music are used to signal a move to a different environment.

Music and sound in games as well as conveying a mood or can also have specific gameplay functionality, interacting with the gameplay (Collins, 2008, p. 90). For example in Doom (id Software Inc., 1993) ambient sounds were used to indicate that demons were close to the player (Collins, 2008, p. 65). In Skyrim (Bethesda Game Studios, 2011) the music changes to signal an attack by an enemy, but if you run away from the enemy the music changes from 'attack' back to 'peaceful travelling' once you have safely escaped the enemy.

The link between music and gameplay, where the music specifically alerts the player to game events and supports the functioning of the gameplay, is an important step towards considering ambient gameplay. Sometimes the link between gameplay and game music is blurred: 'game music may also appear as joint mood providers and usability features when a change in the melody signals an event in the game environment … although masked as mood enhancing features, the sounds are still important usability signals and it is crucial the player apprehends them' (Jorgensen, 2008, p. 176).

So, ambient music, playing in the background, may have a gameplay function, signalling changes in gameplay events. In this way music and gameplay are inextricably linked; though playing a game without listening to sound is possible, game audio and music have the 'power to instantly pull the player in the game world' (McCuskey, 2003, p. xxvii). Sound and music in enhance the game experience by 'informing the player about the state of the game world and by cuing emotions that enhance the immersiveness of the game' (Egenfeldt-Nielsen, 2008, p. 127).

Identifying gameplay properties that are similar to the properties of ambient music offers a novel way of investigating gameplay. Since gameplay, music and sound are linked so closely together, that there may be some correspondence between their underlying properties seems possible. For example, these links are clear when a non-ambient sound like a monster roaring in a game plays. The player's attention is drawn to the monster. The sound is likely to be played at a higher volume than any background music or sound effects in order to stand out. The roar demands the player's attention and has an important gameplay role in addition to adding to the mood of the game. The roar is part of the monster's behaviour and is likely to be signalling an imminent attack.

Investigating the four properties previously identified as central to ambient music

to discover if they might be used to create gameplay enables the development of ideas about ambient gameplay. These four properties of ambient music are used as key elements of the experimental games developed for this research.

In the next section aesthetic ambience is discussed. Aesthetic ambience is not central to this research, but needs describing in order to be clear about what is being excluded.

After the aesthetic ambience section the central thread of this research resumes when a type of game (pervasive games) that seems to offer the potential for ambient gameplay is analysed. That pervasive games seem likely to contain ambience makes them a good starting point for thinking about games that are purposefully built to contain ambience.

2.2 Aesthetic ambience

Before moving on from defining ambience, making a statement about aesthetic ambience is important.

Ambience that is not connected to any mechanisms is found in games, but this type of aesthetic ambience (clouds drifting, birds flying, waves breaking on the shore and so on) is largely beyond the scope of the ambient gameplay that is investigated in this research.

Aesthetic ambience can sometimes be part of the story telling in the game, or can throw attention onto gameplay mechanisms. For example, in many levels of the game Thief (Looking Glass Studios, 1998) there is a moon in the sky. The moon has no direct gameplay purpose, but does explain why there are light and shadows in the streets. The shadows do have a gameplay purpose: the player character can hide in them. So, the moon has no direct gameplay purpose but does support the fiction that there are shadows to hide in. The moon in Thief is an example

of aesthetic ambience which, although not directly connected to gameplay, does support the gameplay.

An example of aesthetic ambience that does not support gameplay but is just to create a more convincing game world are waves in Civilization IV (Firaxis Games, 2005) (both on the sea, in lakes and breaking on the shore). The waves have no gameplay function and are not necessary to support the idea that there are bodies of water in the game. They are there purely for aesthetic purposes.

The game ambience that this research is focussed on is connected to gameplay.

Having excluded aesthetic ambience from this research the next section resumes the discussion of how ambience might be exhibited in games by discussing and defining pervasive games.

2.3 Pervasive games

Pervasive games offer a useful starting point for the development of games with ambience since they have properties similar to those described previously as being central to ambience. Pervasive games exist when gameplay and real life become mixed, Huizinga's 'magic circle' (1955) becomes a 'blurry, porous structure, it is often hard or impossible to clearly differentiate the ordinary and the ludic' (Montola, 2005; Montola et al., 2009, p. 22). Montola describes them as 'a game that has one of more salient features that expand the contractual magic circle of play socially, spatially or temporally' (Montola, 2005). For example, the game Momentum, run in autumn 2006, had players take on the roles of different dead revolutionaries for 36 days, mainly around Stockholm. They played these characters alongside their real life selves. Game events occurred throughout that time and included interactions with other players and non-player characters communicating by phone, email, MSN messenger and so on (Jonsson, 2006; Montola et al., 2009, p. 111). The social element of this Momentum consisted of interactions between players, non-players, organisers and so on. The spatial expansion placed Momentum in many real world locations around Stockholm. Some pervasive games extend into virtual locations, such as many alternate reality games in which websites play a large role, taking the player beyond just different locations within a single game world and to, for example, different locations on the Internet. For example, in The Beast (Cox, 2001-2007; Montola et al., 2009, p. 25) interconnected websites led the player into the world of the film AI Artificial Intelligence (Spielberg, 2001). The temporal expansion can be tied in with the social expansion, with the game merging into real life, outside a traditional game playing session; as in Momentum when real life and the game blurred together over an extended playing session. This definition of pervasive games is both precise, but also vague. The definition precisely sums up what pervasive games are, but also allows for a huge variations between them: they expand the magic circle socially or spatially or temporally. This definition clearly overlaps with the definition of ambient music so a decision was taken to investigate pervasive games. Another genre of games could have been chosen at this early stage of the research, casual games, for example,

but the research had to start somewhere so pervasive games were purposely chosen as possibly closely relating to ambient music.

Another definition of pervasive games lists their characteristics:

- Anywhere
- Anytime
- Player's location is relevant to and/or affects gameplay
- Game has no set states, always in a state of flux
- Game is always on, 24 hours a day (persistent world)
- Leverages available technology to simulate pervasive state
- Incorporates digital media and traditional media
- Emphasizes community (competitive and collaborative) gameplay
- Game contacts player
- Real world is game arena: Gameworld is constructed on the real world
- Emphasizes journey rather than end outcomes
- Game world, real world influence each other

This list should be treated as a 'work in progress' and does not necessarily include every feature. This gives an interesting set of characteristics, though these do not all apply to every pervasive game (Thomas, 2006). Pervasive games also have a number of sub genres, such as treasure hunts, assassination games, pervasive larps, alternate reality games (ARGs) (Montola et al., 2009, pp. 31-37).

The properties of ambience previously listed (engagement, affect, persistence and context) can be mapped onto pervasive characteristics, especially the ideas of persistence and context (includes location). The properties of engagement and affect also sit comfortably within the broad definitions of pervasive games. Players could be more or less involved in a pervasive game; pervasive games can create an emotional response within a particular location. The mappings are made explicit below:

- Engagement
    - Emphasizes community (competitive and collaborative) gameplay
    - Game contacts player
    - Game has no set states, always in a state of flux
- Affect
    - Emphasizes journey rather than end outcomes
- Persistence
    - Anytime
    - Game is always on, 24 hours a day (persistent world)
- Context
    - Anywhere
    - Player's location is relevant to and/or affects gameplay
    - Leverages available technology to simulate pervasive state

- Real world is game arena: Gameworld is constructed on the real world
- Game world, real world influence each other
- Incorporates digital media and traditional media

Some of these mappings are more definite than others and some, such as 'Emphasizes journey rather than end outcomes' are rather tentative and might equally have been placed under engagement (the player engaging on a journey) or persistence (an on-going journey). However, the idea of a journey here seems to be more connected to ideas of an emotional journey rather than a literal journey. As with perhaps any game, the player seems likely to have some kind of affective response when playing a pervasive game. Irrespective of the lack of many affect characteristics there is still a good mapping with the other three ambient features.

That pervasive games may occur persistently in the context of the real world suggests that a range of levels of engagement might be possible. In at least some pervasive games players are able to ignore the game for part of the time. However, having a range of levels of engagement is not a defining property of pervasive games.

A range of levels of engagement is an important difference between the definition of ambience and the definition of pervasive games. Although pervasive games may have the possibility of playing them with a varying level of engagement, this is not a defining property of pervasive games.

At the 2011 Ambient Gaming Workshop, AmGam' 11, definitions of ambient games, as distinct from ambient gameplay, were discussed (Sturm, Johansen, Graaf, & Schouten, 2011). The features of ambient games identified at the workshop were very close to those of pervasive games, with a blending of virtual and real world activities that were temporally and locatively expanded (Sturm & Schouten, 2012). The idea that play might continue even when players are not actively playing was also included, taken from the paper 'Ambient games, revealing a route to a world where work is play?' (M. Eyles, Eglin, R., 2008). Since the workshop was part of an ambient intelligence conference (AmI 11: International Joint Conference on Ambient Intelligence, 16th-18th November 2011, Amsterdam) there was an emphasis on the technologies that might be used to implement ambient games; 'ambient technologies lead to natural and unrestricted interaction' (Sturm & Schouten, 2012). The research described in this thesis is at a more fundamental level, developing a definition of ambient gameplay that could inform the design of games that contain ambience and games that might be labelled as 'ambient games'. However, the dividing line between games that contain ambient gameplay and games that might be labelled as 'ambient games' may be rather blurred.

2.4 Functional and experiential properties of games

2.4.1 Introduction

Having made a definition of ambience and pervasive games the next step is to define some properties of games.

There are both functional and experiential properties of games that need to be understood in order to determine how ambience might be present in games. Although when initially looking at these game properties it was not known which ones would be most important in understanding ambient gameplay, but by considering the definitions of ambience and pervasive games it was possible to derive a list of the properties that might be most fruitful to look at. Knowing that ambience is concerned with engagement and affect it was clear that the player experience would be one key element that needed investigating. Knowing that ambience was concerned with persistence and context it was clear that something would need to be known about the properties of games; particularly, but not exclusively, pervasive games. Specifically, describing properties that might be useful in investigating ambient gameplay. The properties described here are applicable to many computer games, and some of them are found to some degree in every computer game.

The properties described in this section fall broadly into two groups: properties of a game's underlying structure and functions, relating to ambient features of persistence and context, and those that are about player experience, corresponding to ambient features of engagement and affect.

Some of the properties in this section are picked up later and prove to be of importance; some were less important in the later discussions. However, they are all included here to set a base line of common understanding of the terms, ready for the later discussions. This baseline was needed since some of these terms are used with different meanings in the literature; for example, see the section on 'complexity' below where very different approaches are described (broadly, either a systemic definition or a player experience definition).

In the first section below on functional properties of games, the following ideas are explored:

- Emergence
- Artificial intelligence (AI)
- Representation and abstraction
- Complexity
- Persistence

These are all fundamental properties of many computer games (including pervasive games).

In the following section on player experience the following ideas are described:

- Immersion
- Presence
- Engagement
- Attention
- Flow
- Agency

These were chosen as likely to be important in investigating ambient gameplay. Immersion, presence, engagement, attention and flow were all thought to possibly be related to the range of

engagement experienced when listening to ambient music. Agency related to the moods created by ambient music.

2.4.2 Functional properties

In a game which exhibits emergence a small number of rules result in large numbers of game variations (Juul, 2002); complex possibilities are the result of a simple set of rules (Salen & Zimmerman, 2006). Emergence is not simply concerned with interactions within a game itself, but can also work on an experiential level giving rise to 'complex social or psychological relationships among players' (ibid.) further, the rules give rise to 'variety, novelty and surprise' (ibid.). The patterns and results that emerge from the rules are not predictable from knowing the rules. For example, in the real world this sort of emergent behaviour is seem in flocks of birds, schools of fish and herds of land animals, and this can be simulated on a computer through the implementation of a small set of rules (Reynolds, 1987).

Games containing emergence can deliver unpredictable play. The precise moment to moment actions within the games are not pre-scripted, rather the player interacts according to the game's rules creating new gameplay events. For example, the experience of a player of a strategy game normally varies every time they play as they try out different strategies and game units act out different strategies according to their rules of behaviour. Conversely, when playing a point and click adventure every player has an identical experience as they step through the puzzles in the game. Juul describes these as emergent games and progression games (Juul, 2005, p. 71). He further describes many games as lying on a progression/emergence scale and also games as often comprising a mixture of progression and emergence (ibid.).

Rich gameplay that emerges from a simple set of rules may result in improved engagement and have an emotional effect on the mood of players. Some degree of persistence may be required for emergence to appear over time as simple rules are repeatedly enacted. The context of a game may be critical in determining the appearance of some emergent properties. For example, the particular players and the location may enable the emergence of particular behaviours and gameplay.

Emergence seems to align very closely with ideas of ambient gameplay. If a player has chosen to have minimal engagement in a game then the game occurs around them. Gameplay emerges from the player's actions, but the player is not consciously working their way through a series of steps as they might be if the game was a progression game. For example, in order to work through a pervasive progression game, some sort of adventure game set partly in the real world and partly in a virtual world, the player would be required to focus their attention on the game in order to progress (to solve clues). This does not support the idea that the player could withdraw their attention from the game while still progressing.

Emergent behaviour is supported by the artificial intelligence in a game that determines the behaviour of game characters, units, movers and so on. The artificial intelligence enables the game system to be much less predictable, often with many units interacting together. Frequently the artificial intelligence in games consists of a number of simple finite state machines (Adams,

2010, p. 448). For example, breaking up the artificial intelligence in a real time strategy game into a strategic finite state machine that commands units which each have their own finite state machine (Brownlow, 2004, p. 257). These many individual finite state machines control the automated mechanisms in the game and may be responding to player input either directly; the player does something that affects that mechanism, without any other intermediary than the player's representation in the game. Or the mechanism may be responding indirectly, as the result of other automated actions or as a result of a chain of events initially triggered by the player. The mechanism may alternatively be running a set of commands that are not driven by interactions with other units in the game, but following instructions that are independent of player inputs.

Whether gameplay events are being triggered directly or indirectly by player input, or are being triggered automatically and would occur without any player input provides an important distinction. Events that are a result of player actions might be triggered by greater or lesser player input. Additionally players may be more or less aware of the input they are making. The input could even be the result of player actions that are being carried out independent of the game, say, in the real world and away from a game's virtual world. Other game events might be occurring independent of player input and are just automated game systems. They are not a result of player input and would occur anyway. So there is a spectrum of player interactions, with another independent set of actions that lie outside this spectrum. In this context the interactions are synonymous with the amount of 'play' the player is doing; either actively engaging with the game and making events happen or ignoring the game and allowing events to happen without them.

These ideas of events occurring away from the player either as a result of player actions or independent of player actions support the ambient features previously described andin particular support ideas of a spectrum of engagement, with the game sometimes playing without player attention and persistence, with the game carrying on in the background.

Just as AI in games only approximately simulates real world characters and situations (Adams, 2010, p. 18), so the game worlds and characters the player is interacting with are only approximate representations of those things and they can be very abstract. Crawford argues that representation is a defining quality of games. They are not objectively real, but are subjective representations of subsets of reality (Crawford, 1982). So, in a Space Invaders (Taito Corporation, 1978) game the alien attackers are abstract representations of invaders. This degree of graphical abstraction in early computer games is partly driven by the technology available at the time (Wolf, 2003), aliens in many more recent games have become significantly less abstract (see figure 2).

Figure 2: Aliens in games 1978 (Rebellion Developments, 2010; Taito Corporation, 1978) and 2010 (Rebellion Developments, 2010)

Similarly in a strategy game the onscreen elements that represent, say, armies are also abstract representations of those armies. For example, in the Civilization (Microprose, 1991) game a single, small on screen graphic can represent an army. All computer games are representational, they are a 'fantasy representation, not a scientific model' (Crawford, 1982). All computer game graphics are representational, though some are less graphically abstract than others. For example comparing the representation of combat units in Civilization 2 (Microprose, 1996) to those in Total War: Shogun 2 (The Creative Assembly Ltd., 2011) can be seen to show different levels of abstraction (see figure 3).

Figure 3: Warriors in Civilization 2 (Microprose, 1996) and Total War: Shogun 2 (The Creative Assembly Ltd., 2011)

The abstraction here is not just graphical, but also informational. The individual warrior graphics each represent a group of warriors. The details of the combat strength and so on are accessible elsewhere in the game interfaces. By the use of abstract representation a lot of gameplay information can be hidden from the player during play, by, for example, representing large systems with single icons. This gives players a choice about how much information they access. Another example of this sort of abstraction is in role playing games, where the statistics of player characters (character attributes, skills and so on) are often hidden from the player, though they can be accessed if the player wishes. For example, in Diablo 3 the player is represented on screen by a character. If they wish to access more information on their

character, they may open an inventory screen. There is even more information available if they wish to access it: a ‘Details’ button on the inventory screen, under the basic attribute values, enables the player to access the detailed statistics of their character. Players do not need to access these statistics, but they can if they wish. Experienced players may find the detailed statistics useful for improving their play.

Figure 4: A player character in Diablo 3 (Blizzard Entertainment Inc., 2012)

Figure 5: Player character and inventory screen (ibid.)

Figure 6: Inventory and detailed statistics (ibid.)

Both the player-character in Diablo 3 and all the statistics constitute representations of a fantasy character. The image of the character contains only limited information, the inventory gives more information and the 'Details' give the most information on the character, in this example. Although the numbers give more information on the character they are more abstract than the image, which actually looks like a Demon Hunter! At least, in the context of the fantasy world created by the game looks like a Demon Hunter might be imagined.

Juul considers a player confronted with StarCraft and Age of Empires II. Although the games look graphically different, the core gameplay and screen layout is very similar. An experienced player understands the similarity, a novice just sees the graphical differences. As a player progresses from novice to experienced they become more aware of the abstract fundamentals of the game, they are able to decode the abstraction (Juul, 2007).

Figure 7: StarCraft (Blizzard Entertainment Inc., 1998)

Figure 8: Age of Empires II (Ensemble Studios, 1999)

Issues of abstraction in games closely relate to the ambient feature of player engagement, with levels of abstraction allowing information and gameplay to be removed from the player's attention. The ideas of abstraction may change the player experience of a game at a fundamental level, allowing a range of levels of engagement and also allowing for many levels of complexity in a game; both absolute levels of complexity and perceived levels of complexity.

There are different definitions of complexity; Anderson lists eight different approaches to defining complexity (Anderson, 1994). His fourth definition has complexity occurring at the 'edge of chaos', as artificial entities interact in Conway's Game of Life (Gardner, 1970), for example.

The edge of chaos where complexity is found exists between regular, periodic systems and systems that collapse into randomness and turbulence (Salen & Zimmerman, 2004, p. 155; Waldrop, 1992, p. 12). These systems may also be self-organising and adaptive; containing 'fairly independent parts which are highly interconnected and interactive' (Cowan, 1994, p. 2).

In addition to the systemic definition of complexity given above, complexity can also be defined in terms of perceptions of both the number of elements, or levels, and the interrelations between them (Avital & Cupchik, 1998). Visual complexity has been defined simply as 'the amount of detail or intricacy of line in a picture' (Snodgrass & Vanderwart, 1980). By applying this sort of approach to complexity determining player perceptions of complexity is possible. Within the studies completed for this research an absolute measure of complexity is not needed, nor is it necessary to define complexity in a systemic way, rather complexity is a property observed by players.

Robinson considers complexity to be something that can be ascribed an absolute value based on informational demands imposed by the task and uses 'difficulty' to describe the resources that a person needs to meet the demands of a task; these resources comprising affective variables like confidence, motivation, anxiety and ability variables like intelligence, aptitude and cognitive style (2001). Treating complexity as a property observed by players does not contradict Robinson, since even if the complexity is fixed, the judgement of the amount of complexity by players will vary depending on how difficult they find the game; this difficulty level being dependent on the player's affective and ability resources.

Considering complexity in terms of difficulty is useful as it throws light on the player experience of complexity. Difficulty may be broken down into 'absolute difficulty' (measuring difficulty within a game by comparing tasks), 'relative difficulty' (difficulty of a task at the point the player confronts it) and 'perceived difficulty' (how difficult a task appears when a player meets it) (Adams, 2010, p. 341). Absolute difficulty might correspond to an absolute systemic measure of complexity; perceived difficulty correspond to the player perception of complexity.

Complexity does not seem to directly relate to the ambient features of persistence and context already identified but does seem to be important in changing player engagement and affect (also features of ambience) when they are playing a game. Further, that the degree of player engagement may affect how complex they think a game is seems possible or vice versa, the degree of engagement may affect how complex a player thinks a game is.

The persistence in ambient music had the music continuing in the background, even when the listener was not engaged with it The same can be true of games, with persistence often cited as a defining quality of massively multiplayer online games: the game progresses even when the player is not interacting with it (Bartle, 2004, p. 1; Castronova, 2006, p. 818). Similarly many casual games on Facebook, such as FarmVille (Zynga, 2009), share these characteristics of persistence. Persistence is not a property that is exclusive to massively multiplayer online games, though these do offer a good example of persistence.

This definition of persistence in games is very close to the definition of persistence for ambient music and is therefore seems to be a defining property of ambient gameplay. Persistence is considered in the next section where it is given as an important quality of pervasive games and is further explored later in the studies carried out in this research.

2.4.3 Player experience

Before considering the ambient feature of engagement in relation to games first defining the related concepts of immersion and presence is useful.

Immersion occurs in a game when a player becomes caught up in the story and the world of the game, suspending disbelief and having a sense of being transported into the game (McMahan, 2003, p. 68; Murray, 1997, pp. 97-99). Although not a defining quality of ambience there does seem to be a sense of being transported while listening to ambient music. Murray says of music and immersion: 'many people listen to music in this way, as a pleasurable drowning' (Murray, 1997, p. 99).

Presence is often used synonymously with immersion (McMahan, 2003, p. 70) and is defined as "the subjective experience of being in one place or environment, even when one is physically situated in another" (Witmer & Singer, 1998). This is similar, but not identical, to immersion, being more concerned with actions and realistic responses/perceptions within an environment, in particular a virtual environment (Zahorik & Jenison, 1998). Whereas listeners can be immersed in music, presence does not seem to be such a useful concept when applied to music. Witmer & Singer state that immersion and involvement are sub parts of presence. Presence is a very useful idea when considering games and the extent to which players may feel that they are present and acting in the game world. Engagement is similar to presence, but more focused on interaction.

O'Brien & Toms define user engagement (with technology) as 'a quality of user experiences with technology that is characterized by challenge, aesthetic and sensory appeal, feedback, novelty, interactivity, perceived control and time, awareness, motivation, interest, and affect' (2008). They further review previous research and list the following attributes of engagement in computer games:

- Attention
- Challenge
- Feedback
- Interactivity
- Perceived user control
- Pleasure

(ibid.)

O'Brien & Toms' model of engagement explicitly includes variations in engagement. These variations are in the levels of intensity of the attributes they have identified as belonging to 'engagement with technology'. Although not specifically focused on engagement with games,

they are included in the technologies covered by this (ibid.). This possibility of variation ties in very neatly with the ideas of variation of engagement with ambient music and confirms that players can have different levels of engagement with games.

Dickey defines engagement in computer and videogames as relating to narrative, point of view, interactive choices, focused goals and challenging tasks (Dickey, 2005). Engagement is concerned with the gameplay skill of the player at progressing, or winning, in a game and can be at a nondiagetic level. Engagement is at its heart an emotional investment in play. (McMahan, 2003, p. 69)

Engagement is also linked to how much attention players focus on the game, as in listening to ambient music there is a range of engagement as players focus more or less on the game.

Attention is a process in which an individual, in response to an event, selects relevant information from their environment, retrieves appropriate references from memory, evaluates the event and decides what to do. The individual focuses on all this information, though there is a limit to this focus, this attention, which is the amount of information that the individual can simultaneously process (Csikszentmihalyi, 1992, 2002, p. 31). Attention may also be focussed on acquiring knowledge by the 'focusing of sensory, motor and /or mental resources on aspects of the environment' (Sheridan, 2006, p. 16). Attention may be allocated in different ways and may be hierarchical, with larger tasks containing many subtasks. How attention is allocated depends heavily on stored information (what we already know) (Sheridan, 2006, p. 17).

Flow as defined by Csíkszentmihályi is a state of consciousness achieved when a person is completely absorbed in a task with thoughts, feelings, wishes and action all working together. The flow state is intrinsically rewarding with the individual engaging in progressively more complex challenges as their skill level increases in order to achieve the flow state (Csíkszentmihályi & Nakamura, 2009, p. 92). In this way the experience is always linked to the individual and their skill level. Also the experience that enables any individual to achieve a flow state changes over time as their skill increases.

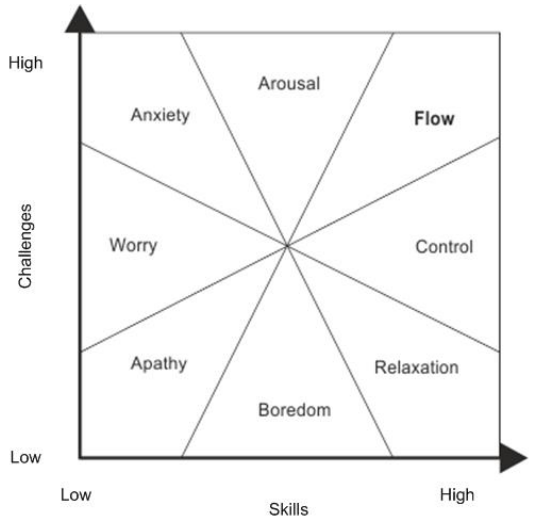

Figure 9: Model of the flow state

(Csíkszentmihályi & Nakamura, 2009, p. 95)

When in a flow state a person focuses their attention on the task at hand, they are completely absorbed in the task with all their attention focused on it. Both games, play (Csikszentmihalyi, 1992, 2002, p. 72), and computer games in particular are good at producing a flow state (Adams, 2010, p. 339; Salen & Zimmerman, 2004, p. 338). The degree to which a person focuses their attention varies with the amount of mental processing power they commit and the complexity of the information in their environment.

Ignorable (ambient) events may only require a small amount of attention. They might be viewed as ‘subtasks’ of a larger task of perceiving the surrounding environment. In a game there is an overall large task of playing the game, but within this there are many subtasks that must be accomplished in order to progress. This is similar to the nested loops of game sub-goals described by Cousens (2005) (ideas of nesting are discussed again in Chapters 6, ‘Study three’, and 7, ‘Findings’). So, some ambient events in a game may be considered to be subtasks or sub-goals that only demand a small amount of attention. The game is a multitask activity with some events requiring more of the available attention resources than others. See the Tulga-Sheridan paradigm of multitask attention allocation given below.

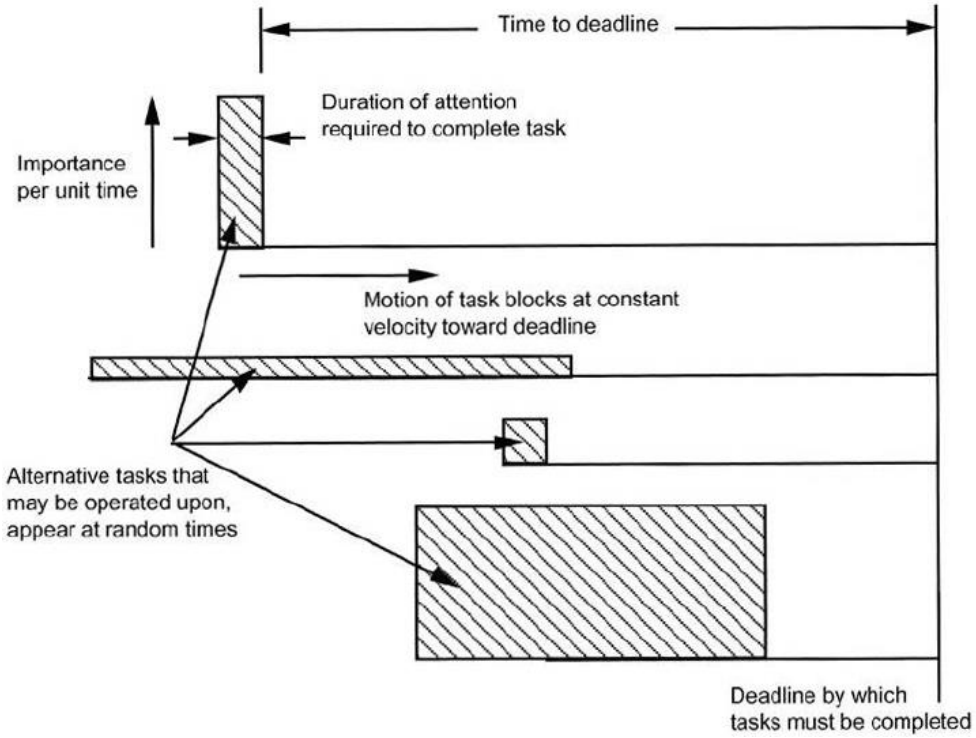

Figure 10: Tulga-Sheridan paradigm of multitask attention allocation

(Sheridan, 2006, p. 21)

Ambient events might be considered as having a range of importance as more or less attention is focussed on them. The overall level of attention paid to the game may be high and may be constant, but the amount of attention paid to ambient events is just one part of this overall attention. This would make it possible to be in a flow state with high overall attention and engagement with a game, but where ambient events occupy a variable part of the overall attention being spent on the game.

Where a game containing ambience is played in the real world (see previous section on pervasive games) the attention spent on the game may also be only a small part of the total attention being expended. The experience of not only focussing attention on a game but also interacting with the game at an optimal level might give rise to a sense of agency in a player.

A player has a sense of agency while playing a game when the game's formal constraints (things the plot of the game guides the player towards doing) are in balance with the material affordances (actions the player is able to take) (Mateas & Stern, 2006, p. 654). If a game has too much plot (formal constraints) or too many actions for the player (material constraints) then the sense of agency will weaken (ibid.).

Murray sees agency as one of three important properties of interactive drama (which includes games). The other properties are immersion, which she defines as being about how people construct their belief in the drama, and transformation, which she defines as being about how the medium can change to enhance both immersion and agency. She defines agency as being about users doing things to affect what is being represented (Bartle, 2004, p. 605; Murray, 1997, pp. 97-182).

The idea of agency is very similar to that of presence and closely relates to flow. The player engages in a game by interacting with the game world, though engagement is not necessarily tied to plot. Engagement is very close to agency, though engagement is something the player does and agency is something the player experiences.

Agency is also related to presence. The player may have a sense of presence in a game, but interaction is not required to feel this sense of presence. Presence might be viewed as just one component of agency, an awareness of the game world and actions that are occurring there. This awareness is of being present and also acting within the world. Agency goes beyond this to include an awareness of characters and plot in progressing through a game.

One of the primary design goals of the game Façade (Mateas & Stern, 2005b) was to create player agency. In the game agency was divided into 'local' (the player's immediate actions) and 'global' (changes to the overall experience, such as changes to plot and ending) (Mateas & Stern, 2005c).

For a game with ambience it may be that the player's sense of agency changes in strength as they become more or less engaged with the game, as they become more or less aware of their senses of immersion and presence. This might be viewed as their local agency fluctuating while their global agency (if this is present in the game) might remain strong.

2.4.4 Conclusion

In this section on the properties of games some fundamental aspects of both game function and player experience have been discussed and definitions that are relevant to ambience have been suggested.

2.5 Summary

In this chapter ambience in music was defined in terms of a set of four features: engagement, affect, persistence and context

After developing this definition of ambience a type of game (pervasive games) that seems to closely match the ambient features was described. This was a useful first step in considering how to design games that contain ambience.

After discussing the definition of pervasive games a number of key game properties that seemed likely to be used in understanding ambient gameplay were defined in order to establish an understanding of the meaning of these (sometimes slightly ambiguous) terms for this research.

Both the understanding of pervasive games and of game properties may inform the design of games with ambience for the research studies that are described later in Chapters 4 and 5.

By drawing on the definitions and descriptions in this chapter a more detailed definition of properties of games with ambience may be listed:

Engagement

The player has the option of engaging more or less with the game and is able to change the degree to which they are focussing on the game at any time.

Affect

The game creates a mood that affects the way the user perceives their environment.

Persistence

Gameplay is continuous, in the background.

Context

The game has a locative element, though is not necessarily set in a specific location.

This is not a final definition of ambient gameplay, but rather a tentative definition of ambient gameplay based on the definition of ambient music. This is a starting point for the research into ambient gameplay. The properties listed here seem likely to be found in games with ambience, but whether they are defining properties, or whether they are found in many types of games is still unknown at this point.

In the next chapter a methodological approach is described that will allow this definition to be used practically to explore ideas of ambient gameplay.

Chapter 3 Design research methodology

3.1 Introduction

Having, in the previous chapter, arrived at a tentative definition of properties that are likely to be found in games with ambience the next step is to see if these can be used in the creation of actual games. In order to be able to learn something from creating games based on these properties an overarching methodological approach is needed. This chapter describes this methodology, though the methods used in each of the studies are given at the start of the chapters in which they are described. The overarching methodological approach in the first two studies (Chapter's 4 and 5) is design research. A third study, a case study of an existing commercial game, was carried out to verify and enrich the findings from the first two studies (Chapter 6).

3.2 Games research

Computer games are often large complex systems bounded by commercial and technical constraints (Bates, 2001, p. 17). Players are an important focus of these game systems (Adams, 2010, p. 9). The investigation of individual components of games is possible, for example focussing on the game's mechanics, but this is limited, giving only partial information on a game. Fully understanding a game as a whole system requires some investigation of player experience (Aarseth, 2003). The investigation of player experience is possible using many different quantitative techniques such as measuring galvanic skin response, eye tracking, button logging and so on. However, qualitative investigations are particularly well suited to explorative studies (Patton, 2002, pp. 139, 239) where little is known about the topic and especially where gaining knowledge of player experience is important. In this investigation into ambience so little was known at the beginning that it was impossible to know what quantitative measurements might yield useful data. The qualitative approach enabled the simultaneous exploration of a broad range of different mechanisms and experiences.

The research could be targeted at particular areas of interest (in this research ambience) by the creation of research games optimised to investigate particular aspects of gameplay (Mateas & Stern, 2005a; Pinchbeck, 2010; Zimmerman, 2003a). At the start of this research an overarching methodology was sought that included the creation and modification of games. This was modelled on the standard games industry practice of having to constantly tweak and improve games from one generation to the next as a response to player feedback and changing technologies (Livingstone & Hope, 2011, p. 22; Zimmerman, 2003b, p. 177).

To summarise, a methodology that included the creation of games, playing games and eliciting player feedback, then modifying those games, or creating new ones, as a response to feedback in order to further investigate emerging themes was needed. Design research was identified as a practice-based methodology that fulfilled these criteria, as it can include the development of artefacts as part of the research process (Lunefeld, 2003, p. 11)

3.3 Design research

Laurel's *Design Research: Methods and Perspectives* (2003) gives a good overview of the different types of design research, with nine different approaches to design research listed, see below. This clearly demonstrates the way that design research has been used in different situations and to investigate things from different perspectives.

- Experimental design research
- Qualitative design research
- Quantitative design research
- Speculative design research
- Experiential design research
- Performative design research
- Discovery-led/poetic design research
- Formal/structural design research
- Procedural design research

(Laurel, 2003, p. 8)

Despite the many varieties of design research, they fall broadly into the following three categories (Frayling cited by Lunenfeld (2003)): research *into* design, research *through* design and research *for* design. Research into design incorporates historical and aesthetic studies. Research through design utilises design as a component of the research process and tends to be project based. Research for design is to 'create objects and systems that display the results of the research and prove its worth' (ibid.). The research into games proposed here concentrates on 'research *through* design', building experimental games to explore key aspects of games. This is an iterative process similar to the approach recommended by Zimmerman (Zimmerman, 2003a, 2003b) when he encourages researchers to build and modify games for research.

While evaluating designs (gameplay mechanism designs, for example), the researcher needs to employ methods to gather useful information. Eric Dishman (2003) suggests an 'Ask, Observe, Perform' framework for design research projects. 'Ask' is about getting information from people, whether at the start of the project when defining the research or at the end when testing a product. 'Observe' is about watching what people actually do. 'Perform' is concerned both with designers putting themselves into the roles of the users of their products and with getting those users to try out and critique 'plausible future scenarios using concept, prototype and product level "props" to simulate future technologies' (ibid). Research into computer games that uses simple experimental games to explore ideas fits neatly with this approach; using inexpensive technologies that display some of the mechanisms of more expensive, and even non-existent future technologies, and that also allow for rapid development and changes in direction.

Vaishnavi and Kuechler (2004) outline a design research methodology for developing software.

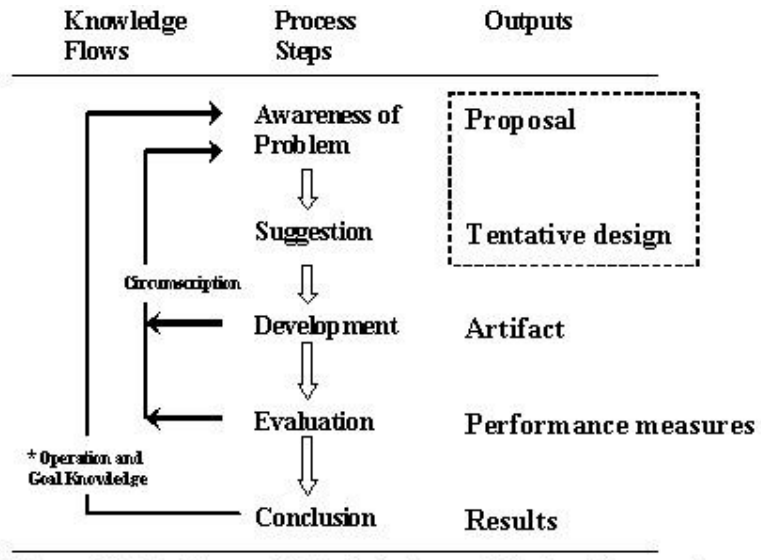

Figure 11: The general methodology of design research (ibid)

This methodology comprises five steps: Awareness of Problem (Space), Suggestion, Development, Evaluation and Conclusion with built in feedback loops, allowing the developed artefact to be evaluated and altered and then evaluated again until enough data has been gathered to draw useful conclusions about the research area. Applying this version of design research methodology for games research enables experimentation with prototypes to evaluate and reveal underlying properties that may lead to generalizable results that are applicable to a wide range of computer games. The application of this approach to exploratory research into games is shown in the figure on the next page.

The figure on the next page builds on previous game design research methodology that was created in the early stages of this research (M. Eyles & Eglin, 2008b, p. 280)

The design process builds by an iterative process that allows the properties (including emergent properties) of different gameplay mechanisms to surface and enables the researcher to take into account individual player's interpretation of the gameplay. This allows game designers the opportunity to observe a game and the properties of the game and utilise these to improve the design. Some properties may be exploited to improve play, others may hinder play and ways of removing, or ameliorating, these may be found. Similarly, this iterative process allows the researcher to pursue and focus on promising lines of inquiry as they emerge. This is particularly suited to the explorative investigation of ambient gameplay in which lines of enquiry may change during the research as new data is collected and analysed,

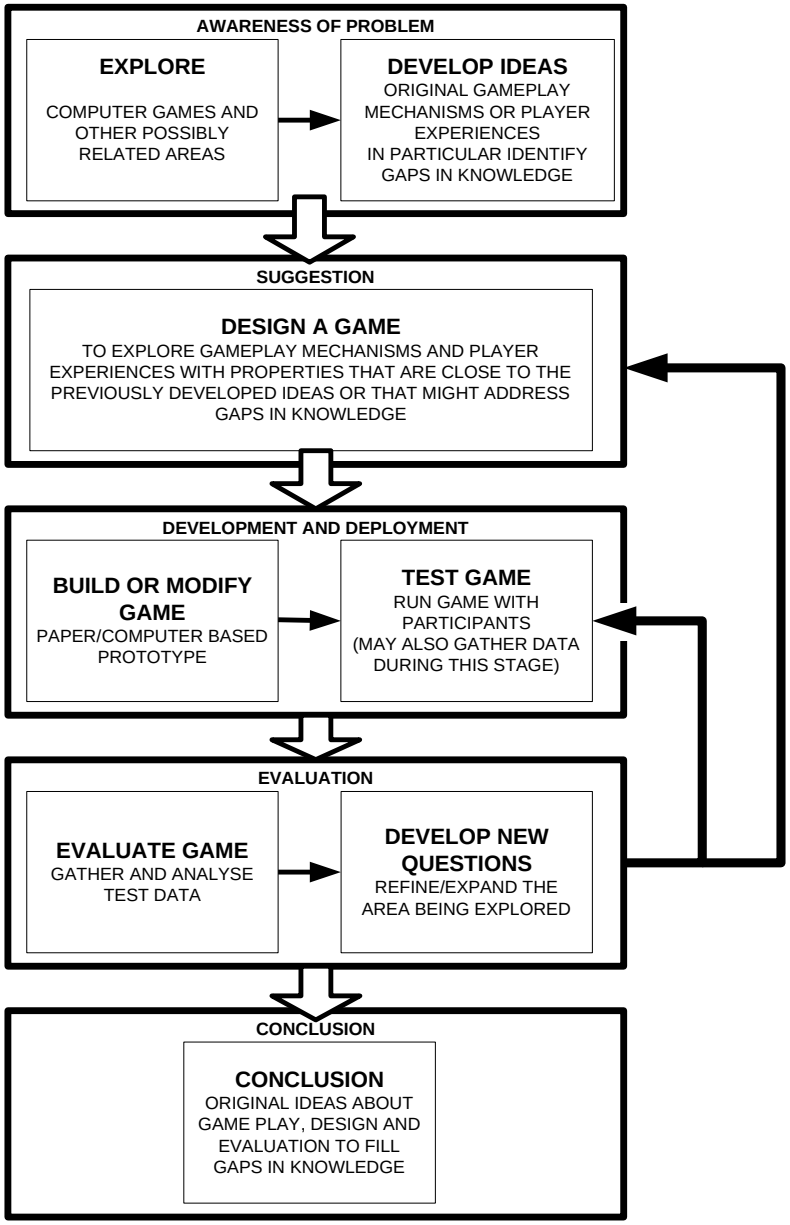

Figure 12: Game design research approach to explorative investigation (after Vaishnavi and Kuechler)

3.4 Case study for triangulating results

The third study in this research is an instrumental case study (Stake, 1994, p. 237) in which a game is qualitatively analysed to support the results of the first two studies; triangulating through the use of multiple data sources (Janesick, 1994, p. 214; Patton, 2002, p. 306). In addition to confirming conclusions from the first two studies, the third study also provides new themes that enrich and deepen understanding.

3.5 Rigour

Sampling was purposeful; enough data was collected to ensure saturation, with additional data collected in the second phase, or block, of the first two studies. (Morse, 1994, p. 230)

Throughout the research, records were kept and shared with the supervisory team. This enabled the confirmation of emerging themes and ensured that the methods were appropriate. Results and methods were further validated through presentations, papers and posters at a range of research events from international conferences, symposia and talks to the research community at the University of Portsmouth. All published papers and posters detailing the research were made available online throughout the research to facilitate peer review.

3.6 Conclusion

Having now described a methodology for carrying out primary research the next two chapters describe the first two studies that were carried out with a design research approach, and also include the methods used. The third study, a case study, is then described, along with the method used.

Chapter 4 Study one: Ambient Quest game

4.1 Introduction

The way in which some of the properties of ambience found in music might be found in games, in particular pervasive games, had been discussed. Next a game that not only contained the ambient properties found in pervasive games, but also had the ambient music property that explicitly allowed the player to have a range of levels of engagement, was created.

This research was still at a highly explorative stage and so what might be discovered was not clear until the game had been built and played.

4.2 Aims

The overall aim of this study is to discover properties of ambient play in a pervasive game that was designed to incorporate some of the properties of ambience identified when investigating ambient music. Although ambient properties could be incorporated into a game, until the game was actually played there is no way of telling what the consequences would be of using these properties when creating a game.

The game was designed and built within tight budgetary constraints, so a very inexpensive technology was adopted: basic, inexpensive pedometers. The computer program part of the game was kept simple so that it could run on almost any PC and also was comparatively quick to create. However, despite these constraints care was taken while designing and building the game to ensure that it would meet the requirements have the following properties:

Engagement

The player has the option of engaging more or less with the game and are able to change the degree to which they are focussing on the game at any time.

Affect

The game creates a mood that affects the way the user perceives their environment.

Persistence

Gameplay is continuous, in the background.

Context

The game has a locative element, though is not necessarily set in a specific location.

In particular this study was initially aimed at discovering more about engagement and mood and the effects of persistence and context. Later in the study, the areas of investigation were broadened out. Also, the aim of this study was not to generalise but to get rich, in depth data, on specific ambient gameplay properties, due to the explorative nature of this research (Patton, 2002, pp. 139, 239).

Additionally this study provided experience of using an iterative game design research methodological approach (M. Eyles & Eglin, 2008b), to confirm that this would be an appropriate methodology to use for the next study.

4.3 Participants

Convenience sampling was used for the first phase of this study (Bryman, 2008, p. 183), with the participants all attending a conference where Ambient Quest was the conference game. Eighty people played Ambient Quest at the Women in Games Conference, 19th to 21st April 2007 at The University of Wales, Newport.

Purposive sampling was used when choosing participants for the second phase of this study (Cresswell, 1998, p. 118; Miles & Huberman, 1994, p. 28). The research required that all participants experienced the research game, but convenience was also an important factor. The research was taking place alongside the principle researcher's challenging, full time job, so time was extremely limited and this pragmatic approach had to be taken in order to ensure successful collection of useful data. The explorative nature of the research game study meant that the exact outcome was not known. Consequently, there was no prescription for ideal participants. The participants in phase two comprised thirty six students in the School of Creative Technologies at the University of Portsmouth studying game development.

For the Ambient Quest studies a criterion approach (ibid.) was taken, talking to and observing people who had experienced the ambient research games, chosen randomly from all the people who had played the games.

4.4 Apparatus

The Ambient Quest game was designed to exhibit elements of ambience, to be as 'ignorable as it was interesting' (Eno, 1978) and to allow players to determine their own levels of commitment, from ignoring the game to fully engaging with it. The Ambient Quest game supported this with participant engagement lying on a spectrum of 'full' to 'superficially slight'. To play the game participants wore a pedometer to track the number of steps they took and then entered the steps into the game to determine the number of moves their player character could make in the virtual game world. The further players walked in the day the further their player character could travel in the game, either under their direct control of the player or automatically under the control of the computer. This allowed the gathering of game data (steps) in the background, with the option of becoming more or less engaged with this process. Similarly controlling the game character allowed more or less player engagement.

The computer game was a simple role-playing game in which a player character gathered experience, levelled up, collected items and battled enemies while exploring a world of varying terrains.

Figure 13: One of the pedometers used for Ambient Quest

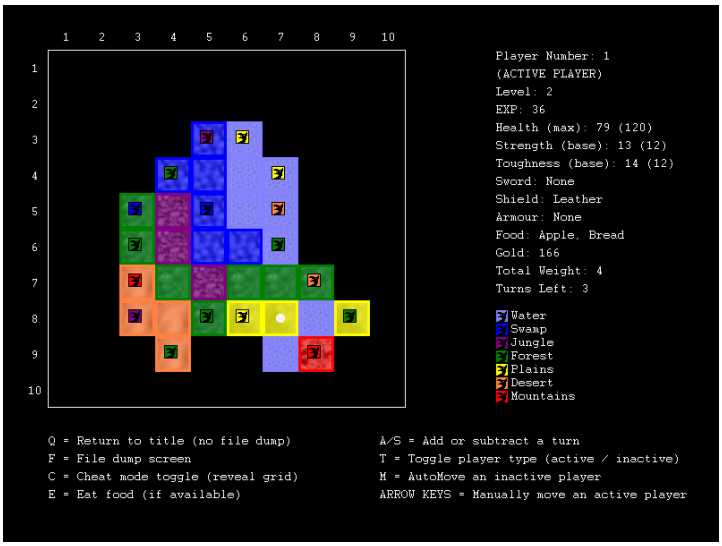

Figure 14: Ambient Quest version 1 screen, 2006 version (phase 1)

The first version of the Ambient Quest game was programmed late in 2006 and was used for phase one of this study at the Women in Games 2007 conference. This version of the game had two parts, a 'master' program and a 'client'. The players gave details of their steps (as measured using a pedometer) and moves to the researcher who then entered them on the 'master' program. The client program was for displaying the current state of play for the player; this was generated from a log file (a .txt file) that the researcher sent to the player.

Following this phase, some minor changes were made to the game program to make it both easier for users and to give users a richer experience. The interface for entering data was simplified so players could easily enter the steps they had taken themselves. The graphics were improved and players given a choice of styles and worlds to play in. The richer graphics and variety of worlds were to improve player experience of the game since they would be playing it over a much longer period than the three days of a conference. See figures 15 and 16 on the next page.

The role of gaming equipment was an important consideration when devising the research game; there were initial thoughts of wholly embedding the game in the environment, independent of any player carried equipment. However, financial constraints precluded this and also the game would have been constrained to a single location. Having the game free roaming and persistent offered some interesting possibilities for gameplay at this early stage in the research, with the player able to interpret the game rules and develop their own approaches to play. The pedometer gave players a link to the game, symbolizing their involvement in the game

and allowed locative, or spatially expanded, play at a very low cost, with the player's world taking on diegetic properties.

Figure 15: Ambient Quest version 2 screen, 2008 version (phase 2)

Figure 16: Different Ambient Quest styles

4.5 Methods

Techniques were drawn from different research traditions throughout the research, for example non-participant observation from ethnography (Bryman, 2008, p. 410), (Patton, 2002, p. 265); analysis by constant comparison from grounded theory (Glaser, 1978, 1992; Glaser & Strauss, 1967).

Ethnographic techniques, such as observation, are particularly suited to exploratory research, where the outcome is uncertain as a new area is being investigated; further the data may be 'unstructured', that is not conforming to a predefined set of categories and focussing on a small number of cases (Atkinson & Hammersley, 1994, p. 248). This Ambient Quest study and the following studies (Chapters 5 and 6) may be considered as case studies; they are both bounded and specific since they both focus on a single game (Stake, 1994, p. 236). Case studies benefit from gathering data from a wide array of sources in order to build an in-depth picture (Cresswell, 1998, p. 123). The first phase of this study involved observation and discussions with participants. In addition online news sites (The Guardian (Krotoski, 2007) and GameSpot (Boyes, 2007)) were monitored to gather public responses to ambient gameplay following reports on the first phase of this research. Though interesting, the data from the news sites did not have a direct bearing on this research and does not form part of the argument presented

here. The second phase involved observation, online questionnaires (though these were dropped from the study, see below) and interviews.

In this study the game players were observed and spoken to by the researcher while they were playing; so to this extent there was researcher participation, Gold's classification has this as 'observer-as-participant' (Bryman, 2008, p. 411). The importance of remaining independent of the participants in order to avoid influencing their experiences with any preconceived ideas meant that the researcher necessarily had to take a largely non-participatory role.

In both phases of this study, and the following study, data was gathered through nonparticipant observation (Atkinson & Hammersley, 1994, p. 248). Mental notes and jotted (scratch) notes were taken throughout the study as new behaviours and events were observed (Bryman, 2008, pp. 419-420). These were then written up to keep a full record of new data.

The use of interviews in the second phase of this study specifically enabled confirmation of conclusions drawn from the observed external behaviours of participants and this triangulation strengthened the conclusions and developed a deeper understanding (Patton, 2002, p. 306).

The questionnaire was designed to elicit information on the degree to which playing the game impinged on players' lives: how often did they think about the game, did it affect their mood and so on. However, a very low number of participants filled out the questionnaire so the questionnaires were dropped from the study as the results were inconclusive.

4.6 Results and discussion

4.6.1 Phase one

Players engaged well when playing the Ambient Quest game when it was first played at the Women in Games 2007 Conference. Some of the players changed their behaviour as a result of playing the game. Players' attention on the game varied greatly over time; they were seen to ignore it while in conference sessions and seen to focus more fully on it in breaks, when they would discuss it.

They rapidly started to invent their own rules and were observed finding ways to 'cheat', by, for example, shaking their pedometers. Players were also reporting how they had walked further in order to increase their pedometer readings; for example, walking to the conference instead of getting a taxi.

The pedometers used at the conference had a rubber reset button on the outside (see figure 13). Pressing this accidentally was easy to do, which 'lost' all the steps previously taken. After this had happened to a few of the players one of them discovered that it was possible to 'mod' the pedometer by pulling out the reset button. Many players carried out this modding procedure.

One of the participants also made an interesting observation about the way people were reduced to 'steps'. The 'steps' then transformed into 'squares' when using the scalar pedometer reading to determine the vector moves on a 2D game map; a numerical to graphical transformation.

That the game affected the mood of the conference was impossible to conclusively tell. However, there was some lively engagement with the game, indicating that it had made some impression on the players. Whether another conference game would have had a similar affect is unknown.

Entering step data into the version of Ambient Quest at the conference required players to report their steps to a conference helper, who would then manually convert them to moves (1,000 steps per move) and then enter them into the master game program on a computer in the game demonstration area of the conference. Once the steps were entered up on the master program, the players could then choose whether to type in their moves or let the computer automatically move their character for them.

At the conference, the client program was not used, with all play happening on the master program. The intention had been that the client program could be used in future studies by players who would email their moves and step numbers to the researcher who would use the master program to enter their moves and also track what they were doing.

One of the possible consequences of having to involve someone else in converting steps to moves and entering them in the computer game was that some players started to play a game of competing to see who had taken the most steps. Whether this was just a product of this version of Ambient Quest was unclear until the second phase of play.

However, the heart of the game, using pedometer steps to drive a character in a virtual environment, remained unchanged. Running Ambient Quest at the conference had showed that the game was capable of supporting different levels of engagement and also that it supported emergent behaviour (pedometer shaking and modding). Additionally the game was shown to be persistent and to have the effect of turning the conference space (including hotels, roads to the conference, surrounding areas) into a game space, as conference attendees played the game over the three days of the conference.

The suitability of the iterative game design research approach was also demonstrated with a new version of the Ambient Quest game being produced following feedback from the conference.

4.6.2 Phase two

The results of this preliminary phase informed changes to the Ambient Quest game ready for the next phase of this study. The main change was that the client was dropped and the interface on the master program improved so players could directly enter their steps into the game, which then automatically converted these into moves. As well as the graphical improvements previously detailed (see ‘Apparatus’) the game was updated to run in a window rather than full screen. This allowed the player to easily switch focus to other application windows or to the desktop simply by clicking away from the game window, which could be left running. The previous master program only ran in full screen mode.

The second phase of this study involved a more detailed investigation of the themes that emerged in the first phase of this study. A smaller number of participants was recruited for this study, but more in depth data was accumulated. The 35 participants were mainly avid gamers.

As previously detailed data was initially generated by nonparticipant observation. Interviews were carried out to gather rich, in depth data to confirm the themes that had emerged.

Observations and discussions with players indicated that players thought about the game at least a few times a week, and some players were thinking about the game once or twice a day. When talking about the Ambient Quest game player 3 reported both high and low levels of commitment and attention:

> *'got a little bit OCD on that, trying all the possible different routes'*
>
> *'Saved them up [steps] until I had lots, like 30,000 or something and then just put them all in' - to create moves in the game.'*

Then:

> *'Quite often when you're out it's not like you're thinking about the pedometer 'cause you can't feel it and it's not heavy or anything'*

Whereas player 2 also showed less commitment when they said:

> *'I forget more and more frequently and it would get to a point when I'd almost completely forgotten'*

This range of player engagement allows games to offer a wide variety of experiences and drives game playing. All games investigated, both original research games and commercial titles, had a property of engagement and this property varied to lesser or greater degrees. Indeed 'engagement' seems to be an axiomatic property of all games.

At any moment a player has a level of engagement, but engagement is not a fixed property or state, it is a varying process that players execute over time. Similarly perception, focus, emotion and commitment, which also all have a range of values, are also all processes.

The use of some equipment seemed useful in signifying involvement in the game. For example, the game was always present in the background, ready to grab player 3's attention:

> *'It was largely about the pedometer, but it wouldn't have meant anything without the game'*
>
> *'On the whole I think the physical object [pedometer] has some minor advantages, just 'cause it's something to remind you that you're playing some, playing the game'*

Similarly, player 2:

> *"you need something to make you realise that you are taking part"*

This seems to be showing the importance of the pedometer in this particular game. The pedometer seems to be representing more than just a device for counting steps, but also to be embodying the game.

This may also connect with another theme of player control over play. The Ambient Quest game did offer players the opportunity to stop playing:

> *'if you decide 'I do not want to play today' you can take it [the pedometer] off' (Player 3).*

There is still not enough data on this to draw firm conclusions about player control, but it is possible that the 'always on' nature of games with ambience may make some people feel uncomfortable.

Whenever the Ambient Quest game has been run there have always been discussions between players about cheating as is shown from this quote in researcher field notes from phase one of this study:

> *'people were also now telling me how they were managing to cheat (shaking their pedometers)'*

Similar 'cheating' was observed in phase two and recorded in field notes and was explicitly admitted in an interview:

> *'Players were observed shaking pedometers during lecture to increase their number of steps.' Field notes.*
>
> *'Just cheat and shake the pedometer.' Player 3.*

An implication of the idea of 'cheating' is that players were aware that they were deviating from the rules of the game. This shows an engagement with the game; if they had not engaged with, and accepted, the game rules they would not have considered shaking the pedometer as 'cheating', but just another way to increase the score.

One of the players in phase one commented on cheating:

> *'[Player name] suggested that the cheating was fine while the reset button was intact since the pedometer had cheated by resetting itself. After removing the reset button she didn't want to cheat anymore.'*

This seemed to be like re-writing the rules of the game and was an early hint that player invention might be an important theme in these studies.

The freedom inherent in pervasive games that move outside Huizinga's 'magic circle' (1955) may offer ways to circumvent game rules. Particularly in the Ambient Quest in both phases of the study players were both observed, and reported, finding ways to increase the number of steps reading on their pedometers. They did not report cheating by entering an incorrect (larger) number of steps into the game to give themselves more moves.

In phase two, as in phase one, there was an indication that players started to invent their own gameplay:

> *'just do random little things like I'd wonder how many little steps it was from here to the old place, it did get me thinking about steps and distances' (player 3)*

Complexity was an aspect of the two versions of Ambient Quest that appeared important in player engagement. They need to be complex enough to maintain interest, but no more complex than this. Too much perceived complexity was a barrier to player involvement, as demonstrated when a dice and paper version of Ambient Quest was handed out to students during induction week at the University of Portsmouth, School of Creative Technologies in October 2008. Unfortunately, this dice and paper game did not engage the students:

> *'it looked, like, quite complicated' (player 1)*

> *'don't know where to look [on the dice game sheet], but once you got over that it didn't look all that confusing really' (player 3)*

The dice and paper version of Ambient Quest incorporated written instructions and was packed onto two sides of A4 paper (see Appendix 18). As the quote above shows although the game was relatively simple it appeared complex.

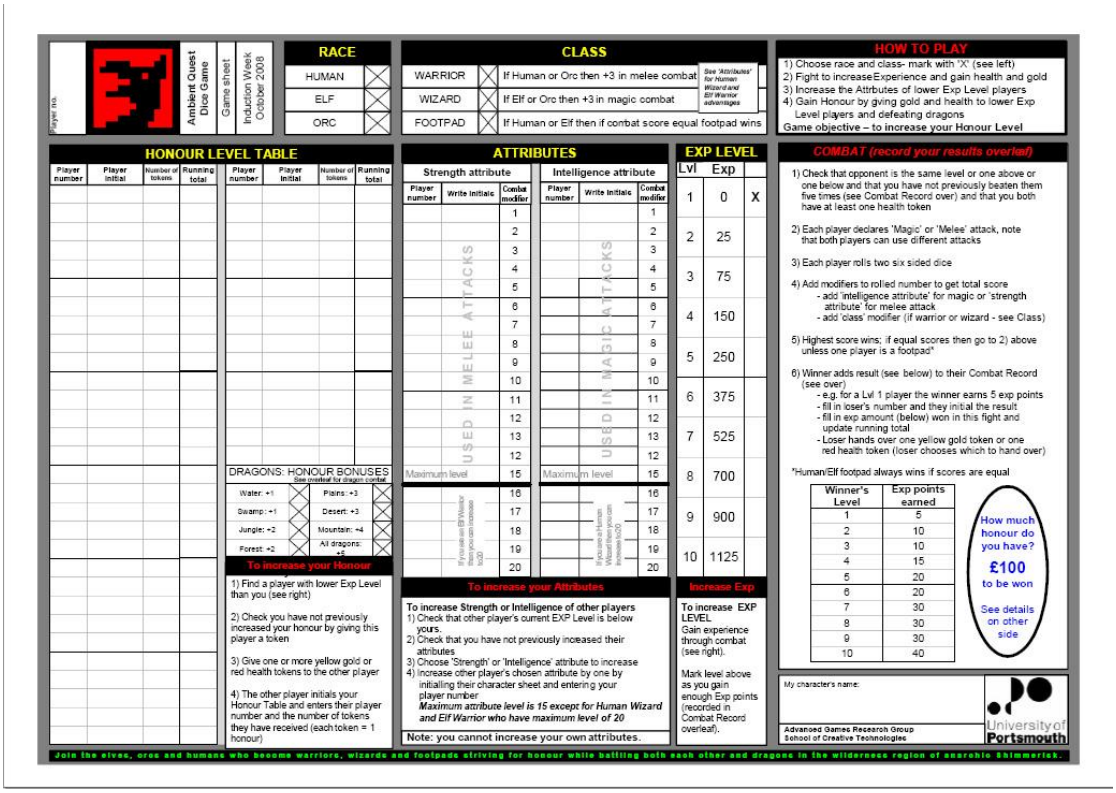

Figure 17: First page of Ambient Quest paper and dice game

However, the pedometer version of Ambient Quest elicited this comment about the complexity:

> *'it was enough to keep me interested for the project' (player 3)*

As analysis of the data continued the importance of ideas of the granularity of time, or observations over different time periods, emerged. When investigating gameplay in this study it became clear that the time periods being considered when investigating the game had significant effects on the perception and descriptions of the game. For example, the varying experience of a game second to second compared with the overall experience of a completed game could be very different. This way of looking at a game in the context of different game

time periods, or temporal granularity, correlates closely to nested objectives in games. Players have short term objectives that they must achieve second to second while playing (i.e. shoot baddies); medium term objectives that they achieve over an hour or so (i.e. complete a level) and long term objectives that they achieve over the whole of the game (i.e. complete the game). These nested objectives have been referred to as 'nested loops' Cousens (2005). Björk & Holopainen (2005) describe not only goals and subgoals but also different levels of closures, such as the closure of completing a level and closure for eating a pill in Pac-Man (Namco, 1980). These all capture similar ideas to temporal granularity.

Note that although ideas of temporal granularity are particularly easy to apply to real-time games, when considering turn-based games thinking about gameplay loops or goals and subgoals may be more useful. Whether considering a turn-based or real-time game the reported player experience of a game often varies depending on the time period under consideration. Additionally the design imperatives at different temporal granularities vary.

The game in phase one of this study lasted for three days. The phase two playing period lasted for eight weeks. Players were observed for limited amounts of time during these playing periods, particularly in phase two. Observation during phase two included informal discussions with individual or small groups of players (particularly at the ends of lectures).

4.6.3 Summary and conclusion

Thematic analysis of the Ambient Quest game revealed the following about ambient gameplay:

4.6.3.1 Engagement

Players engaged with the games to lesser or greater degrees. The amount they engaged with the games changed over time. This was an intrinsic part of the game; players necessarily were extremely unlikely to fully engage with the game constantly, especially when it ran over weeks. There was a range of engagement from fully engaged to not engaged as players focussed their attention on the game or moved their focus away from the game.

Clearly players can engage more or less with any game, the differences here are the extreme range of different levels of engagement and also that the game was specifically designed to have the capacity for that range of engagement.

4.6.3.2 Affect

Although there was some limited evidence that the games affected player moods and sensory experiences, this was inconclusive.

4.6.3.3 Persistence

The games were shown to successfully run persistently, the game continued even when players were not thinking of the games. Players approached them as persistent experiences as shown by comments such as:

> *'Saved them up [steps] until I had lots, like 30,000 or something and then just put them all in' - to create moves in the game.' (Player 3)*

The idea of persistence in games requires the game continues in the background, even when there is no player interaction (see the description of persistence in Chapter 2). Although the Ambient Quest virtual world did not need to be running while the player continued accumulating steps, there is a sense that the (virtual) game world is there in the background waiting for the steps to be entered and converted to moves. The Ambient Quest virtual world could have been actually always running on a computer, but there was no necessity for this.

Compare this to massively multiplayer games where the game actually is 'always on', the game world continuing to run on the computer, whereas with Ambient Quest the game can still be 'on' (i.e. the player is gathering steps/moves) even when the game world is not actually running on a computer.

Although persistence is an important quality of massively multiplayer games, it can have a subtly different definition when considering pervasive games where persistence is defined as the game being 'always on' (Thomas, 2006). The implication of this definition of persistence is the player may still be interacting (i.e. gathering steps) even though they have attenuated awareness of this interaction, in which case the game can be considered as still running, or still being 'on'.

4.6.3.4 Context

The time the games lasted seemed to affect play, with phase one players engaging well over the full period of the game. In phase two the number of players actively playing the game diminished over time.

The spatial, locative element of play was important, though the precise influence the play locations had is unclear.

4.6.3.5 Token of play

The use of a physical token (the pedometer in these games) seemed to add to the players' feeling of playing a game. They acted as a link to pull the player into the game world.

The experience of the players might be described as 'presence' since the token was not just a symbol that added to the player sense of immersion, but also acted within the game. The feeling that the token gave the players was part of their engagement with the game, and this theme could have been centred on engagement; however, 'presence' seems appropriate since it is primarily about the players' affective connection to the game rather than about their interaction with the game. Engagement seems to focus more heavily on interaction than presence does, even though interaction can be a component of presence.

4.6.3.6 Invention

Players found different ways to play (shaking pedometers) and invented their own games to play (competing to see who had the largest steps count). However, whether this would transfer to other games that were high in ambience or was just a property that was driven by having a pedometer was unclear:

'happy to see how much I was walking, and such, and how high I could get my scores each day' (Player 2)

The invention of the players resulted in emergent behaviour in the game. This emergent behaviour occurred both while collecting steps with a pedometer and within the game itself. The examples above clearly show that emergence in the use of the pedometer. The computer game component of Ambient Quest was a role playing game with multiple routes through it, rather than a step by step 'progression' game (Juul, 2005, p. 71) and consequently contained emergence.

'Invention' was chosen for this theme rather than 'emergence' since it was something the players were both seen to be doing and that they reported doing in the interviews.

4.6.3.7 Conclusion

The Ambient Quest game had shown that a playable game could be built based on the properties of ambience that had been identified by investigating definitions of ambient music. In addition to the properties that came directly from ambient music other properties emerged that were related to this game and might be more generally related to ambient gameplay. The properties connected to ambience found in Ambient Quest were:

- A range of engagement
- Affect
- Persistence of the game
- Context
    - Time
    - Location
- Token of play
- Invention

A new study, and new game, was planned to address unanswered questions raised during the first study. That the new game should be very different from Ambient Quest, while still retaining the core ambient properties (engagement, affect, persistence and context) was important. Further, the game was designed so that additional methods could be employed for gathering data: as well as observation the study would be videoed and photographed and there would be interviews with all the players, not just a sample.

Chapter 5 Study two: Pirate Moods game

5.1 Introduction

The initial study described in the previous chapter had established that a playable game containing properties of ambience, in particular a range of engagement, could be built. The results of the first study had extended the knowledge of ambient gameplay, confirming the possibility of explicitly incorporating ambient gameplay in a game. The study had also raised new questions that needed to be addressed in order to better understand ambient gameplay.

A new game containing properties of ambience was designed and built to address the questions. This was still very explorative, seeking to confirm or refute themes that had emerged, but also seeing if anything new and unexpected might be found.

If this research had been less explorative then it might have been that a game very similar to Ambient Quest would have been created in order to investigate one single aspect. However, in order to maximise the opportunity to extend knowledge the game created for this study was made very different to Ambient Quest. This research was attempting to map out a large area, rather than focussing on a single variable.

5.2 Aims

A very different game from Ambient Quest, still based on the definitions of ambient gameplay, was produced for the second study. This new game was for investigating findings that were inconclusive in the first study. Once again, the game was designed and built within tight budgetary constraints; while ensuring that it had the gameplay required for the study.

This second study focussed on a game in which the location (one facet of the game's context) was fixed, rather than free roaming, as in Ambient Quest. The game still had an element of persistence, but this was much less important in this game than in Ambient Quest. The game for this study was played in a comparatively short time, under thirty minutes rather than days or weeks as in the first study, so persistence was easy to maintain over a play session.

The game was still designed to have an emotional impact (by putting the pirates in jeopardy, though this was intended to be somewhat comedic as, for example, they tried not to drink too much rum), but this was not the main focus of the investigation. Separating out affect from other qualities of the game was very difficult. Affect was closely bound up with engagement and context. Although not the main focus of investigation affect was still explored in the context of the game.

That the Ambient Quest game was exclusively single player may have had an effect on the way players thought about it and also their overall experience of the game. In particular, in study one phase one a lot of competition and social interaction was observed between the players. The same level of social and competitive play did not happen in the study one phase two. In order

to discover more about social implications of ambient gameplay the next game was explicitly designed to incorporate both single and multiplayer game play.

This game was still exploratory; the differences to the game in the first study were marked and were to confirm or refute the themes discovered in the first study, exploring the following areas from the first study:

Engagement

- Allow for a range of levels of engagement
    - Ensure that players are able to both ignore the game and fully engage with it.

Affect

- Explore how social interactions affect game experience.
    - The game contained both multiplayer and single player gameplay.

Persistence

- Allow for the game to run persistently.
    - The game continues in the background, even at times when there is no player input.

Context

- In the first study the games ran for three days and then for eight weeks. Investigate whether the length of game was a significant factor in player experience of ambient gameplay.
    - Game play time was shortened to under an hour.
- Discover more about context, in particular whether fixing the game in a single location changes player engagement and experience.
    - The game was fixed in location.

Token of play

- Discover more about using a token as both an input device and linked to the player character.
    - The token in this game was explicitly representing the player character and also was used as the input device.

Invention

- Ensure that emergent play is possible.
    - Allow different routes to progress in the game within a small rule set.

Observing and gathering data on all events in the study one game Ambient Quest was not possible; gathering data throughout play was a specific aim of the new research game. By shortening the game to under an hour and placing it in a single location, the entire game could be observed and recorded (video and photographs). As well as designing these functional differences into the game, the game also used a different technology (radio frequency

identification) for interaction. The result of this was that the game had a very different interface. Because the game was shorter and in a single location capturing the gameplay was possible both photographically and on video, which added depth to the data.

5.3 Participants

The sampling for study two was largely theoretical (Cresswell, 1998, p. 118; Miles & Huberman, 1994, p. 28), choosing participants who were thought to be able to contribute to the evolving ideas and understanding of ambient gameplay.

In this research game study participants were chosen for a mix of reasons. That they were familiar with the game location was important, so that they were able to focus on the game (Pirate Moods) and were not influenced by the novelty of the location. The previous research games were not constrained to any particular location, so play might be expected to often occur in locations that the players were visiting as part of their normal lives; i.e. in the real world. To replicate this normality of location, and hence remove location novelty as a major factor in the player experience, was the main reason for locating the game in an environment that would be familiar to participants.

In the first study all participants played games, but for the second study a maximum variation (Cresswell, 1998) approach was taken, choosing participants with a wide range of game play experience, from non-players, to casual gamers to very experienced players. Participants were known to the researcher; who also confirmed the gaming experience of participants with his supervisory team. Participants' precise level of game playing experience was not important, just that there was some range of experience across the participants. That they did not all have the same previous game playing experience was important to ensure that multiple perspectives were displayed in the case studies (ibid.).

5.4 Apparatus

For the second study game, Pirate Moods, a decision was made to incorporate some kind of player tokens to represent players in the game. The use of pedometers had successfully attached players to the first two games, reminding them they were playing and also acting as a focus for their play as reported in the results of study one. The game was designed to be embedded in a single environment, rather than carried around with the player in their everyday life. The game was built using radio-frequency identification, or RFID, technology with players carrying RFID cards representing different pirates (see figure 18) around notice boards on which RFID aerials were mounted (see figures 19 and 20). The RFID cards were lighter than the pedometers and were carried in players hands, rather than being clipped onto clothes. Each RFID aerial, and therefore each notice board, represented a different resource or action:

Timber	Rum	Gold	Fire cannons
Canvas	Food	Cannon Balls	

Each notice board was labelled so players could see what resource or action it represented and an LED at the top of the notice board lit when resources were being gathered (the pirate card was near to the aerial).

The individual pirates shown onscreen (see figure 21) gathered different resources (rum, cannon balls, canvas and so on) while their cards were near specific aerials (and notice boards). The object of the game was to keep the pirates' resources in balance, keep their ships afloat, defeat enemy kraken (with cannon) and keep the pirates happy (see figure 22). Cannon were fired by placing cards next to the 'Cannons' RFID aerial. The state of the pirates, their ships, their resources and the kraken were displayed using simple graphics and reported in text.

Players could choose their level of involvement by either closely monitoring and controlling the resource gathering and kraken battling, or just letting it happen automatically as they moved around the notice boards.

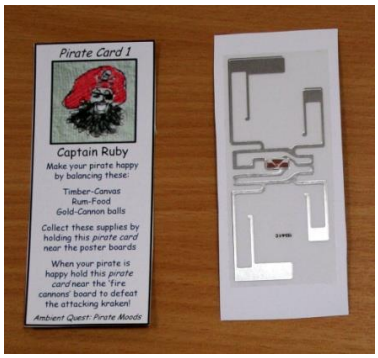

Figure 18: RFID pirate card

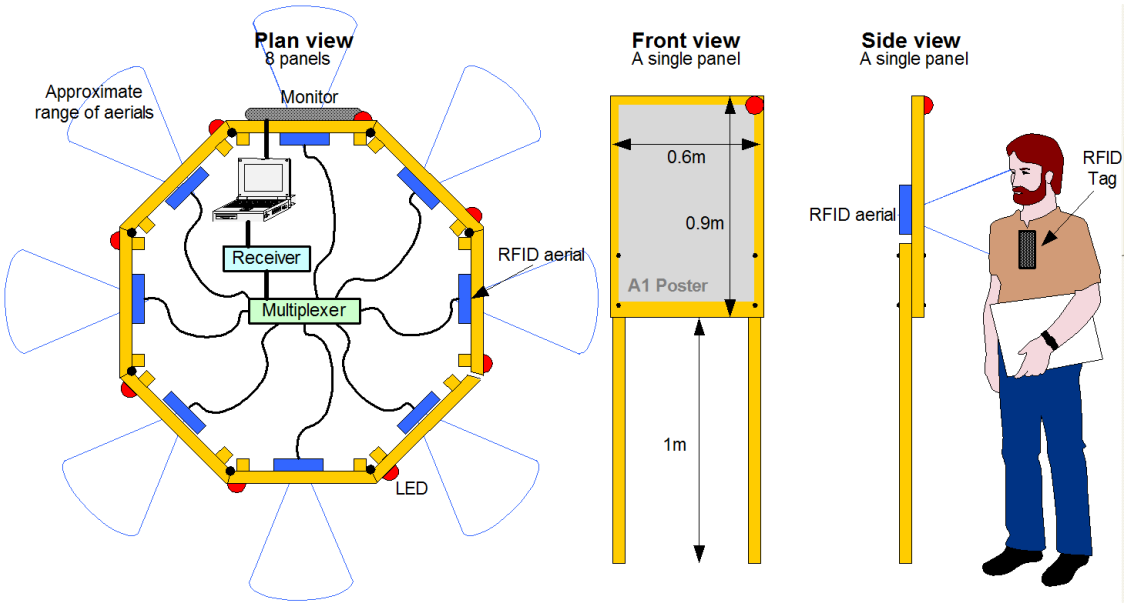

Figure 19: Pirate Moods design

Note that in the 'Pirate Moods design' diagram from the game design document the RFID tag is shown on a lanyard around the player's neck. When the game was run the tags were left loose and players held them in their hands.

Figure 20: Pirate Moods equipment

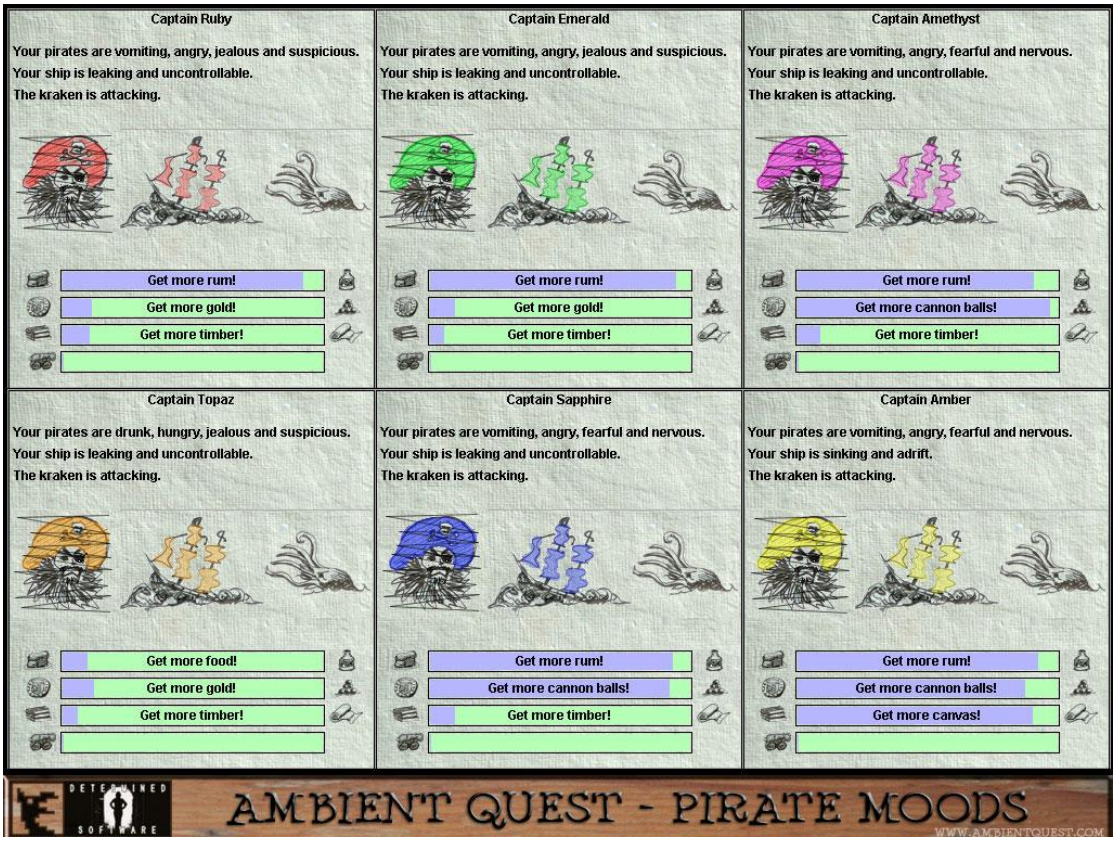

Figure 21: Pirate Moods screenshot

Figure 22: Captain Ruby happy and sad

The game was designed for both single player and multiplayer gameplay. A single player could play the game by taking on the role of one (or more) pirates, defeating the attacking kraken and keeping their pirate crews happy. The short-term objective of the game was to keep the resources in balance; shown as moving bars between resource icons and reported with text messages. A longer-term objective was to defeat the kraken. However, the game did not a have victory condition. Once one lot of kraken were defeated more would appear, the resources would get out of balance and the pirates would become unhappy. In this way the game could be played for any length of time. Players could decide which objectives to strive for.

If more than one person was playing then as well as competing to defeat their kraken first they could also strive to defeat the kraken who were attacking all six of the pirate ships, at which point they would be rewarded by a 'You have defeated all the kraken' message. This required some degree of cooperative play with players either actively helping each other or at the very least working alongside each other to each defeat their own kraken. Once again after 'defeating all kraken' players would find that their pirates became unhappy, resources lost balance and kraken returned.

The third study was carried out in two phases, with data being analysed in between the two phases. This allowed emerging themes from the first phase to be confirmed during the second phase.

5.5 Methods

The data was gathered in two main blocks, or phases, of game playing, with a break in between them during which it was possible to make a start on analysing the data from this study. Seven participants took part in the first block of game playing at the end of 2009 and five in the second block in mid-2010.

In the game Ambient Quest the player was able to focus their attention on things happening in the real world, while their pedometer continued to count steps and hence create moves for use in the Ambient Quest virtual game world; or could focus their attention on the distance they were walking and try to gain more steps/moves. In the game Pirate Moods players were able to focus their attention on posters on notice boards while the RFID tags they were carrying accumulated resources for pirates in the Pirate Moods virtual game world, or could concentrate on gathering resources and ignore the posters. In both these games play continued (collecting steps in Ambient Quest, resources in Pirate Moods) carried on persistently in the background while players focused their attention away from the game and events in the virtual game world.

Data was collected by videoing all Pirate Moods game sessions, photographing all game sessions and interviewing all players after play sessions. Additionally all play sessions were observed by the principle researcher.

5.6 Results and discussion

5.6.1 Introduction

Coding of the data from this study was started as soon as the first data was gathered from the first play sessions and once again the technique of an iterative process of constant comparison was employed (Glaser, 1978). The themes identified in the previous study were found and refined during this process. The analysis continued constantly throughout the study. The data analysis that occurred in the second block of game playing did not add new themes, but rather confirmed those that had been established using data from the first block of game playing. References to block two data were added to the results from the block one play data.

5.6.2 Engagement

The idea of 'engagement' has previously been defined. Player engagement varies from player to player as well as from game to game, platform to platform and so on. There is a range of player engagement, so, for example, players of Pirate Moods were seen to be focussing their attention on pinned up pages while playing the game. See the left hand photo below taken during one of the Pirate Moods play sessions (session 1, 11/12/2009).

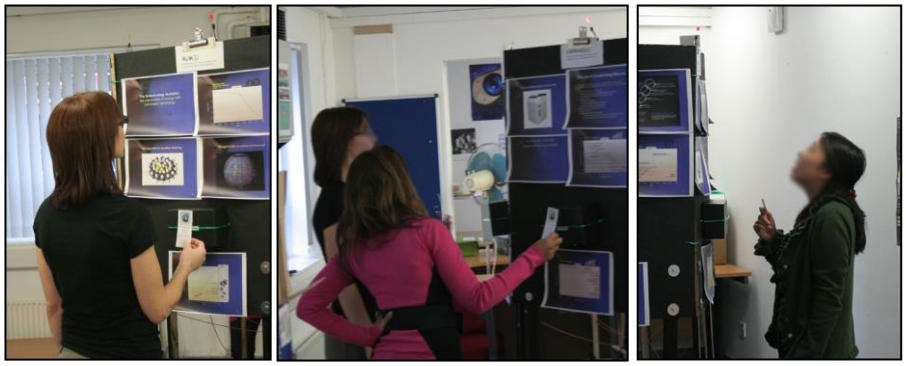

Figure 23: Photographs from Pirate Moods play sessions

In the photo above the player is holding a pirate card close to the RFID aerial and reading the pages pinned to the poster board while at the top of the picture a lit red LED indicates that the pirate card is being detected and rum is being collected by the pirate.

In the next photo from the same playing session, two players are seen engaging fully in the game. They are looking at the game screen while one player can clearly be seen holding their pirate card up to collect canvas resources.

In the photo to the right (from session 2, 11/12/2009) the player is barely engaging with the game, holding their pirate card at a distance from the RFID aerial, and are focussed on reading the poster board. The LED indicator at the top of the notice board is lit, showing that although the player is not focussed on the game they are still collecting resources in the background.

The three photos from Pirate Moods playing sessions show a range of engagement by the players: splitting attention between the game and poster boards, focussing entirely on the game and ignoring the game.

Emotion is a crucial part of engagement (McMahan, 2003, p. 69). By feeling something, such as having an emotional attachment to their pirate, about the game the player may be encouraged to continue playing; or discouraged, perhaps by frustration at lack of progress, and stop playing. When engaging emotionally players may assign the game some significance and experience emotions tied to their game playing and also possibly the game's story and characters. When talking about Pirate Moods players said:

> *'it's really fun' (Player 10)*
>
> *'finding out about how the game works is joyful' (Player 11)*
>
> *'sad because you never get to a point where you can say 'OK [I] achieved this and that'' (Player 11)*

Commitment is another property connected to engagement; and commitment has been defined in a number of different ways: affective commitment based on an emotional link (affective), commitment based on engaging in activities (continuance) and commitment from a sense of responsibility (normative) (Allen & Meyer, 1990). In order to play a game, players have to dedicate some time and effort to the game (setting it up, learning the rules etc.) (Salen & Zimmerman, 2004, p. 333) which seems similar to the 'engagement' definition of commitment and then later may also not only be committed in an 'engaged' way but also have an emotional, affective, link to the game. Both engagement and affective commitment properties of player engagement vary over a game. For some games (especially those with ambience) commitment can be reduced to close to zero, or increase to a maximum value. Complete withdrawal of attention is possible at the 'not engaging' end of the engagement spectrum and attention is essential at the 'very engaged' end. Note that the game still continues while the level of engagement (attention focussed on the game) varies. For example, in the game 'FarmVille' (Zynga, 2009) players can think about the game, make some moves and then may stop actively playing the game (they are not doing anything to the game or even observing it) and do something else while the game continues in their absence. In this case players are fully engaging with the game while making their moves and then ceasing to think about the game when away from the computer. This is also an example of persistence, supported by automation, in a game; persistence facilitates low levels of engagement, since the game continues (automatically) even when the player is only minimally engaging.

In addition to an emotional involvement in the game and a commitment of time, effort and emotion players also need to be able to perceive what is happening in the game. Once again their perception of the game can vary from intensely focused to unaware (they have forgotten they are playing).

5.6.3 Affect

As with the previous study that the players had affective responses while playing was very clear. The video recordings showed players getting excited while playing and they reported this in the interviews:

'but it was still fun, the last bit, defeating the kraken, was, especially when it kept regenerating, was kind of fun, I think we all got quite into that, wanting to defeat them all of them at once.' (Player 4)

This clearly shows excitement directly connected to the gameplay, though perhaps this is not surprising.

5.6.4 Persistence

As mentioned above in the comments on engagement, persistence is a necessary condition for variable levels of engagement. Persistence was also one of the defining qualities of ambient music and of ambience as applied to games (see Chapter 2). Although shorter than the Ambient Quest game of the first study, Pirate Moods still ran persistently. The game sessions in study two lasted less than an hour, but the game could have continued for any length of time in the background. Even while waiting for input the game was coded such that the levels of resources randomly changed in the background giving a sense of a living virtual world continuing without player input. This aligned the persistence in Pirate Moods closer to the definition of persistence in massively multiplayer games than the persistence was in Ambient Quest, where it was closely aligned to the definition of persistence in pervasive games.

5.6.5 Context

Context is important in considering the player experience of any game. Not only do different players have varying experiences of games, but also where and when the game is played also affects the experience.

Player emotions, intellect and previous game-playing and life events all affect their experience of any game.

The precise location becomes even more significant when considering locative games, such as the experimental games in this research.

Not only does the time at which the game is played have an effect on player experience, but also the way that time is portrayed in the game. Within many games time stops when players stop playing them. However, other games treat time differently and game time continues, or persists, even when the player has stopped playing. This persistence of the game world is a major feature of massively multiplayer online games.

A prominent feature of games that are highly ambient seems to be that players can join and leave them at any time. They are persistent (see the earlier properties proposed for ambience). In both the research games players could focus on the game and actively think about it or they could ignore it and it would continue playing (step collecting or resource collecting).

5.6.6 Token of play

A physical token (pirate card) was used in Pirate Moods, performing a similar function to the pedometer in Ambient Quest. Both the pirate card and the pedometer functioned as input

devices, allowing players to interact with the games. Once again, the token was important to players:

> *'this [RFID card] was my control and this was my character as well, so it combined the two' (Player 13)*

In Pirate Moods the pirate card could have been ignored, but was largely focussed on by the players, even though it was smaller than the pedometer in Ambient Quest. There were far fewer instances (as observed and recorded on video) of players forgetting about tokens in this second study than there were of players forgetting about their pedometers in study one. In both cases, the physical token seemed to pull players into the game and possibly increase their sense of presence, though the degree to which this occurred is not clear. Further, the importance of having a token to properties of ambience did not seem conclusively shown. The tokens were important to both Ambient Quest and Pirate Moods, but seemed important as an input device, in the way a game controller is to a console as well as having a link to the player character in both games.

5.6.7 Invention

Some games are specifically designed to enable players to create things; maybe building a city, a creature, a civilization (Adams, 2010, p. 119). These are similar to Juul's 'emergence games' (Juul, 2005, p. 71) (see Chapter 2). However, sometimes players start to create things not envisaged by the developer or not explicitly designed into the game (like rocket jumping in Quake (Id Software Inc., 1996)), Juul's calls this 'undesirable emergence' (Juul, 2005, p. 76).

As players discover things in a game that has emergent gameplay they not only become more familiar with the developer coded, 'desirable' emergent activities in the game but also they may start to create their own activities. They start to invent things that may or may not have been foreseen by the developers, but that still may be desirable and not make the game less enjoyable. Player invention is what happens during emergent gameplay. Although the 'emergence' and 'invention' are almost synonymous there is a subtle difference; 'emergence' is something that occurs during play whereas 'invention' is something players actively do.

Player invention then drives commitment, emotional responses and perceptions as the player focuses on what they are doing.

Videoed observations of players playing Pirate Moods provided many examples of players making up their own gameplay, adding their own rules to play. For example during a play session between players 4, 5 and 6 the following events show:

> *'Player decides to only play with one card' (2m 37s)*
>
> *Waving card back and forth towards aerial to gain commodities. (4m 16s)*

After another play session player 10 said:

> *'I kind of like to make my own game; and so like I'm racing each other, which one [pirate] the faster [at firing canon]'*

Player 13 made very explicit comments about the possibility of players creating their own version of the game:

'something you pick up and stuff, rather than having set game rules and everything'

'I was stealing his [other player] rum' [by placing their RFID card in a better position]

Invention may occur during interactions with the game, while the game is running. However, players may also construct inventions while away from the game. These inventions may result in extensions to the game world and greater engagement with the game. For example, Player 3 talking about the Ambient Quest game found that the game had started them thinking about finding distances between locations:

'it was useful for, um, just like, finding the shortest route to places'

The way in which players interacted with the games in studies one and two, in particular by inventing their own rules and ways of playing, suggests that invention is an important component of games, and may be a significant part of ambient gameplay, though see later comments in the Chapter 7 section on invention.

To a lesser or greater degree invention has been found to be present in not only the experimental games, but in all games investigated. Games with a high degree of ambience seem to facilitate player invention (see the results and discussion of all three studies). This may be due to the high-levels of ambiguity and abstraction that seem to be associated with games with ambience. Players are able to engage shallowly with the games, engaging with only a small part of the rules. This perhaps gives them the space to start inventing their own rules and gameplay mechanisms.

Whether the property of invention is particular to ambience has not been established. Clearly emergence is present in many different genres and types of game and so it is likely that invention also is present. However, even though invention may be found in many different types of game there is clear evidence that it also exists strongly at the heart of the games from the first two studies and so should be included when developing schemas, described at the end of this chapter.

5.6.8 Complexity and ambiguity in games

"We all play occasionally, and we all know what play feels like. But when it comes to making theoretical statements about what play is, we fall into silliness. There is little agreement among us, and much ambiguity." (Sutton-Smith, 1997) Although Sutton-Smith is discussing all forms of play he argues that play is at its heart ambiguous due to its 'diversity of forms', 'diversity of players', 'diversity of multiple forms of play equipment, 'temporal diversity' and 'spatial diversity' (Sutton-Smith, 1997, pp. 5-6). Salen and Zimmerman pick up on Sutton-Smith's thoughts on play: "Any definition of play will be a bit fuzzy at best. But this fuzziness points to the fact that that there is something fundamentally unknowable and ephemeral about play, something mysterious and exciting…It is this exacting ambiguity that makes play so rich" (Salen & Zimmerman, 2006, p. 85). These ideas of fuzziness and variety have a resonance with ideas of

the complexity of systems. So a game can be considered as a system in which many parts interact to produce a particular type of complexity that leads to meaningful play (Salen & Zimmerman, 2004, pp. 152-153) and complexity can be estimated and observed by players (see Chapter 2).

Ambiguity and complexity were two important properties that emerged from the data during the studies, and are both fundamental properties of games. Ambiguity and complexity are not things that the player does. They are properties of games that may be observed by the player. Player perception of the levels of complexity and ambiguity in any game vary from player to player.

The study games' rules were perceived as ambiguous so players started interpreting game events according to their own ideas, creating their own version of the game rules. This type of ambiguity seems to be especially prevalent in pervasive games that expand beyond Huizinga's magic circle (Huizinga, 1955), with the game interface becoming completely ambiguous and with the possibility of any actions and/or sensory observations being seen as part of the game (Montola, 2005).

For example, when talking about Pirate Moods player 14 revealed that they had not realised that they could have played with more pirates, they created their own 'one pirate' rule, or assumed there was a one pirate rule. The rule was seen as implicit:

> *'just assumed that was what you had to do; didn't realise you could have more than one [pirate card]'*

Player 10 invented a competition between pirates:

> *'I kind of like to make my own game; and so like I'm racing each other, which one's [pirate] the faster [at firing canon]'*

Player 15 went even further realising that:

> *'there were many ways to play the game'*

In the photograph below (play session 1, 05/03/2010) the player has chosen to play with two pirate cards and has also discovered that they can rest the cards on the top of the aerial to play (one of his two cards is on the RFID aerial to the right).

Figure 24: Playing with two pirates and resting card on aerial

In these cases it was possible for each player to be playing their own personalised version of this game that contains ambience, according to their particular interpretation of the rules. The highly ambient research games may both be perceived as having very clear victory conditions and also to be completely open ended. In the case of the Pirate Moods game some players reached a very definite end point when they were satisfied they had completed the game, others thought it would just carry on indefinitely:

> *'It actually felt like end game' [when all the kraken were defeated] (Player 5)*
>
> *'I still had a, sort of, desire to keep everything in the middle and see if I could make them [the pirates] even happier' [after defeating the Kraken at the end of the game] (Player 15)*

When playing a game the player can make a judgement about whether they find the game complex. Complexity and difficulty levels are related, but do not necessarily have a direct correlation. This is supported by Robinson (2001), though he is not talking specifically about games, who says that complexity and difficulty do not have a fixed relationship to each other. A game with a low level of complexity can be difficult to play and a player may not consider the game 'complicated' or 'involved'.

Games can also be considered as complex systems in which their complexity relates to how predictable they are. Games have some degree of unpredictability, lying between periodic systems (predictable, repetitive) and chaotic systems (unpredictable, random) (Salen & Zimmerman, 2004). Even with this systemic approach to gauging complexity in games they sometimes appear to players as simple and predictable and at other times as surprising, unpredictable and complicated. The degree of predictability, and hence complexity, varies from player to player, according to the player's perceptions. Any individual game may appear complex to some players, novices, for example, and not others, experienced players, for example. This is similar to difficulty in games; there is very clearly a range of difficulties both within games and between different games. For example, many casual games are designed to be less difficult than hardcore first person shooters. Also, the perceived difficulty of any game will depend on the experience, abilities and affective resources of the player (see Chapter 2).

The degree of predictability, and hence complexity, also varies over time for an individual player. At first encounter a game may seem to have a low level of complexity, but as the player becomes more involved much deeper levels of complexity might be revealed, perhaps as the rules are learned. For example, when first starting a role-playing game a player may not have to consider underlying attribute and skill systems – they may just be running around fighting monsters and so on. However, as they play for longer and start to gain experience points they may start to engage with the game's underlying attribute and skills systems. In this example, the game seems simple at first and more complex as the player progresses. The perceived complexity of the game varies over time.

Alternatively, a game may at first appear very complex as a new player struggles to figure out how to play. Then as the player becomes more familiar with the game they may perceive it as being less complex than they first thought.

Managing complexity is a fundamental design consideration of all games. Too much perceived complexity is a barrier to player involvement; too little and the game may fail to attract or maintain engagement, though there are games with little complexity that are able to maintain player engagement, Tetris (Pazhitnov & Gerasinov, 1986) for example.

The threshold level of complexity needed to attract and maintain engagement varies between different games.

> *'It was fun, but to want to play it for any length of time it would need to have a bit more complexity' (Player 4 talking about Pirate Moods)*

For games with ambience the perceived complexity should allow different levels of engagement, including the ability to have a very low level of engagement. In other words, a game that is highly ambient should allow a player to have a low level of engagement even if the perceived complexity is very high. The perceived level (high or low) of complexity should not act as a barrier to different levels of engagement.

When playing a game an observed increase in complexity may drive perception of ambiguity up or down. Similarly, an observed increase in ambiguity may drive the perception of complexity up or down (see later comments in Chapter 7). When talking about the perceived complexity of Pirate Moods player 14 was clearly influenced by the ambiguous nature of the game's location (posters on notice boards that did not actually directly affect gameplay):

> *'all the information that was there made me think, initially think that this is more complicated and I did assume it was a much more complicated game'*

As a player deciphers the complexity and ambiguity of a game they discover things (rules, game world and so on) about the game. When reflecting on playing Pirate Moods player 15 made a comment that seems to indicate a degree of ambiguity that opens possibilities for more complexity and the creation of more player created rules:

> *'now I think of it, there were many ways to play the game' (Player 15 talking about Pirate Moods)*

The game may also become more predictable, or its unpredictability may be better understood by the player (this also seems to be implicit in player 15's comment).

Note that it is possible for a player to perceive a game as being complex, but still find it easy to play and perceive the game having roughly the same degree of complexity even as their understanding of the game increases. Complexity does not have a direct correlation to difficulty, perceived ambiguity or to how well the game's rules and gameplay mechanisms are understood.

5.6.9 Discovery

Discovery is something the player does while playing a game. They find out how to play the game; uncovering clues, exploring the game world, learning player character controls and so on. Discovery is an on-going process during play.

The things that are discovered may have been coded into the game by the developer. For example, game environments can be explored. Other things the player discovers may not have been intended by the developer, but rather are emergent play that is perceived and constructed by the player. For example, in Quake III Arena (id Software Inc., 1999) players discovered that if they fired a rocket down while jumping they could do extra high 'rocket jumps'(Juul, 2005, p. 81).

Although the act of discovery is a player action and a process, the descriptions of things discovered are fixed. For example, a description of how to rocket jump ('fire your rocket down when you jump and ride the shockwave') is not a process, even though the act of jumping is a process. The process of experimenting with rockets and jumping which led to a discovery of emergent gameplay is a process of 'player invention'. The emergent property of 'rocket jumping' is a player constructed gameplay mechanism.

In this way the process of discovery allows the player to find both developer pre-coded things and player constructed (and emergent) things.

'Player invention' is closely linked to 'Discovery'. Discovery allows the player to find out things that can then be used in an act of invention to create new gameplay.

5.6.10 Feedback loops and ambience

All gameplay hinges on feedback loops. Games respond to things the player does. Additionally these feedback loops may be of different lengths and are often hierarchically nested (see the previous comments on temporal granularity). (Cousens, 2005; Salen & Zimmerman, 2004, p. 228; Schell, 2008)

In games with low degrees of ambience there are significant consequences if player attention is moved away during a feedback loop, or at any time. For example, while playing a first person shooter the player is required to maintain attention on the game at all times. Failure to do this will normally lead to the 'death' of their player character.

Feedback loops seem to relate to engagement and the idea of players having a spectrum of engagement, being able to move their focus away from the game as well as focussing intently on the game. Though for ambience just moving attention away from a game while it continues is not enough, there must be player-initiated events continuing, player input continuing. In turn based games an event might be initiated and left while the player moves their attention away from the game, the event is poised to continue, possibly ambiently, when the player triggers the next turn.

5.6.11 Conclusion

The results of this second study enabled many of the uncertainties of the first study that were investigated in this study, to be much better understood. The number of themes was increased and existing themes were better understood.

This study revealed new themes of ambiguity and complexity, discovery and feedback loops.

After the descriptions below of each of the themes investigated in this study there are a series of diagrams which show the development of a high-level schema based on these themes.

The Pirate Moods game was successful in exploring areas that had not been covered by Ambient Quest and establishing that the themes identified in the first study were still present. However, detail was added to those themes as detailed in this section. The study was started with some specific questions about whether fundamental changes that were made in designing this game would have any effect on the emerging themes identified in the first study.

- Playing in a fixed location enabled the theme of engagement and affect to be expanded and results from the first study to be confirmed. Although the gameplay experience of Pirate Moods was different from that of Ambient Quest, it still retained similarities that linked it, once again, to the ideas of ambience that had been developed after looking at ambient music.
- The length of the game did not have a major effect on the properties that had been identified in Ambient Quest. A main difference was that most players seemed to, on average, maintain higher levels of engagement than had been noted in Ambient Quest, though there was still a very clear range of levels of engagement shown.
- When the game was multiplayer there was evidence of cooperation and competition, though the social interaction was very much focussed on the game and did not affect the previously identified themes.
- Although having a token was once again important, this seemed important in the same way that having a controller to play a console game is important. Linking the player to character actions. That having a token to link the player to the game is a defining property of ambience seemed unlikely, though it could be considered connected to engagement.
- The design of Pirate Moods facilitated gathering comprehensive, rich, deep data from all the play sessions in the second study. This data offered much stronger support of the themes identified in study one and also the development of some new themes, that emerged from the study.

So the themes that emerged by the end of the second study were:

- Engagement
    - Includes commitment
    - Feedback loops
    - Tokens of play

- Affect
- Persistence
- Context
- Invention
- Complexity and ambiguity
- Discovery

Having established themes that seemed to be linked to games containing ambience the next stage was to summarise the data and get a clear idea of what still needed investigation. In order to get a clearer idea of remaining gaps in knowledge a high-level schema was created as detailed in the next section ('Using schemas to identify gaps in knowledge') before working on the design of a third study.

5.7 Using schemas to identify gaps in knowledge

5.7.1 Introduction

The core themes that emerged in the first two studies were used to develop an evolving schema (see the definition of schemas below). The evolving schema were created from the results of the first two studies in order to determine remaining gaps in this understanding of ambient gameplay. The early versions of the schema demonstrate how the graphical representation of the themes and their relationships were refined to produce a final high-level schema. These schema were started while still in the process of gathering and analysing data during the second study.

5.7.2 Defining schemas

Schema are flexible ways of representing knowledge and are suitable for representing formal and experiential aspects of games (Salen & Zimmerman, 2004, p. 103). Rumelhart and Ortony list four characteristics of schema:

1. schemata have variables
2. schemata can embed one within the other
3. schemata represent generic concepts which, taken together, vary in their levels of abstraction
4. schemata represent knowledge rather than definitions (1977, p. 101)

Martin discusses these four characteristics, which makes it clear that schema are particularly suited to representing the data from this study:

1. schema provide a framework into which new information can be assimilated
2. schema can contain other schemas, the embedded, subordinate schemas containing more knowledge not visible in the higher level schemas
3. by representing knowledge at many levels of abstraction, schema can not only represent information about objects in the environment, but also the way objects interact or the nature and structure of events.

4. they represent knowledge rather than definitions; that is, they represent important information about an object or event (1994, pp. 272-273)

With reference to the use of schema in this study:

1. A schema is developed into which properties and ideas from the study are placed. The way the schema changed and evolved during analysis, as new knowledge was uncovered, made it important to have a way of representing the knowledge that was flexible and fluid.
2. Many of the ideas within this schematic framework would be themselves capable of being developed into schema; this is hinted at in some of the schema where individual components contain a number of ideas.
3. The ability to represent information at a number of levels of abstraction (the environment, interactions and links between properties) is essential in attempting to understand something as complex and fuzzy as ambience.
4. This research is not primarily about developing a single all-encompassing definition of ambient gameplay, but rather about developing information about ambient gameplay that can then be used analytically.

Successive schema based on the data from the second study (and hence implicitly drawing on the first study) were developed and refined by constantly referring back to the themes that were discovered and refined as the study progressed. Schema showed how themes might be linked together. The purpose of the schema was to identify gaps in the understanding of ambient gameplay. The gaps identified then informed the design of the third study.

5.7.3 Early schema of ambient gameplay

The following diagrams (see next two pages) chart the progress of development of a schema incorporating the themes discovered in the first two studies.

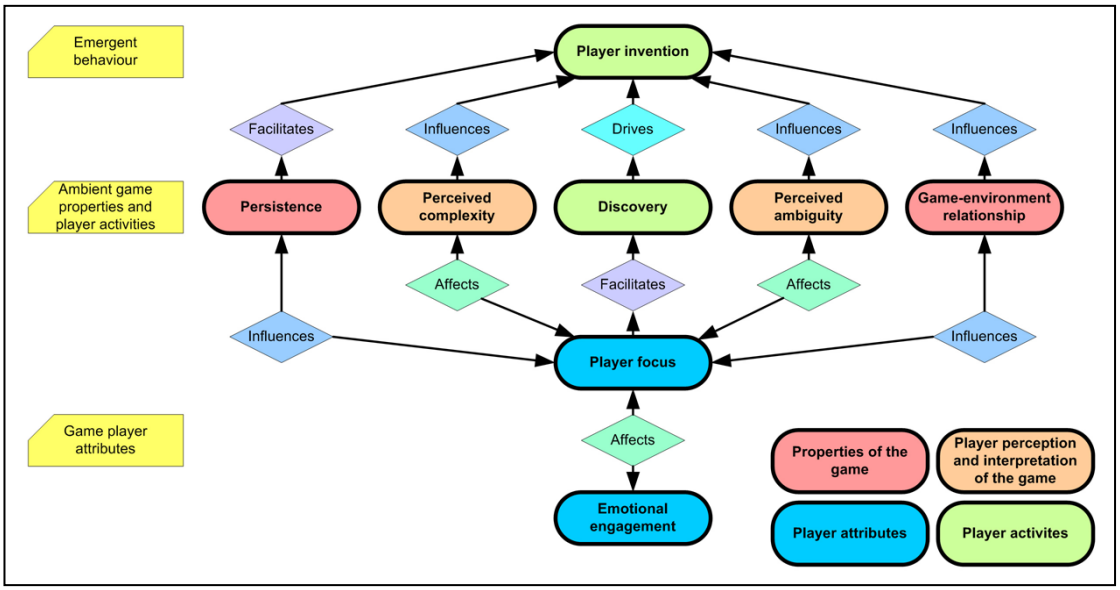

Figure 25: Ambient gameplay schema version 1

This first version of a schema links together the themes that emerged during the first two studies. The vertical position of each theme relates to three ‘rows’ representing:

- Emergent behaviour
- Ambient game properties and player activities
- Game player attributes

Colour coding themes further adds structure and detail to the areas that each theme relates to:

- Properties of the game (red)
- Player perception and interpretation of the game (orange)
- Player attributes (blue)
- Player activities (green)

The colour coding of the links has no significance other than similar links being the same colour.

Note that at this stage of the research there was still an idea of ‘ambient games’ alongside the idea of ‘games that contained ambience’. As research continued the idea of ‘ambient games’ as a distinct genre became more difficult to justify, since it was becoming apparent that many genres of games might contain ambience. The idea of ‘ambient games’ was too imprecise. Consequently the idea of ‘ambient games’ as a distinct genre was dropped. The research continued focussing on ambient gameplay.

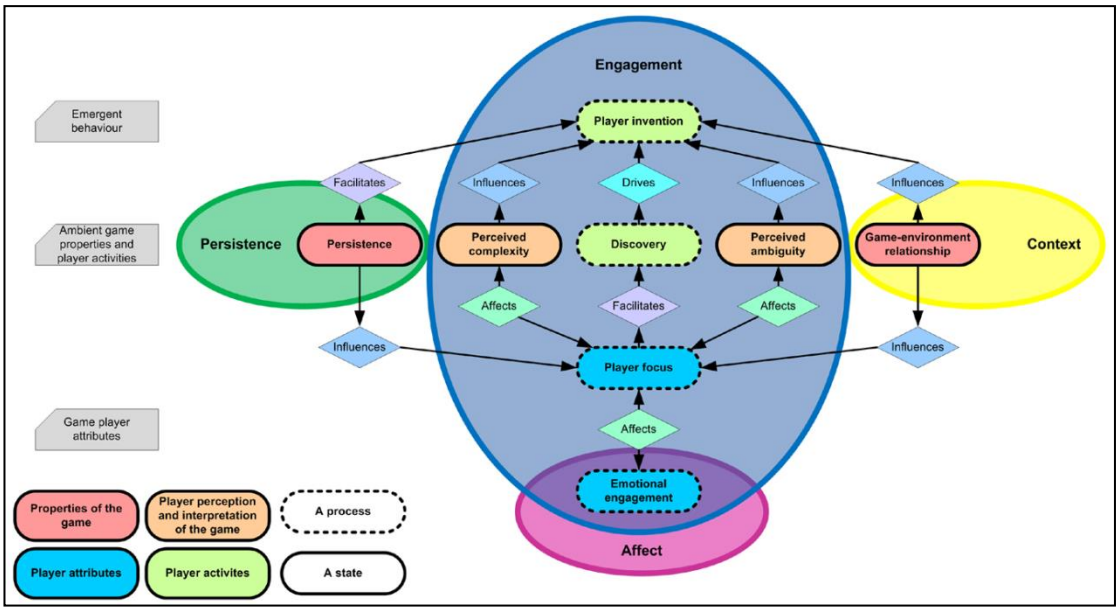

Figure 26: Ambient gameplay schema version 2

A key step taken in this version of the schema was separating out the four defining properties of ambience ‘Engagement’, ‘Persistence’, ‘Affect’ and ‘Context’ (see Chapter 2). Individual themes were then located within these for properties.

Another key step in this schema was differentiating themes between ‘processes’ and ‘states’. In this context all the processes are ‘players doing something’. The states are fixed properties of the game. There are two slightly problematic themes here: ‘Perceived ambiguity’ and ‘Perceived

complexity'. These have been given as states, since at any particular time 'Ambiguity' and 'Complexity' were fixed properties of the game. However, the perception of them were likely to change over time and so might also have been considered as processes causing states to change over time. This is addressed in the next version of the schema.

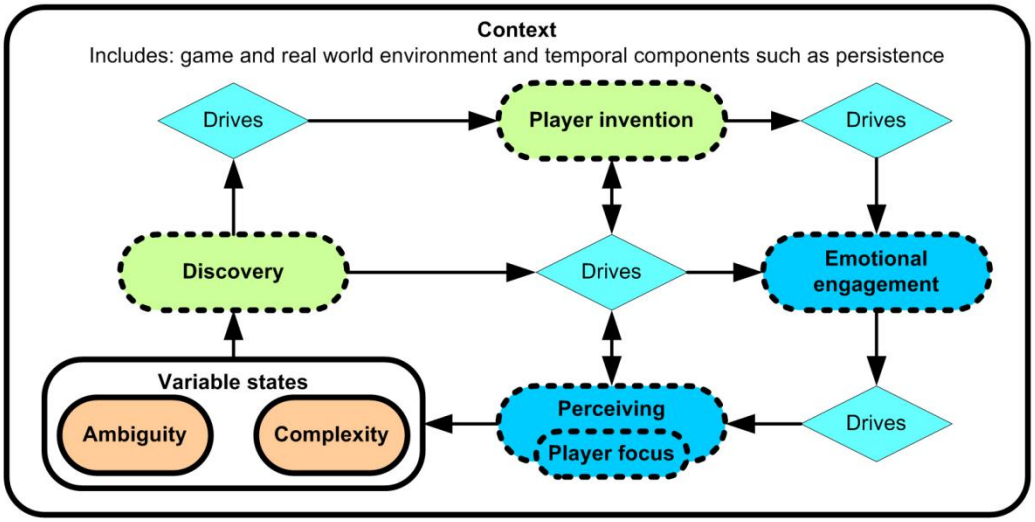

Figure 27: Ambient gameplay schema version 3

In order to distil out the salient components of the schema without loss of meaning the links were simplified; replacing 'Influences', 'Affects' and 'Facilitates' with simple arrows that still clearly showed the relationships between the different themes within the schema. Other themes were collected into 'Context'. These are all properties that support gameplay and the experience of the player, they are like a framework in which the game is experienced, similar to the 'game component framework' described by Björk and Holopainen (2005, p. 8).

5.7.4 High-level schema of ambient gameplay

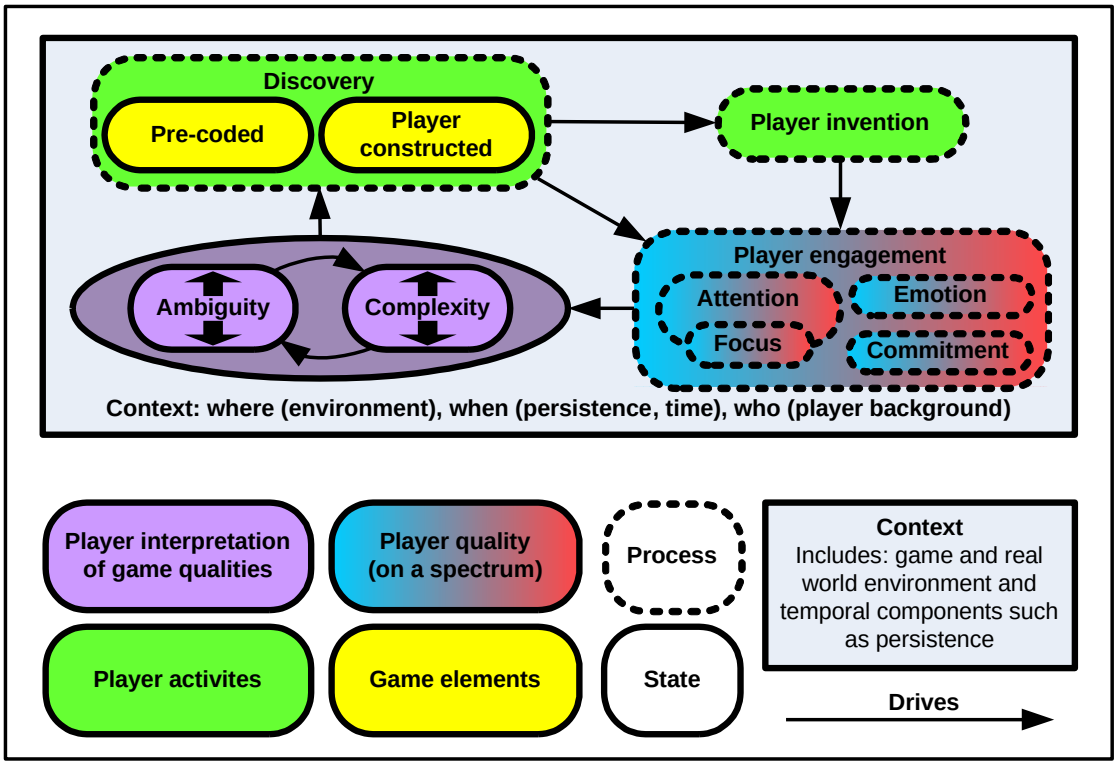

Figure 28: High-level schema of ambient gameplay

This final schema based on the first two studies was at a high-level of abstraction. Being at such a high-level of abstraction some of the ideas are perhaps a little too abstract for them to be used to identify ambient gameplay. However, they do offer a framework that suggests areas for focussing future investigation. This high-level schema is one step in the process of determining the properties of ambient gameplay and is not a final definition of ambient gameplay.

This schema comprises a number of different processes and states. All the processes were things that the player was doing: engaging, discovering and inventing. The states were both related to the game and to the player: ambiguity, complexity, context, pre-coded discoveries and player constructed discoveries. Some of these states were player perceived and could change (ambiguity, complexity and player constructed discovery). Others were fixed properties of the game (persistence, environment and pre-coded discovery).

The states and processes are linked by ‘drives’ arrows:

- Discovery ‘drives’ player invention.
- Discovery also ‘drives’ player engagement.
- Player invention ‘drives’ player engagement.
- Player engagement ‘drives’ discovery, through the ambiguity/complexity modifier states.
- Ambiguity and complexity drive each other up and down (unpredictably).

Considering the properties of ambient gameplay as either processes or states enables a deeper understanding of the properties and their relationships; though states and processes are not defining qualities of ambient gameplay.

5.7.5 Conclusion

This distillation of the data from studies one and two, that were built on the original definition of ambience, gives a valuable insight into properties that are important in games with ambience.

The original properties of ambience defined in the literature review were modified and extended by investigating how they functioned when used within games. A new set of properties of ambience were revealed by distilling down themes discovered in the first two studies into a high-level schema that may be summarised is this way:

- Engagement
    - Affect
    - Focus, attention and commitment
- Context
    - Persistence
    - Location
    - Player attributes (hard-core, casual, mood)
- Invention
- Complexity and ambiguity
- Discovery
    - Pre-coded
    - Player constructed

‘Tokens of play’ and ‘Feedback loops’ have been subsumed into ‘Player engagement’ and are considered as supporting the process of player engagement, but are not defining properties of ambient gameplay.

Affect has been included in ‘Player engagement’. Affect is incredibly important in games, but once again is not considered to be a defining property of ambient gameplay.

The schema describing ambience was based entirely on research games. There was the very real possibility that this schema was only applicable to those research games, or only to games with ambience, and had no wider applicability.

The aim of this research project was to develop a deeper understanding of ambient gameplay in games. Through the first two studies a deeper understanding of ambient play in games was developed; however to what extent this might be generalizable was not established. Whether all, or none, of the themes revealed in studies one and two were applicable beyond the research games was yet to be discovered. This was addressed by the third study.

The definition of ambience produced by researching ambient music was shown to be applicable to games through the production of games that featured those properties. Once those games were investigated, themes that did not directly relate to the original ambient properties were

discovered (see the ambient gameplay schema diagram, figure 32). There was no way that these new themes could have been discovered except by building games based on ambient properties and then finding out what other properties arose alongside the ambient ones. Further, the relationship between themes that directly related to the definition of ambience and the new themes that arose were also revealed.

In order to move the research on, looking beyond games created from the definition of ambience was vital. Investigating a game that had not been created specifically to demonstrate ambience would enable existing themes to be confirmed and possibly new ones discovered. This methodological triangulation approach (Miles & Huberman, 1994, p. 266; Morse, 1994, p. 224; Patton, 2002, p. 247) was an essential next step in investigating ambient gameplay. The schema of ambient gameplay already produced was at a high-level of abstraction and, although useful for signposting future areas for investigation, more research was needed to add detail to the ideas derived from the schema. Discovering some themes derived from looking at low-level properties would make enriching this schema possible.

In the next section properties of ambient gameplay are developed, based on investigating a commercial game, in particular looking at low-level properties and seeing the ways in which gameplay mechanisms in this game support ambience. Importantly the game chosen was not developed to explicitly exhibit ambience. However, as described in the next section, the game purposefully chosen was thought likely to contain ambience.

Chapter 6 Study three: Civilization IV

6.1 Introduction

After investigating ambience by building games, the next step was to investigate ambience by looking at an existing game. The intention was to see if the previous results were more widely applicable. In addition, as the research was still highly explorative, choosing a very different sort of game to investigate for ambience (as previously defined by investigating ambient music) seemed a good way to test and possibly extend the things already discovered; perhaps narrowing down the precise nature of what had already been found out.

6.2 Aims

After exploring ambience with custom built research games, discovering how the emerging ideas might apply in an existing commercial game was important. For the results from the first two studies to have validity and wider application they needed to be compared with results of investigating a game that had not been created using the ambient properties derived from the investigation into ambient music.

Having already developed a high-level schema the aim of this study was to take a bottom up approach, identifying low-level properties in a game that might contain ambient gameplay. These results could then be compared and contrasted with the high-level schema to see what properties seemed to be universal properties of ambient gameplay.

The term ‘low-level’ is used here to imply that these properties are solidly embedded in specific gameplay mechanisms.

6.3 Method

The research games Ambient Quest and Pirate Moods allowed players to focus their attention elsewhere in the real world while playing the game (game data was persistently gathered in the background in real time). To find a commercial game with this underlying property of being able to focus player attention in different places while gameplay continued away from player attention suggested looking for a game in which gameplay was occurring over the whole game world while the player focussed on a small part of the game world at any time.

The previous games were pervasive, with strong locative elements to them. In order to rigorously confirm or refute previously discovered ideas about ambience a game that was not pervasive and was not locative was chosen. If the things so far discovered about ambience were going to have applicability beyond pervasive, games then the only way to discover this was to purposely choose a game to look at that was clearly not pervasive.

Rather than looking briefly at many games, a single game was picked to study in depth. This approach has been successfully used previously in game research and the importance of playing games to understand them has been cogently explained by Aarseth (2003). There are

time constraints around playing many large complex games, though clearly a game researcher may draw on the experience of playing hundreds of games over tens of years, then developing an argument built on the game investigated, but in the context of their gameplay experience.

Many genres of games were considered and a decision to focus on strategy games was finally taken. Most games do not have activities occurring away from the player's onscreen display. In most games everything is happening onscreen and near to the player's character (or other onscreen representation) and hence always commanding the player's attention. This is true of action adventures such as Tomb Raider (Core Design Ltd., 1996), first person shooters like Doom (id Software Inc., 1993) and (single player) role playing games e.g. Baldur's Gate (BioWare Corporation, 1998). Gameplay events all occur in the immediate vicinity of the player and as the player moves through the world further events are triggered. God and other strategy and management games are normally different to this. Computer controlled characters are not just acting in the immediate vicinity of the player, but often are carrying out game activities at a distance from the player; away from the player's knowledge.

In strategy games the player can focus their attention in the virtual game world while elements of the games continue persistently elsewhere in the background, away from the player's attention. The sub-genre of 'god games' was chosen for investigation. A large, well-produced, bug free game that was perhaps part of an established franchise was needed to ensure that enough rich data could be produced and also that the gameplay had been thoroughly tested. These requirements narrowed down the choice of strategy games.

Civilization IV Complete (Firaxis Games, 2007a) is rich in gameplay depth and complexity and offers features such as persistence and gameplay events away from the player's attention. This game seemed to promise gameplay that might contain ambience. Civilization IV Complete also fulfilled the criteria previously listed:

- The game had already been available for five years and had benefitted from two expansion packs, Warlords (Firaxis Games, 2006) and Beyond the Sword (Firaxis Games, 2007b), so there had been plenty of time to iron out any faults or imbalances and refine the gameplay.
- The game was part of a well-established franchise so the gameplay within this particular title built on previous titles and was tried and tested.
- That the game had two expansion packs meant that it had extensive, rich gameplay. Civilization IV had even more gameplay mechanisms than Civilization V (Firaxis Games, 2011) that was released in 2011. For example, the possibility of establishing a religion was removed from Civilization V (though was added with the Gods & Kings expansion (Firaxis Games, 2012), which was released after this study was completed).

Using such a polished and well-tried and tested game meant that any ambience discovered was likely to result from carefully designed gameplay mechanisms. All the mechanisms in the game had been thoroughly tested by both the developers and the many players. All the gameplay mechanisms in the game were there because the developers had decided they should be there,

this was a well-structured and constructed game. Additionally, since this was the latest iteration of a Civilization game in a well-established franchise the gameplay was well understood. When choosing a game to investigate the critical acclaim received by the game was considered in order to ensure that a game of the highest quality was selected. Civilization IV has received equal highest Civilization game score on Metacritic, with both Civilization IV and II receiving 94% (Metacritic, 2011a) and a user score of 9.6/10 for the Complete edition (no metascore available) (Metacritic, 2011b) indicating that it was likely to be a high quality game.

A defining feature of Civilization IV is that it is turn-based. This means that the game is particularly weak in the persistence property previously identified as important for ambience. However, in other properties of ambience the game is strong; in particular with the possibility of a range of levels of engagement with mechanisms within the game, with possibilities of invention and discovery and with play that can be complex and ambiguous.

If instead of a turn-based strategy game a real-time strategy game had been chosen for this study there would have been a constant necessity to pause it while investigating what was happening in other parts of the world, which would necessarily interfere with the persistent quality of the game and make play difficult. By choosing a turn-based game, the gameplay is easy to see, turn by turn. The game automatically pauses at the end of each turn, allowing detailed data to be gathered. As the game state updates every time the 'next turn' button is clicked, functionally this is the same as the game loop in a real time game, updating the game state. That the player has to click the 'next turn' button in order to progress does mean the persistence property of ambience is weak (the game pauses between moves) and does force frequent engagement with the game. However, the benefit of not interfering with the gameplay by frequently pausing the game, and looking round the environment to monitor what is happening, far outweighs the lack of persistence caused by the player having to click the next turn button.

This study is about investigating the game mechanisms themselves and determining how they might support ambience. This research is not about investigating the experience of the players as they play the game; this was done in the previous two studies. In this study no data is gathered on player experience, just on the mechanisms in the game. If the necessity of clicking the 'next turn' button is ignored the game may be treated as though it is running continuously in real time. If the game is viewed in this way then it might even be considered persistent.

Modeless activity is an important feature of Civilization IV and is discussed later in the 'Results and discussion' section. Modal and modeless interaction is defined here to ensure that there is a common understanding of this. Dialog boxes in applications are a good example of modal interactions. When a modal dialogue box opens (a 'save' dialogue for example) the application stops and waits for the user to make a selection using, for example, a list, 'OK' and 'Cancel' buttons. The user has to stop what they were previously doing to respond to a dialogue box – the dialogue box demands their attention. The application will not continue until the user has closed the dialogue box. A modeless interaction allows the application to keep running and might also allow the user to make a selection (Cooper, 1995, pp. 302-303). For example, when

highlighting text in Microsoft Word (Microsoft, 2006b) a context sensitive menu briefly appears; the user can either ignore this menu, and it will fade away, or they can click on one of the buttons.

Figure 29: Modeless menu

An inventory is an example of a modal interaction in a game:

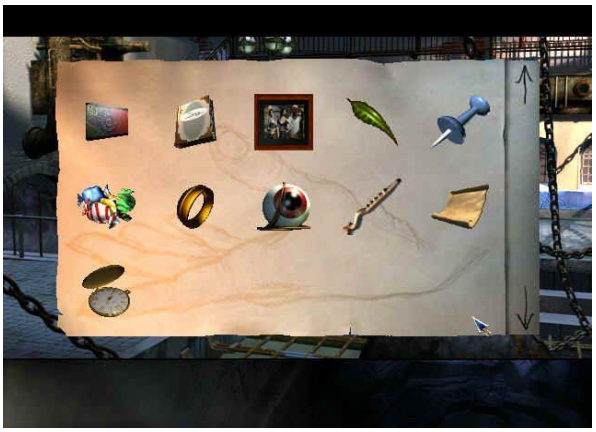

Figure 30: Inventory screen in The Longest Journey (Funcom, 2000)

The game is paused while the player manipulates items in the inventory. The same game has an example of a modeless interaction:

Figure 31: Modeless pointer in The Longest Journey (ibid.)

The pointer at the bottom of the screen has changed to a blue eye and is helpfully telling the player that it is pointing at a 'Landscape'. This information is supplied to the player modelessly: the player does not have to click anything to remove the 'Landscape' information pop up, the pop up disappears as the pointer moves to another part of the screen. This is similar to the

mouseover tooltips often supplied for buttons on applications such as Microsoft Office (Microsoft, 2006a).

One of the categories for the mechanisms identified in Civilization IV was the mode of the interaction with the mechanism. Each mechanism was identified as either modal or modeless. As previously mentioned the significance of this is mentioned later in the results section of this study.

An inductive bottom up approach was taken to investigate the possible presence of mechanisms that support ambience in Civilization IV, looking at individual, specific mechanisms and then drawing out general properties from these (Patton, 2002, p. 453). The gameplay was examined and a list of 196 gameplay mechanisms compiled. These were then categorised, grouped and examined for evidence of ambience by referring back to the original definition of ambience in Chapter 2. Finally, themes emerged that were distilled into a set of ambient gameplay properties.

The list used to categorise each gameplay mechanism in the game was arrived at by considering the functioning and functions of gameplay mechanisms. To do this the game was exhaustively played and the list created iteratively during play. As each category was created it was tested against existing categories to see if it offered new information or was already contained within a previous category. In this way there was a process of refinement until the list of categories was stable. Since the research was into ambient gameplay, the categories were all concerned with gameplay. There was no attempt to create categories to consider cosmetic properties such as, for example, unit colour.

Note that since this was a qualitative investigation there was no attempt to quantify these results. However, some reference has been made to the preponderance of different types of mechanism in some cases; the precise numbers in these cases are less important than merely knowing that there were more than just an isolated few instances. A range of mechanisms supports each argument made in the results and discussion section, but the actual number of mechanisms has limited significance. If a quantitative measure of the importance of various mechanisms was required it might be necessary to measure how often these mechanisms were used, or how long they were used for, or how much impact they had on the game or some similar measure, depending on how ‘importance’ was defined.

As mechanisms were identified in Civilization IV Complete (Firaxis Games, 2007a) during gameplay they were listed in a spreadsheet. They were then organised and categorized in a sheet with the following column headings:

- Reference number
    - As mechanisms were noted, they were numbered. The order in which mechanisms were noted does not have any significance.
- Name
    - A unique identifier

- Mechanism description
    - Very brief description of the mechanism.
- Active or Passive Mechanism
    - Passive mechanisms are automatically enacted by the game (i.e. increase in unit strength while defending a city), active mechanisms are directly triggered and/or controlled by the player.
- Action, Field Effect or Information
    - Actions are gameplay mechanisms that commence as a result of a player (or AI) decision during the game. Field effects are mechanisms that are constantly acting through the game but only become noticeable under specific circumstances (they act on any units that fall under their influence, rather than focussing on a single unit. Information displayed in the game is used by the player to make gameplay decisions.
- Management focus
    - The mechanism is the level of Civilization, City, Unit, Land (terrain outside cities) or any combination of these. Also may be acting at the game set up, before starting play.
- Mechanism focus
    - Combat, Politics, Construction, Resource, Movement, User Interface. These are the main activities in Civilization. Construction includes gaining units or cities through combat or politics. Construction also includes maintenance and repair of units. Politics includes diplomacy and religion.
- Mode
    - Modal or Modeless: modal then the game pauses waiting for player input, modeless then the game does not pause.
- Automated
    - Once started the mechanism continues (over multiple turns) without player input.
- Time
    - The mechanism 'continues' without stopping until player intervenes or 'stops' after a limited number of turns.
- Player control
    - The player can stop the mechanism, rather than it continuing in the background beyond player's direct control; listed as either 'Player' or 'Computer'.
- Attached, embedded

    - Action attached to or embedded in environment (land and sea), city, unit or government (ruler of the civilization).

- Acts on
    - What is acted upon by the mechanism. Sometimes the effect is on one thing and then another in a direct chain. For example ‘building a road’ acts first on the road building unit (Worker) and then at an environmental level (improving the infrastructure).
- Civ IV manual page
    - Reference to the mechanism description in the game manual.
- Warlords manual page
    - Reference to the mechanism description in the game manual.
- BTS (Beyond the Sword) manual page
    - Reference to the mechanism description in the game manual.
- Also see No
    - Cross reference to other related mechanisms.

Categorising the low-level gameplay mechanisms meant that it was possible to systematically search for themes within the data in order to build a list of properties that supported ambient gameplay.

6.4 Results and discussion

6.4.1 Introduction

All the properties described here are derived from the process of analysing and listing Civilization IV Complete gameplay mechanisms. Mechanisms are referred to by name and reference number throughout this section and further support and context is given by references to other games and the mechanisms found in them.

Before considering the ambience of various gameplay mechanisms in Civilization IV a brief overview is given of the main types of mechanism. Following this detailed descriptions are given of gameplay within Civilization IV that seems to support ambient gameplay as defined in Chapter 2.

Gameplay supporting the properties from the second study were not used to identify ambient gameplay in Civilization IV. The properties discovered in the third study were not integrated with the schema from the second study until Chapter 7. That the results of the third study were independently arrived at, rather than fitted to a framework derived from the schema is important; they needed to be independently arrived at so that they could be used to test the veracity of the previous results. In Chapter 7 the properties of ambience are combined with the schema in order to rigorously verify and, where necessary, modify the definition of ambient gameplay.

6.4.2 Gameplay mechanisms

196 unique mechanisms were listed while playing Civilization IV. This number is not thought to have any special significance, this was just the total number of mechanisms found during play.

The 196 gameplay mechanisms identified in Civilization IV are primarily focussed on the following tasks:

- Construction
    - 62 of the 196 mechanisms had a construction focus
- Combat
    - 47 of the 196 mechanisms had a combat focus
- Resource production (includes research)
    - 42 of the 196 mechanisms had a resource focus
- Politics (including diplomacy and religion)
    - 46 of the 196 mechanisms had a politics focus
- Movement (unit)
    - 9 of the 196 mechanisms had a movement focus

Some mechanisms had more than one focus; for example, mechanism 160 'Trade' is concerned with both resources and politics.

'Construction' includes gaining units or cities through combat or politics. Construction also includes maintenance and repair of units. 'Construction' and 'Resource' may be combined in activities like 'Build farm', mechanism 123..

Construction always occurs without any further player intervention required once it is started, though a player can focus their attention (see the descriptions of engagement in Chapter 2) on the construction and halt it, if they wish. In this way construction supports ambience in the game. Automated construction occurs in many strategy games, both management sims like SimCity (Maxis Software & Will Wright, 1989) and real time strategy games like Age of Empires (Ensemble Studios, 1997) and StarCraft (Blizzard Entertainment Inc., 1998). Requiring players to micromanage construction and forcing them to drive the construction forward, perhaps by repeatedly pressing a button or key, would be possible but not very much fun. Consequently, by introducing the ambience of automated construction the enjoyment of many strategy games has been increased.

Combat is frequently not ambient (the player is not able to remove their attention from it), often requiring direct player guidance. Even though once commands are given to units then those commands are carried out automatically by the units, these actions last only for a short time (normally one turn). Automatic combat that lasts for more than one turn is possible when units

are effectively given standing orders to ‘defend city’ when they are placed within a city; mechanisms 42, ‘City defence’ and 58, ‘Fortify’.

Resource creation, gathering and management frequently occurs away from the player’s attention and so strongly support ambience in the game, but allowing the player to move their attention elsewhere, while the these activities occur persistently in the background. For example, once a city is set up and starts producing ‘food’, ‘production’, ‘commerce’ and ‘research’, which are all raw materials that give access to other things, the city continues producing until the player changes the production options. Mechanism 87, ‘Automate production’ enables the player to automatically manage a city’s production. Mechanisms 89, 90, 91 and 92 enable the player to emphasize ‘food’, ‘production’, ‘commerce’ and ‘research’. This ability to run production as an automated background activity is often present in strategy games, for example gathering food and wood in Age of Empires real-time strategy games, minerals and Vespene gas in StarCraft real-time strategy games. Micromanaging resource production would not be much fun, clicking on a production unit each time it gathers a resource would be an incredibly repetitive and uninteresting activity (Goetz, 2006).

The automation of resource production in games is a good example of a way in which ambience has been introduced to strategy games, allowing activities to occur persistently, away from player attention; though players can focus on them if they wish.

The political and diplomatic manoeuvring in Civilization IV requires the player to engage with other rulers in modal dialogue windows, setting up trade deals or opening borders and so on. Once set up ongoing deals such as mechanism 166, ‘Open borders’, continue ambiently in the background. These mechanisms that are highly ambient have been introduced into the gameplay to create richer and more complex worlds.

Religion was explicitly added to Civilization IV to increase the realism of the world model. Once again this functions ambiently except when the player changes the religion of their civilization; mechanism 143, ‘Change religion’.

In the Civilization IV manual it states: ‘We have streamlined or removed many time-consuming elements of the previous games, especially in less enjoyable areas like pollution control and civil disorder’ (Firaxis Games, 2005, p. 5). An event like ‘civil disorder’ previously required the player to constantly be monitoring and adjusting cities in order to prevent disorder; with Civilization IV mechanism 80, ‘Manage city’ enables the player to set up parameters that keep the city running automatically. By correctly managing the city and setting automated systems for resource management (food, production, commerce, research) the occurrence of civil disorder can be reduced. Removing this micromanagement element has freed the player to concentrate on more enjoyable parts of the game and increases the ambience of cities in that they may be left along for longer periods and are less likely to force the player into adjusting with them. This may be seen as an ambience increasing change in the game.

Movement in Civilization IV (and other games in the franchise) allows the player to set up a journey for a unit that then automatically continues over a number of turns; mechanism 11,

‘Move unit far’. The player does not have to micromanage the journey, setting a new destination every turn. This is another example of gameplay facilitating ambience in order to increase enjoyment.

All gameplay mechanisms within Civilization IV are:

- An action (158 mechanisms)
- A field effect (6 mechanisms)
- Delivering information (32 mechanisms)

An ‘action’ mechanism occurs when something (unit, player etc.) actively affects something else. A decision is required to activate the action: choose to do something to something else.

Actions always need to be activated, or started, by the player or AI. Once started they may continue ambiently, without further player intervention.

A ‘field effect’ is a mechanism that affects another game component, but does not need to be actively instigated in order to interact. For example, in Civilization IV when a warrior moves onto a square containing a hill it automatically gains a defence bonus; mechanism 43, ‘Hill defence’. The defence bonus does not need to be selected, but happens automatically.

Field effects are always able to work in the background without the direct control of the player.

The key property of field effects and other hidden events and information that seems to fit in with ambience is that the events were initiated by the player, they are consequences of gameplay inputs the player has made. Events that are not consequences of player input fall under the normal functioning on the game’s AI and would happen anyway

In this way field effects support ambient play when they are acting as a result of player input.

Some mechanisms are solely concerned with supplying information, to enable informed gameplay decisions to be made. They do not have a direct impact on any of the game’s components, but can have a profound effect on the progress of the game by influencing player behaviour. Many of these occur modelessly, for example mouseover pop ups, but other information is supplied in modal dialogues, the Civilization IV ‘advisors’, for example; advisor information screens, mechanisms 27, 28, 30, 31, 32 and 34.

6.4.3 Player engagement

A range of levels of engagement occur within the game in a persistent (while the game continues) environment. Engagement in the game has to be examined in the context of the play environment, in order to understand how a range of engagement is facilitated by mechanisms that may also be considered ambient.

Examining the play area of Civilization IV once the player is, say, 50 turns into the game it is clear that a lot of information is hidden from the player; either in a part of the world off-screen or within a hidden window (such as a city window).

Thinking of a player having a limited amount of 'attention resource' to spend on playing the game and gathering information may be useful. Miller suggests that people only have enough attention span for seven things (G. A. Miller, 1956). This limited amount of attention resource may be focused on a limited area at the beginning of a Civilization IV game, when not much of the world has been explored and there are few, if any, cities. However, as the game progresses the attention resources are spread over a larger number of items (cities, explored areas of the map, units), they may be thought of as being more widely distributed. Rather than having a single city to think about at the start of the game, later in the game there may be ten cities to keep track of.

So the player's attention resources can be spread more widely by hiding gameplay from player attention, which may be achieved in a number of different ways:

- Distance creates areas not currently viewable
- Fog of war/discovery
- Nesting of play areas
- Increasing abstraction

These are each explored in more detail in the next sections of this chapter.

As the number of events in the game increases, more player actions are automated. Abstraction increases and the player's attention focuses on a smaller percentage of the game. The player may still be focussing on a similar number of things (units, actions, strategies and so on) to when the game first started, but these things are a much smaller percentage of the overall number of things in a game. At the start of the game the player will only have one or two cities to look after. By the end they may have tens of cities to rule. In order to keep control of their civilization they may automate more and more. More events are continuing away from their focus of attention and in this way more ambience appears in the game.

Another effect of the growth in the number of active gameplay components (units, cities and so on) may be a decrease in the amount of attention the player gives an single unit. Their attention is not just distributed more widely but also more thinly. This decrease in attention is supported by the availability of automation in Civilization IV. For example, at the start of a game the player only has one Warrior unit to keep track of and so may micromanage the movements of this unit; specifying its movements turn-by-turn (mechanism 11, 'Move unit far', but setting the destination close by). Partial automation is possible by setting a destination that takes many moves to reach. In this case the unit moves automatically each turn, mechanism 11, 'Move unit far'. A further level of automation is also possible in which the player commands the unit to explore the world automatically, mechanism 56, 'Explore'. Notice that this gives three levels of player involvement, with decreasing player attention required to look after the unit. Effectively the density of player attention on this unit is decreasing.

Comparing this to the distribution of attention resources previously mentioned reveals that increasing amounts of abstraction seems to be linked to increases in attention resource distribution and a decrease in attention density.

As well as having their attention spread over a wide area, while playing Civilization IV the player is constantly moving their attention around the play area, from one thing to another. For example, using mechanism 16, 'Scroll map'; scrolling map north, south, east and west using arrow keys or by moving pointer to the screen edge.

This is different to a traditional single player first person shooter. The player travels through a level shooting at enemies. The action takes place at a single location, then, once enemies are cleared, moves to a new adjacent location where more enemies are encountered. Once the new enemies are cleared the player moves to a new, adjacent location and so on.

In Civilization IV game play is fundamentally different. The player is playing at many locations in the game world at the same time. They are able to freely move around the play area and make moves across many fronts, concurrently. During the game they are not constrained to a single part of the game world as in a traditional first person shooter. Although supporting ambience in Civilization IV, freedom of focus is not essential for games with ambience. However, games with constrained focus may exhibit little ambience since game responses at the current player location do not require other (distant) locations to be simultaneously updated.

6.4.4 Game world: engagement

Player initiated events that are occurring at a distance from the player's current focus of attention, possibly off screen, may be considered ambient.

Figure 32: Screen area in Civilization IV

The figure above shows a very small world in Civilization IV. The red rectangle indicates the area visible onscreen at any time (when zoomed in); the area viewed is controlled by mechanism 15, 'Zoom in/out'. Clearly there are areas that the player cannot see and where play may be occurring. They could send a character out to explore and then scroll around the screen, but at any moment there are large areas of the map where the player doesn't know what is happening.

In the majority of computer games the player only sees part of the total game world at any one time. In many of these nothing is happening in the unseen parts of the play world. For example, in level-based first person shooters the player only sees part of a single level at a time. Yet in the unseen levels, and frequently in the unseen parts of the current level, nothing is happening; there are no game play events occurring.

In other games gameplay events are occurring in the unseen areas of the game world. For example in multiplayer games (Counter-Strike (Valve Corporation, 2000) for example) things are likely to be happening in parts of the game world not being viewed by the player. In many strategy games (including real-time strategy games like StarCraft (Blizzard Entertainment Inc., 1998), for example) game events are occurring out of sight of the player.

For ambience to occur things need to be happening away from the player's perceptions. Ambience is about player initiated on-going processes that are occurring wholly or partially hidden from the player (they are not focussing their attention on these processes). If a game area away from the player is not changing (its state remains the same), then ambience is not occurring. For example, when playing Doom (id Software Inc., 1993), the levels not currently being played would not be considered 'ambient', just because they are not being currently viewed. However, if the unseen levels were running and things were happening in them that would have a gameplay effect, and that were initiated by the player, then they could be considered ambient. This particular property that supports ambience arises from the original definitions of ambience (Chapter 2). The player can choose to fully engage and focus on any particular event or can ignore them and focus their attention elsewhere. The events continue persistently in the background, away from the player's attention.

Fog of war and fog of discovery also obscure parts of the play area from the player; mechanisms 195 and 196. Events occur in the fog of which the player is unaware. This is very similar to 'distance' previously described.

Figure 33: Area not obscured by fog of discovery

The red outline in the figure above shows the area visible to the player at the start of this game (turn 0). The rest of the map is obscured by a black fog of discovery.

Fog of war and discovery are used in real time strategy games, such as StarCraft (Blizzard Entertainment Inc., 1998) and Shogun: Total War (The Creative Assembly Ltd., 2000). They also appear in some role-playing games, such as Baldur's Gate (BioWare Corporation, 1998).

Figure 34: Fog of war in Baldur's Gate (ibid.)

Figure 35: Fog of discovery in Baldur's Gate (ibid.)

Fog of war and fog of discovery are both mechanisms for removing events from the player's perception. The events that are hidden behind them may be driven by player actions or may be occurring independent of player actions. For example, in the early stages of a Civilization IV game all civilizations are exploring and founding cities. The founding of cities hidden by either the fog or war or fog of discovery by computer controlled civilizations is not driven by player actions and is not a direct response to player actions. Consequently this founding of cities should not be considered as ambient events. This is just the normal operation of the game's AI. However, if the player has attacked a game-controlled (AI) city and lost all their attackers then the city will be responding to this attack and rebuilding their forces behind a fog of war. The actions of this hidden city may be considered as an ambient response to the player's actions. The player may focus their attention on the city if they wish, by despatching units to reveal it, or they may ignore it.

Fog of war and discovery are not the only way that events can be hidden from players. Another important mechanism is nesting gameplay events and areas within containers that are located within the game world. So, for example, in Civilization IV the city screens are accessed by double clicking on the city icons on the map of the world.

Figure 36: Civilization IV city on map

Figure 37: Civilization IV city screen

The city screen reveals previously hidden information and gives access to gameplay mechanisms. Further information is hidden within the city screen; mechanism 80, 'City screen'. If a player mouseovers a building at the bottom of the screen further information is revealed;

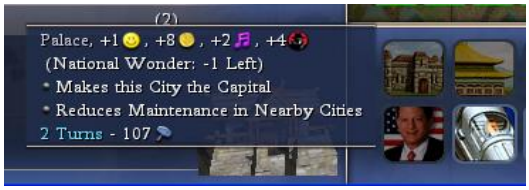

Figure 38: Civilization IV building mouseover information

If the player mouseovers a unit a pop up window reveals more information.

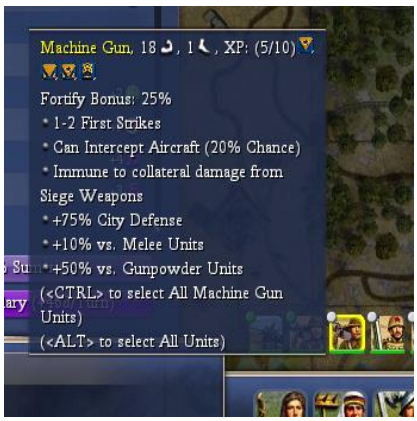

Figure 39: Civilization IV unit mouseover information

There are other places within Civilization IV where play areas are nested, such as the advisor windows that may be accessed via icons at the top right of the main screen.

Versions of nesting appear in many different games from inventory screens to conversation screens to map screens. These nested play areas may be primarily for containing information (map screens) or may be repositories for gameplay (for example, the lock screens in Oblivion (Bethesda Softworks, 2006), Thief (Looking Glass Studios, 1998) and Bioshock (2K Australia Pty. Ltd. & 2K Boston, 2007)). However, they would not be considered ambient unless gameplay was occurring in them while the player was focussing their attention on a different part of the play area.

As well as in Civilization IV ambient nesting occurs in many strategy games, where large amounts of information must be accessible to the player and where the player has wide range of things to do; needing different user interfaces for manipulating things (units, buildings and so on) in the game world. For example in the 4X (eXpansion, eXploration, eXploitation and eXtermination (Rogers, 2010, p. 11)) Sins of a Solar Empire (Ironclad Games, 2008) gameplay takes place across many star systems. The game features a powerful zoom that allows the player to zoom in to act around a single space ship or zoom out to view nearby planets or the local group of stars.

Figure 40: Sins of a Solar Empire: zoomed in

Figure 41: Sins of a Solar Empire: zoomed out

When zoomed out, details of game events around planets are hidden from view, even though they are still continuing. In this example a player can issue orders to their ships and then move their attention elsewhere while those orders are carried out.

Imagining a hierarchy of nested components is possible. Some components, high-level nesters, contain many other components while other, low-level nesters, contain few components. A city in Civilization IV might be considered a higher-level nester than an advisor screen. The city screen contains a very large number of different gameplay components. The advisor focuses on a single area and has many fewer components.

Nesting allows many currently functioning gameplay mechanisms to be hidden from the player, while they continue. For example, opening a city allows access to information on the construction of buildings. That is, the player can access functioning gameplay mechanisms that were previously hidden. This supports the idea of a player having a range of engagement with a game, able to either ignore or focus on the hidden gameplay mechanisms; while the mechanisms continue to function persistently.

Considering the level of information in any game component allows the development of a framework, similar to nesting. Level of information can be considered as how much information is contained, or hidden, within the current item onscreen. For example, a city icon on the map screen allows the player to access a very large amount of information. Whereas a Settler character has much less information attached to it. The city icon may be considered information heavy, the Settler considered information light.

This information weighting could be thought of as one attribute of the ambience found in games. Therefore, components that are both informationally heavy and are high-level nesters are likely to contribute to the overall ambience in the game by hiding active gameplay mechanisms. In Sins of a Solar Empire the zoom function also acts as an information zoom. As the player zooms out from being focused on a single ship more and more information is present within the containers (planets) that become visible. The information currently hidden in the containers (planets) onscreen was still present when the player was focussed on a single ship, but it was hidden off-screen. As the player zooms out the hidden information is represented onscreen by the planets that appear. The ambience of player initiated actions occurring throughout the game world is present whether the play is zoomed in or zoomed out. However, without nesting information within planet containers the game would be unplayable. Without the ability to zoom out and view the full play area the game would be unplayable since the player could never get a full strategic overview of what was happening if they could only view one ship at a time, especially since this game runs in real time. Similarly, if there were no planet containers to hide information then it would be impossible to play the game since there would be no way to display all the information simultaneously onscreen.

Consequently, the total information weight of a game like Sins of a Solar Empire, or Civilization IV, makes the use of some kind of nesting mechanism inevitable in order to prevent the player being overwhelmed by masses of details. As soon as this hiding of information, and game events, from the player starts to occur, the instances of ambience in the game also increase.

6.4.5 Game world: complexity and abstraction

As parts of the game are hidden away within containers so the way that those containers are represented becomes more graphically abstract and removed from the actual things they represent. Similarly, other elements in the game become more abstract. In this way, there can be considered to be a range of abstraction within the game, with the amount of abstraction in the game changing over time.

Mechanisms that support ambience can appear at any level of abstraction, from concrete, physical movement of units to highly abstract ideas of focussing on (prioritising) different activities (production, commerce, research and so on).

In Civilization IV the units are tokens that represent real world items; the units are not representations of real world items all created at the same scale. At the start of the game this is perhaps less apparent. The player controls Warrior and Settler units, both of which are of similar scale and seem to walk over fields, deserts and so on in a perfectly natural way. However, they tower over trees and hills on the map and are almost as tall as mountains. Then later in the game discontinuities in scale of the units become more apparent as units such as Stealth Bombers appear and are of a similar size to the human units. This increasing absurdity of scale emphasises that the units are only tokens, abstractions of actual things. This relates to the previous idea of nesting, with the representation of information by the unit graphics. So, alongside the change in graphical abstraction there are also changes in informational abstraction, with less literal renderings of items in the game and attributes of units and characters being given as numbers. For example, the relative strengths of units are not shown by their graphical size.

When the first city is built and the human units tower over it the abstraction in the game becomes explicitly clear. The city model on the map is only a representative token, not an actual geographically accurate model of a city.

In this way the game can be seen to be fundamentally abstract. There is no literal interpretation of the real world, just a series of tokens that represent actual items.

Compare this with a ‘god game’ such as Black & White (Lionhead Studios Ltd., 2001), where the villagers live in a more or less accurately scaled environment, to which they are also more or less accurately scaled. Civilization is more abstract than Black and White. In Black & White there is less information hidden from the player; a villager represents a villager, not a group of villagers.

During Civilization IV abstraction seems to increase as the token nature of unit graphics becomes more obvious; for example, a Stealth Bomber and Worker are both of similar size on the game screen.

Another way in which abstraction increases through Civilization IV is through the game play mechanisms that the player has to focus on. At the start of the game the player only has a couple of units to control (Warrior and Settler). The player is able to move these around the play

map founding a city (Settler unit; mechanism 13, ‘Build city’) and exploring (Warrior unit; mechanism 56, ‘Explore’). Once the first city is built this immediately increases the number of abstract items in the game: the city is an abstract representation of elements that might be found in a real city. When increasing the size of a city the player has to work with abstract representations of buildings, units and so on. They do not physically build the buildings or make the units. Rather they start an automatic creation process that, after a time, results in the completion of a building or unit. This abstract construction process is different from more literal process moving Warrior units around the map.

As the game progresses, the player normally builds more cities and starts to interact with other rulers and play moves away from literal interactions, which are often automated, to more abstract interactions with the game mechanics. The game also gains information as play continues and the increase in abstraction supports this, with more abstract representations of actions and items.

The level of abstraction in terms of gameplay increases over time. As it increases players have more to keep track of (more cities, more units, more enemies and so on). Players are forced to move away from a literal view of game interactions (Warriors walking from one location to another), to a more abstract engagement with the game. They move away from the micromanagement at the start of the game to a higher level of abstraction where many actions are automated.

Abstraction in any particular game is perceived differently by players as they move from ‘novice’ to ‘experienced’ (Juul, 2007). Civilization seems to support this progression from novice to experienced as the complexity and the degree of abstraction increases over a game. Clearly experienced players will sometimes start new games and so return to a ‘novice level’ of abstraction, with a more direct relationship between onscreen tokens (characters, cities) and the things they represent. The experience of a seasoned gamer playing the early stages of a Civilization game is likely to be different to that of a new player; the experienced player having a deeper understanding of the consequences of their actions. However, although the experienced player has this deeper understanding they will still be experiencing the game at a lower level of abstraction.

As abstraction increases so ambience increases with more gameplay events occurring away from the player’s awareness. This is not true of all games, but is true of the Civilization range of games. Abstraction is a key mechanism for controlling the amount of ambience in a game as the player’s focus (see comments on engagement in Chapter 2) is able to shift between different abstract tokens that contain information and gameplay actions. Player attention may not only shift between different tokens but also shift between levels of abstraction in a similar way to the informational zoom in Sins of a Solar Empire. At a low zoom level in Sins of a Solar Empire, the player is presented with a detailed graphic of a space ship. As they zoom out they are presented by planets that, although looking realistic, are not realistically laid out as they would be in actual space. There are comparatively small distances between the Sins of a Solar Empire planets rather than the astronomical distances of planets in the real world. The planets

are abstract representations of planets and their relative positions and connections (‘phase lane’ routes along which ships travel between planets); whereas the ships are ‘realistic’ (within the context of a space opera real time strategy game). In this way the zoom function in Sins of a Solar Empire acts as an abstraction zoom, with the representation of the world becoming further from real life as the zoom increases.

When playing Civilization IV the increasing complexity of play and the increasing number of elements (such as units) in play, means that the player cannot keep their attention on everything at once. The increase in abstraction facilitates an increase in complexity, by allowing more gameplay events. For example at the start of a Civilization IV game, the number of units available to the player will look something like this, figure 42:

Figure 42: A Civilization IV game, turn 0

The player has a unit of settlers and unit of warriors only. They have no cities yet. After 50 turns the player may have built a city or two and also created many more units.

Figure 43: A Civilization IV game, a city at turn 50

The city view shown above, figure 43, may be accessed by the player, but is not visible all the time; mechanism 80, ‘City screen’. The information and gameplay possibilities in this screen are hidden from the player most of the time and only accessible when this screen has been opened.

When the city screen is closed (see the previous description of nesting) then it is represented by a cluster of icons, each of which is an abstract representation of some part of the city.

As well as increasing number of units and larger cities the number of cities also increases through the game (see the diagrams below), making greater demands of player attention resources. The greater demands on player attention resources and the increases in abstraction during the game give an argument for the complexity of the game increasing over time. As the game continues there are many more gameplay activities occurring. Simply viewing a game map at the start and end of a game shows very clearly how complexity increases.

Figure 44: Start of Civilization IV game units and city

Figure 45: End of Civilization IV game units and cities

Within Civilization IV the increase in complexity is accompanied by an increase in the amount of ambience (see the previous comments in this section on increasing information and increasing abstraction) as the game contains more information, more gameplay events. Also, this increase in complexity is facilitated by mechanisms that support ambience. If there was not an increase

in ambient mechanisms then the game would become increasingly difficult to play as events multiplied. If city nesting (which supports the ambient properties of persistence and a range of engagement) was removed so that everything that was happening in a city was visible on the map screen, then fitting all the data for even just two or three cities would be all but impossible and would completely fill the screen. Much of the map would be obscured rendering the game virtually unplayable (the player unable to manoeuvre their units around the obscured areas of the map).

Note that complexity is not required for ambience. For example, consider a game like FarmVille (Zynga, 2009). FarmVille players are able to leave the game running persistently in the background while they do other things; even closing down their computer, leaving the game running on Zynga's servers. So, FarmVille has a high degree of ambience (persistent, range of engagement) and yet is not a complex game to play, centred on planting and harvesting crops for rewards.

Similarly, removing the ambience enabling automation of unit activities would force the player to micromanage every single event in the game. The automation of many repetitive activities removes much drudgery from the game. This enables the player to spend more of their gaming time focussing on strategies and tactics, rather than housekeeping. In The Sims responsibility is off loaded from the player when micromanagement is removed (Maxis Software, 2000; Rouse, 2001, p. 404).

In Civilization IV once the city window is closed the player no longer has the information and city gameplay opportunities immediately available to them (see the city window in figure 43). Instead they have a view of the play map; depending on the level of zoom they may have a large area of the map in view. Gameplay continues within the city while the player is playing elsewhere. At this time the player initiated play in the city has been rendered ambient; it continues persistently in the background, creating gameplay effects, but without direct and immediate input from the player. As the complexity has increased, so the ambience has also increased. See previous comments on the turn based nature of the game; since the game is not running in real time, persistent changes in the city rely on player input, if only clicking the 'next turn' button.

As the player creates more cities, they also create more ambience in the game. While the player is viewing the main map, each of their cities contain gameplay that has a direct effect on the game, but is outside their knowledge, beyond their control until they access them, one at a time. Clearly there has been an increase in the number of gameplay items the player can interact with. The complexity has increased. The ambience can be seen as player initiated events that are away from the player's attention.

In addition to the gameplay hidden in the cities there are many other hidden gameplay elements. For example, units may be automatically working (building roads, farms, land improvements and so on) beneath the player's notice; mechanism 120, 'Build route', mechanism 123, 'Build farm', mechanisms 124 to 134, build farm chain, fort, lumber mill, mine, pasture, plantation and so on. Trade may be continuing, agreements between rulers being enacted, technologies being researched. Without the hiding of gameplay it would be impossible

to have an increase in complexity in the game; the increase in scope as the number of cities and units increase. The limit would be the amount of information that could be concurrently shown on the screen. This seems to be a property of ambience, moving events away from the player's attention. In this way ambience is fundamental to Civilization IV, enabling Civilization IV to have such rich gameplay through the low-level mechanism of hiding information and gameplay events.

In contrast to Civilization IV some other games have little or no gameplay hidden, and hence may be considered to be low in ambience. The whole of the game is on screen in front of the player. There are no hidden mechanisms, information or actions. Everything is onscreen all the time. For example, in Space Invaders (Taito Corporation, 1978) the whole play area is on screen at once. The player can see everything that is happening. Consequently there is no ambience in Space Invaders.

Figure 46: Space Invaders

6.4.6 Persistence

Civilization IV does not run persistently outside of play sessions, in the way that massively multiplayer online games continue outside of play sessions. However, while Civilization IV is running, during a play session, over a series of turns (see comments on turns), events happen away from the knowledge of the player, in the background, and so may be considered as running persistently.

Persistence is a key indicator of the presence of ambient gameplay. Specifically, persistence supports the ability of gameplay to continue without player intervention. Any game that runs persistently contains ambience.

When played normally, as opposed to played and analysed for research, Civilization IV is not a good example of persistence. However, that it does have some features of persistence does add to the evidence of it as a game that contains ambience.

In Civilization IV 28 mechanisms continue without ever stopping, such as mechanism 170, 'Trade resources annually; a further additional 30 mechanisms continue over a number of turns modelessly (without player actions), such as mechanism 120, 'Build route'. That gives 58 out of 196 total mechanisms that have some persistence qualities.

6.4.7 Modelessness

Within Civilization IV there are 62 modal (pause game and wait for player input) and134 modeless (game continues, though there may be the possibility of player input) gameplay mechanisms (see the definition of modelessness). For example (modal), when research is complete on a particular technology a modal dialogue box appears asking the player to choose the next thing to research; mechanism 108, 'Choose technology research'. For example (modeless), once started, farm building continues automatically in the background until complete, though this can be interrupted at any time and stopped; mechanism 123, 'Build farm'.

Modeless mechanisms allow the game to continue persistently in the background while the player's attention is elsewhere. Consequently, modelessness is an important defining quality of ambient gameplay.

6.4.8 Conclusion

Key ambience supporting mechanisms have been identified in Civilization IV, and, where relevant, have been set in a wider context by referring to other games.

Study three has revealed a number of properties as important to ambience by looking at the low-level mechanisms of Civilization IV and identifying ways in which these might support ambient gameplay. Evidence found that supports the previous ideas about ambience. Ambience supporting properties identified in Civilization IV were particularly well supported by the 136 mechanisms that were 'modeless' and/or 'continuing'. The properties supporting ambient gameplay are:

- Engagement
    - Attention (resources, distribution and density)
- Game world: engagement
    - Distance
    - Fogs
    - Nesting
- Game world: complexity and abstraction
    - Complexity
    - Abstraction
- Persistence
- Modelessness

In the next chapter these results are brought together with the schema derived from the results of studies one and two to create a robust set of properties that support ambient gameplay.

Chapter 7 Findings

7.1 Introduction

This section builds on the results of the three studies, in particular bringing together the design research results (studies one and two) with the analytical investigation (study three).

The high-level schema (drawn from data described in Chapters 4 and 5) and properties of ambience (described in Chapter 6) are contrasted and compared to generate a set of properties that support ambient gameplay. These are then used to create a definition of ambient gameplay and in chapter eight to create investigative lenses for describing ambient gameplay.

Properties of ambience	**High-level schema**

• Engagement
  ○ Attention (resources, distribution and density)
• Game world: engagement
  ○ Distance
  ○ Fogs
  ○ Nesting
• Game world: complexity and abstraction
  ○ Complexity
  ○ Abstraction
• Persistence
• Modelessness
	• Engagement
	  ○ Affect
	  ○ Focus, attention and commitment
	• Context
	  ○ Persistence
	  ○ Location
	  ○ Player attributes (hardcore, casual, mood)
	• Invention
	• Complexity and ambiguity
	• Discovery
	  ○ Pre-coded
	  ○ Player constructed

Table 1: Properties of ambience and high-level schema

The properties of ambience detail ways the high-level schema elements are implemented and show ways of providing game spaces for the high-level schema to operate in. The high-level schema should not be thought of as containing the properties.

Context was one of the defining properties of ambient music (where is the music played?) and also one of the original defining properties of games with ambience (where, when, who?). In Civilization IV the context of where the game was played, and by who, was not considered. The investigation of Civilization IV was into gameplay and the game world provided a context for gameplay. The player was engaging with the game world and this might be considered as context in the properties of ambience column in the table above.

There is not a separate 'gameplay mechanisms' label in the high-level schema but they are central to any game. Everything in the high-level schema is acting on or through gameplay mechanisms. The concept of ambience as defined in the high-level schema and properties also

works through gameplay mechanisms. In this way ambience is solidly rooted in the functionality of the game and has a direct impact on gameplay and player experience.

7.2 Engagement, attention and affect

The attention distribution and density properties relate to the spectrum of player engagement in the high-level schema. In the properties of ambience, when playing a game, the player's attention resources are spread around the play area, with different amounts (density) of attention at different places in the game space. In the high-level schema there is an idea of the existence of a spectrum of player engagement that is focussed on the game; the spectrum allowing for different amounts of attention over time.

There is a very close correlation between the idea of a spectrum of player attention (high-level schema) and the idea of a finite quantity of attention that is spread around the game world (properties of ambience).

The use of the player's limited amount of attention resources is a process of moving their attention from one part of the game to another. The amount of attention focused by the player at any one time may also vary, both density and distribution.

Nesting is a way of controlling both information and gameplay. Each nested item (screen, popup or dialogue) may be considered a separate game state. For example, the city screen is a game state. Although affect is listed in the high-level schema, this was not identified as a particular property in the third study. That Civilization IV generates emotions and visceral excitement in players is unquestionable (as evidenced by reviews, blogs, wikis and other online resources devoted to the Civilization games). However, this also seems to be true of all games. They are all designed to create an emotional response in the player, even if it is just to encourage a player to achieve something (Adams, 2010, p. 104). However, games create more than just an emotional response, they create an affective response: 'a kind of participatory action and circuits of kinaesthetic pleasure' (Moore, 2011). The affective response to ambience has not been shown to be qualitatively different from the affective response to gameplay with no ambience. As a consequence affect does not seem to be a useful property when considering ambience. Certainly it is present, but if does not help identify ambience.

7.3 Persistence

Although the property of persistence less clearly differentiates between types of music, it is significant when considering games and whether they continue while the player is not engaged with them. Persistence was noted as present in the high-level schema and the properties of ambience, though only present to a limited extent in the game Civilization IV Complete.

Persistence is an important element of ambience. In both the schema and properties persistence exists as a background state of the games.

7.4 Modelessness

Many game mechanisms, and virtually all the mechanisms supporting ambience identified in Civilization IV, act modelessly. The modality of individual mechanisms was not considered in the high-level schema. However, modelessness does support a spectrum of player engagement, allowing players to either ignore a mechanism or focus in on it and potentially make changes.

7.5 Complexity, ambiguity and abstraction

Complexity in the high-level schema is tied in with player perceptions and experience. Although complexity increases in the game as an absolute measure of the number of units and other mechanisms in play the player perception of complexity can vary from one player to another; an experienced player's perception of the complexity of the game varying from the perception of an inexperienced player.

The high-level schema states of complexity and ambiguity may be thought of as snapshots of the player's perception of the current set of gameplay mechanisms they are engaging with. All of the properties of ambience contribute to the states of ambiguity and complexity; they all contribute to the player's experience and perceptions. Abstraction in the properties of ambience moves from concrete, direct correspondences between units and the things they represent (both graphically, informationally and in terms of gameplay). For example (as previously noted in Chapter 6), settlers at the beginning of the game representing small groups of nomads looking for somewhere to establish a more permanent community compared with the list of buildings within a city later in the game. The list of buildings in the city screen has small thumbnails representing each building, but this is further removed from the thing itself than the animated settler characters that walk around the map looking for somewhere to found a city. As the representations of elements in the game become more abstract there is more chance of player misinterpretation. The representation of a settler is fairly unambiguous, whereas the small building graphics might suggest a number of different buildings. For example, the Intelligence Agency icon could represent any number of different buildings. Even when this icon is 'selected' the close up graphic of the Intelligence Agency could apply to many different institutions.

Figure 47: Settlers

Figure 48: Intelligence Agency icon

Figure 49: Intelligence Agency selected

The settlers could be interpreted as having a different function, though they do not have the weapons of warrior units. They look like travellers, with their staffs and packs. There is a much more direct correlation between the settlers and their function in the game than the Intelligence Agency graphic and the function of the Intelligence Agency in the game. Game information is delivered with greater levels of abstraction and the gameplay also becomes more abstract.

As indicated in the high-level schema, and above, perceived complexity is constantly varying and is linked to ambiguity. Complexity, in the third study, increases over the course of the game and is a real measurable quantity, in the case of Civilization IV, related to the increasing number of units, cities and so on in play. Although subtly different from the high-level version of complexity, the study three version still comprises ever increasing numbers of units and cities that may (according to the high-level schema) drive discovery and player invention, as there is more to discover and manipulate. Note that the units and cities are all interactive. An increase in complexity is not just connected to a larger number of items in the game, but to gameplay active elements.

7.6 Discovery, distance and nesting

The high-level discovery process is supported by many of the study three ambient properties. For example, distance supports the process of geographical discovery. There are different ways in which distance affects games, but discovering previously undiscovered areas is a ‘distance related’ activity with potential for supporting ambience.

The ambience of player initiated mechanisms operating at a distance from the player’s attention, or focus, clearly facilitates a process of discovery. Both discovering things placed in the game by the developers (new technologies in the Civilization IV tech tree, for example) and emergent, player initiated things, such as enemy forces massing on borders in response to expansion of the player’s empire. In this way not only is distance one property that enables discovery, but also the ambience associated with distance is clearly at the heart of discovery, at

a very low, fundamental level. Fogs of war and discovery also are mechanisms that facilitate discovery at a fundamental level.

The low-level property of distance can also be applied to player engagement. In the high-level schema discovery drives player engagement. The discovery of game elements at a distance, or even just thinking about game elements away from the player's current view can be seen to drive player engagement. Imagine playing Civilization IV. The player sends a unit off automatically exploring. Events are soon occurring away from their view (on a part of the map not currently on the screen). As the player engages with the game (emotionally and intellectually), they may choose to move their attention, or focus, to the unit that is exploring. If they do this then the act of discovery is driving player engagement. Both player initiated events happening ambiently and events happening automatically (but not as a direct result of player actions) at a distance (real, concrete gameplay mechanisms) are the means for both discovery and player engagement.

Nesting in Civilization IV may contribute to the perceived complexity of a game by both hiding and revealing gameplay. Nesting intrinsically supports pre-coded and player constructed discovery, allowing the player to open game windows (the city screens in Civilization IV, for example) to reveal information and gameplay. The way that nesting serves to hide gameplay is similar in effect to placing gameplay at a distance (in the game world but off-screen).

7.7 Invention (emergence)

The process of player invention is an all-encompassing property at the heart of the high-level schema. As has been previously noted, emergence is something that occurs during play whereas 'invention' is something players actively do. In Civilization IV the sheer complexity of the game (number of units and gameplay mechanisms) supports emergent play through player invention. There are clear links between the low-level properties of Civilization IV and player invention. In a game like Civilization IV player invention is right at the heart of virtually all gameplay. The player is creating their own civilization, founding cities, creating transport networks and so on. The game is not solely about player invention. For example, the player may also be engaged in military strategies, conquering neighbouring cities and empires, all emergent play. However, even when engaged in military campaigns the player is creating their own strategies. They are creating their own unique empire and armed forces; given the complexity of Civilization IV the chances of two players having identical games seems unlikely to the point of impossibility. However, players may often be playing with similar collections of units, developing technologies in a similar order and building similar sets of buildings.

Many other games support player invention at a fundamental level. Minecraft (Mojang AB, 2009) is an extreme example of a game founded on player invention, with play revolving around construction with blocks. The invention in Minecraft is facilitated by construction in contrast with the invention in Civilization where player invention is facilitated by strategies. Minecraft has many ambient features such as persistence, things happening at a distance, complexity and the possibility of player attention being widely spread. As with Civilization IV player attention

spreads out as they construct more. Minecraft is a good example of a game in which ambience is a key feature, with many things happening away from the player's immediate focus, but also with the possibility of many levels of attention on any particular area of the game.

An example of a game that does not support player invention, despite having a large rich environment for the player to explore is Myst (Cyan Worlds Inc., 1994) (or any of the other single player Myst games). Myst comprises a series of puzzles that must be solved in order to progress through an entirely pre-scripted, developer written plot played out through full motion video and pre-scripted cut-scene sequences. However, although not containing player invention, Myst does contain other low-level properties that support ambience and high-level ambient schema elements. Discovery is encouraged, though this is all pre-coded. Myst is complex and contains many puzzles that, until solved, appear ambiguous. Unlike games with ambience it requires a continuous high-level of player concentration and engagement in order to progress; there is no gameplay that runs automatically in the background. Although Myst has much non-gameplay ambience, particularly the later games in the series, such as various incidental fauna, it has few properties of ambient gameplay.

The massively multiplayer online version of Myst, Myst Online: Uru Live (Cyan Worlds Inc., 2007), introduced gameplay that supported ambience (persistent, player initiated play away from the player's current location). There were still pre-made puzzles to solve, but solving these required groups of players to act cooperatively. As a consequence puzzle solving incorporated a social element not present in the single player game. Unlike the single player games there were many opportunities for player invention, working individually or together to create new Myst mythos and stories.

Examining the single player Myst games and the massively multiplayer Myst game from an ambient perspective, with both the properties of ambience and high-level schema, allow fundamental differences to be observed and could allow designers to gain a deeper understanding of how players might react to the different styles of play.

The massively multiplayer version of Myst was commercially unsuccessful. Perhaps one way of viewing this is that the increase in ambience within this title alienated the single player Myst fans, who were used to playing within an immutable, 'progression' (Juul, 2005, p. 71) game world that demanded their full attention throughout all gameplay. More research would be needed to confirm whether this was true or not, but viewing these games from an ambient perspective does enable asking fundamental questions about the player experience from a novel angle.

7.8 Conclusion

In this Findings chapter the results of the three studies have been compared to draw out common themes. Ideas of attention and engagement, complexity and ambiguity, discovery, distance and nesting have drawn on previous study results to create a richer understanding of these ideas and how they operate in relation to ambient gameplay.

After being identified as a fundamental, defining property of ambient music, a range of levels of engagement has been shown to also be a defining property of ambient gameplay.

Persistence has remained as a key property of ambience, right from the original definition of ambience in relation to music through to these findings.

Nesting has been identified as a key property that ties in with discovery and distance to support a common theme of hiding information and gameplay.

Invention is once again identified as a key property applicable to both the high-level schema and low-level properties. However, (as noted in the second study, see Chapter 5) invention has not been shown to be unique to ambience. Invention has been shown to be fundamentally associated with emergence; so although still included as a strong property of all the games investigated in this research there is much evidence that it occurs in a very wide range of other games. Consequently invention is being excluded as a defining quality of ambient gameplay.

The following ideas are taken forward from this chapter:

- Engagement and attention
- Persistence
- Modelessness
- Complexity, ambiguity and abstraction
- Discovery, distance and nesting

In the next chapter the ideas in this chapter form the basis of discussions of ambient gameplay and also of possible applications of ambience in order to build a fuller, deeper understanding of the way ambience operates within games. This deeper understanding is then used in the final chapter to generate investigative lenses.

Chapter 8 Discussion

8.1 Aims and introduction

The aim of this research is to develop investigative lenses to give game designers and others a better understanding of ambient gameplay. The hoped for consequence of this better understanding is that developers may be able to provide richer, deeper gameplay experiences to increase player enjoyment and are able to also gain more control over their game designs. An improved understanding may also lead to the accomplishment of more positive change in the world through games.

This discussion chapter includes an improved definition of ambient gameplay, based on the findings of the studies. This is then used to create six investigative lenses for identifying ambience in computer games. This is an important, original contribution to knowledge. Possible uses of ambient gameplay are then suggested, in order to explore the practical applicability of the definition and lenses.

8.2 Defining ambient gameplay

Ambient gameplay was previously defined, based on an investigation into ambient music. The original definition comprised four parts:

- Engagement
- Affect
- Persistence
- Context

The three studies in this research have investigated the implications of firstly applying that definition to creating games and secondly searching for ambience, based on that definition, within an existing game. The results of these studies have enabled parts of the original definition to be confirmed as properties of ambience and other parts to be discarded. Therefore, the definition of ambience in gameplay arrived at from the studies consists of:

- Engagement and attention
- Persistence
- Modelessness
- Complexity, ambiguity and abstraction
- Discovery, distance and nesting

In this chapter these results are used to develop a clear definition of ambient gameplay, that is then used to create investigative lenses for identifying ambient gameplay processes.

When ambience is found in a game then events may occur away from the player's attention, but which the player may choose to focus their attention on. In order to support this range of

engagement and attention the events may be modeless; the player's attention is not demanded and the game can continue with or without player involvement.

Gameplay events may be away from the player's attention by occurring at a distance in the game world, beyond the player's immediate view; or they may be hidden by, for example, being nested within a container that the player cannot see inside or by being obscured by a covering (as in a fog of war). These events may happen simultaneously at many game locations and are not confined to a small area around the player. Not only may events be occurring simultaneously but also they are likely to be persistent, continuing even when the player is not engaging with them.

Importantly, to differentiate these persistent, unseen events from the normal functioning of automated game events driven by the games' AI they must result from player gameplay actions in order for them to be considered ambient, that is, they must be player initiated.

Varying complexity, ambiguity and abstraction in games have been an important qualities in the studies. There has been both perceived and actual variations in these that have supported the range of engagement and attention found within games with ambience.

Pulling together the properties that have been discovered as defining ambient gameplay writing a succinct definition is possible:

> **Ambient gameplay in computer games appears as the persistent presence of player initiated modeless game events that the player may ignore or focus attention upon. The player may have greater or lesser engagement with these events, which may be hidden from the player and may be occurring simultaneously within the game world.**

This definition is an original contribution to knowledge and is an important step in the process of developing lenses for investigating ambient gameplay.

8.3 Lenses for identifying ambient gameplay

8.3.1 Introduction

In this section investigative lenses are described that enable the identification of ambient gameplay. These are directly based on the definition, which was directly based on the results of the studies carried out in this research.

The lenses are expressed as statements of the properties that a game containing ambience is likely to contain. Each statement is followed by questions that can be used to discover if the game contains those properties.

8.3.2 Six investigative lenses for identifying ambient gameplay in computer games

A computer and video game containing ambient gameplay is likely to:

1. **Persistence**

- Contain persistent gameplay.
    - Do gameplay, and game events, constantly continue without breaks?

2. Attention

- Allow player initiated game actions to occur away from the player's attention.
    - At any instant, where in the game are gameplay events occurring?
    - Where do gameplay events that the player is not aware of occur, for example hidden in nested containers or at a distance from the player's current location?

3. Locative simultaneity

- Have gameplay events occurring simultaneously at different locations within the game world.
    - Are simultaneously occurring gameplay events distributed widely throughout the game?

4. Modelessness

- Use modeless functions, events and mechanisms, including the ability to interrupt modeless decision points in the game.
    - Are there points in the game where ignorable information is supplied to the player?
    - Are there points in the game when ignorable, but significant, gameplay events are occurring?
    - Are modeless events in the game interruptible by the player, for example, to change strategies?

5. Automation

- Allow automation of a (large) number of player initiated functions, events and mechanisms and may allow interruption of those automated functions, events and mechanisms in order to update the instructions controlling them.
    - Can many player activities be automated?
    - Can the player control and/or influence the events occurring in these automated systems?

6. Abstraction

- Use abstract representation to allow many events and/or large amounts of information to be located within the user interface. For example, representing large complex systems with single icons.
    - Are some events/information not shown and remain hidden from the player (though they are discoverable)?

These lenses are an important and original contribution to knowledge.

Not all of these need apply in order for a game to contain ambient play. Even a game with only a small subset of these may be considered to contain some ambient gameplay. These lenses are not for identifying the amount of ambience in a game; just whether it is present (limitations are discussed in Chapter 9).

8.4 Possible uses of ambient gameplay

Ambience enables the game designer to understand a range of game parameters and features that affect the player experience of games and hence possibly their emotional involvement in games. Consequently, ambient gameplay might be used to manipulate the player experience.

Ambient gameplay gives the game designer an insight into:

- Providing hidden gameplay that continues away from player's full attention - resulting in 'player discovery'
- Moving player attention around the gameplay space
- Manipulating player attention resources, including distribution (wide to local) and spread (thin to thick)
- Increasing available information (increase information density and information volume of the game)
- Controlling abstraction, ambiguity and complexity
- Decreasing information the player needs to be aware of in order to play (store information ambiently).

8.4.1 Hidden gameplay

Player initiated gameplay events happening away from the player's attention, especially away from the player's view, may result in changes in non-player characters and/or the game world. These changes may then be discovered by the player, often as a result of player exploration.

Exploration is a major feature of many games, especially those with large environments that the player has to traverse during play. The game environments may be more constrained and linear so that the player is guided through a series of pre-defined locations and experiences, Juul's 'progression games with emergent components' (2005, p. 71). For example, this is typical of many first person shooters (Doom (id Software Inc., 1993), Quake (Id Software Inc., 1996), Unreal (Epic MegaGames Inc., 1998) for example), in which the player makes their way through a number of levels. This type of exploration does not involve ambience, but comprises pre-scripted events that play out in very similar ways each time.

Some open sandbox game environments give the illusion of ambient gameplay events occurring away from the player, but actually consist of a series of predefined game events. For example, in the Elder Scrolls games Morrowind (Bethesda Softworks, 2002), Oblivion

(Bethesda Softworks, 2006) and Skyrim (Bethesda Game Studios, 2011) the player has large open worlds to explore and there is the illusion of a living world in which people and creatures continue their lives away from the player's view. However, events in the games all occur in the immediate vicinity of the player, triggered by the player's actions. There is the illusion that there are many gameplay events occurring in the worlds away from the player's view; however, this is only an illusion. Nothing is happening in the game world away from the player character.

So, in these games there is discovery, but this is not discovery of ambient events and their results.

In a game like Civilization IV player initiated gameplay events are actually occurring (ambiently) in the game world, away from the player's view. These player initiated events affect the game, they are not purely cosmetic. Exploration enables the player to discover these.

Gameplay events can also be hidden in containers. For example, the cities in the Civilization games have many events happening in them, even while not viewed by the player. On the main map screen they appear as iconic cities that may be clicked to open up a window with full details of what is occurring in the city. The large number of game events occurring within the Civilization games is made possible by hiding many of them away; showing them all on screen at any one time would not be possible. This large number of events allows for nuanced gameplay with subtle variations in player and non-player behaviour possible. The possibility of, for example, taking a more or less aggressive stance in these games suggests that the emotional engagement of the player can be varied. Compare this with the first person shooters previously mentioned in which the player is required to take an aggressive role in order to progress through the game, with fewer options for subtlety of emotion.

8.4.2 Moving player attention around the game space

In games with ambience events are occurring away from the player and frequently are distanced from the player geographically, within the game world. Player attention can be drawn around the play area in order to keep track of what is occurring. The player's attention varies from ignoring actions in the game world to being intensely involved in actions in particular parts of the game world. The player can be drawn to different events by messages that appear modelessly during play. For example, in Civilization IV messages appear near the top of the screen reporting on events in the world. The player can choose to investigate these or they can ignore them. In addition to directing player attention geographically around the game world players can also be directed to nested screens (such as city or advisor screens in the Civilization games).

8.4.3 Manipulating player attention resources

Closely connected to moving player attention around is the technique of controlling the amount of attention the player has to pay to any particular part of the game.

Hiding events away from the player, reduces the amount of attention the player has to pay to the game (they can ignore the hidden events, if they wish). If a player can be considered to

have a finite quantity of attention to use on the game then it is possible to create enough activity within the game to demand all of this attention in order to play successfully. Additional activity can be added to the game without the player knowing, if it is hidden away from the player. In this way, the total number of events occurring in the game can be much higher than the player can focus on at any one time. However, although there are a very high number of events they do not overwhelm the player if they are both hidden away and if the player has some control over the amount of attention they are giving to them. For these hidden events to be considered ambient they should be player initiated; in this way there is a distinction between hidden ambient events and hidden AI events.

At the start of a game such as Civilization IV there may be less to demand the player's attention as the game world is comparatively empty. However, as play progresses the game world gets massively more complex as additional units, buildings, technologies and so on are added to the game world. Managing this increase in complexity so that it does not overwhelm the player is possible by ambiently hiding player initiated events. A player's finite attention resources are shared and focussed on the different parts of the game by means of choices made by the game designer about what to make explicit to the player and what to place where the player can choose to access it.

Additionally micromanagement can be reduced, or removed, from games using similar techniques of automating activities within the game. Once again these activities may be considered ambient if they are player initiated.

8.4.4 Controlling abstraction, ambiguity and complexity

Increasing abstraction during a game may be a consequence of increasing numbers of events and units. A result of the increasing numbers of events and units is that, as has previously been noted (see Chapter 6), information on events and progress in the game becomes hidden away from the immediate attention of the player. The increasing abstraction occurs alongside an increasing pressure to push things into the background; an increasing pressure towards the use of ambience.

Frequently in games situations are not explicitly clear, the player is not one hundred percent sure of what they need to do next in order to progress in the game, as in the study games. These moments of ambiguity allow the player to interpret the game in two or more different ways.

When ambient events are happening away from a player's attention, they exist in an uncertain state from the player's point of view and can be interpreted by the player as occurring in many different ways. This ambiguity then crystallizes into a single solution when the event is observed by the player. For example, imagine playing StarCraft II: Wings of Liberty (Blizzard Entertainment Inc., 2010). The enemies are working beneath a fog of war in response to player actions. As long as they are obscured the player cannot see the enemy and can imagine them as very powerful or very weak. The actual state of enemy deployment is ambiguous; the disposition of forces may exist in more than one state within the player's mind, resolving as

more information is collected, until ambiguity disappears and the player is aware of their state (focussing attention on them). Consequently the amount of ambience in a game has a relationship with the amount of ambiguity. An increase in ambience in a game can be used to create more or less ambiguity; especially by means of how much, and what, is kept hidden or revealed.

As has been previously noted, ambience can be used to control player access to data in a game. Large amounts of data, that continues to act on game events, can be hidden away from the player. The way that all this data interacts on game events, and the player's character or characters can be highly complex, but once again this can be hidden away from the player. The data can be accessible to the player, but they have a choice about accessing it and may choose to ignore it, leaving it in the background.

For example, when playing a computer role playing game such as Baldur's Gate (BioWare Corporation, 1998), which is based on Dungeons and Dragons (Gygax & Arneson, 1977), a large part of the dice rolling and statistics that are required to play the game using pen and paper are hidden away from the player. The player can access this information if they wish, but they can also largely ignore it and continue playing successfully. More recent games such as Elder Scrolls V: Skyrim have introduced graphical interface components that hide many of the statistics. For example the points required to level up in Baldur's Gate are given as a number, in Skyrim this is shown graphically as a bar. The accumulation of experience points continues as a background task in both games, but the player is not required to focus their attention on this. The acquisition of experience points is largely an ambient mechanism, driven by player actions in the game and is ignorable.

The consequences of gaining experience points and levelling up are far reaching and complex. In Skyrim players' receive modeless (ambient) reminders when they have gained enough experience points to level up. They can choose to engage with these and level up or can ignore them.

By using an ambient approach game designers can choose to create very complex games, which can still be played without overloading the player with gameplay events and information. Without employing the sorts of ambient techniques previously detailed players would be confronted by more information than would be possible to easily take in. Imagine Baldur's Gate without nesting; trying to display all of the character statistics for a Baldur's Gate player character party of six characters on screen with the play screen, inventory screens, journals and maps.

8.5 Conclusion

This chapter has included a wide range of discussions of ambient gameplay. A definition of ambient gameplay has been developed, drawing on the study findings. Lenses for investigating ambient gameplay have been derived from the definition. The properties described in the definition and lenses form the basis for a discussion of possible uses of ambient gameplay.

Although this discussion moved beyond the data into more speculative areas this helped in testing boundaries for what ambience might realistically do. The speculative discussion of the uses of ambience also informed ‘Limitations of this research and future work’ in the next chapter.

Chapter 9 Conclusion

9.1 Contextual statement

Ambience is a familiar concept when considering music, but this musical approach to ambience had not been applied to games prior to this research, which started in 2004. Research into the experience of players normally focuses on what they are doing in games, second to second, minute to minute, hour to hour. This research focused on what players are not doing.

Since this research was started in 2004 ideas of ambient gameplay have begun to appear in development and academic communities.

Games such as Eufloria (May, Kremers, & Grainger, 2009) are now (in 2012) being explicitly described as 'ambient' (Kremers, 2012) and games have started to appear that have many properties that support ambience. In particular the gameplay with a Pokewalker pedometer in Pokemon HeartGold (Creatures Inc. & Game Freak Inc., 2009a) was very close to Ambient Quest. There has been an ambient games workshop as part of the AmI-11 Ambient Intelligence conference (16th – 18th November 2011 in Amsterdam) (Sturm et al., 2011).

There appears to have been an upswell in ambient gameplay post-dating the Ambient Quest and Pirate Moods research studies. If the research into ambient gameplay was just starting now in 2012 then it may be that rather than having to create a game containing ambience (Ambient Quest) it would have been possible to use Pokemon HeartGold and SoulSilver (Creatures Inc. & Game Freak Inc., 2009b).

This research started with the idea that producing games with ambience might be possible. The driving force at the start of this research was to create something that shared characteristics of ambient music; specifically the idea that gameplay could continue with a range of player involvement and attention. Once a tentative definition of ambient gameplay was created experimental games featuring ambience were made. Although there were existing games that seemed to contain some elements of ambience, creating experimental games was a focussed way to investigate ambient gameplay. These games were designed to support ambience by enabling gameplay to occur persistently with a wide range of player attention, from no attention to intense attention. An analysis of data on the player experience confirmed the games exhibited ambience as previously defined and was able to refine ideas on ambient gameplay. Until the games were constructed and played it was not possible to unequivocally know the effect on player experience of ambient gameplay. The tentative definition of ambient gameplay was confirmed and refined so that a schema of ambient gameplay could be constructed

In order to establish if the definition of ambience only applied to the research games but had wider applicability, a commercial game, Civilization IV Complete (Firaxis Games, 2007a) was investigated to see if it had elements of ambience. A list of gameplay mechanisms was created and searched for those that supported ambience, those that matched definitions of ambience. A range of existing gameplay mechanisms were identified that supported ambience. Although pre-

existing the research games, and also containing ambience, this commercial game was not expressly created to enable ambient play. The ambience found in it was one aspect of a wide range of gameplay mechanisms.

Findings from all three studies were combined into a definition of ambient gameplay that could be used to create investigative lenses that comprised descriptions of ambient gameplay elements.

9.2 Contributions to knowledge

The original contributions to knowledge that arise from this work are six investigative lenses for identifying ambient gameplay processes in computer games. These six lenses are solidly founded in the studies and contain themes that have recurred through this research.

The definition of ambient gameplay from which these lenses are derived is a further contribution to knowledge.

By defining ambient gameplay and developing a way of identifying this in games the landscape of games research may be significantly altered. The new direction of enquiry revealed has far-reaching implications for the way that games are investigated and designed. This way of thinking about gameplay is also a significant contribution to knowledge.

The definitions of ambience in the literature review clarify the terminology used in describing ambient gameplay. Given the blurred definitions of some of these concepts in the relatively new field of computer games research this is a contribution to knowledge in a theoretical area.

The ways in which this research was approached and the particular methodologies used also are a contribution to knowledge in a methodological area. In particular, the ways in which earlier ideas of game design research were refined and extended demonstrate a novel and effective application of a design research methodology.

The suggestions of possible uses of ambient gameplay is a practical contribution to knowledge. This is built on in the next section through the suggestion of practical, game development guidelines.

9.3 Limitations of this research and future work

9.3.1 The application of this research in game development

The development of the lenses to investigate ambient gameplay now allows researchers and designers to better understand the functioning of games and the player experiences they provide. The next important step in this research is to reframe the lenses in a development context; creating a toolkit that game designers and developers can use when creating new games. The current output of the research enables the investigation of ambient gameplay, but this is not yet quantified. Nor is the effect of the ambience fully understood in terms of player experience. Is there an optimal level of ambience for any given game? How would we calculate or measure this accurately? How does the experience of ambience vary for different players?

Clearly although this research has developed powerful ways of investigating ambient gameplay it has not yet determined how best to apply ambience for improving player experience. By using the guidelines developed in this research adding ambience to new or existing games is possible, but whether this would lead to a better or worse player experience is unknown. Further, the effect that adding ambience to a game would have on non-ambient gameplay is unknown.

There are a number of key properties that support ambient gameplay. In order that a game exhibits ambience it does not have to have all of these properties, but is likely to have one or more of them. These are not necessarily defining mechanisms but have been identified as being present in games that exhibit ambience.

The speculative guidelines below offer real, concrete ways in which game designers might think about introducing ambient gameplay. There is a hope these will eventually have a practical impact on game development and are not solely explanatory. However, these guidelines come with the caveat that there has not yet been research into whether these improve the player experience; they just offer a different experience.

Ambience appears in a game when the development team:

- Creates persistent gameplay.
- Allows player initiated game actions to occur away from the player's attention, hidden from the player at a distance or within nested containers.
- Has many gameplay events occurring simultaneously at different locations within the game world.
- Uses modeless functions, events and mechanisms, including the ability to interrupt modeless decision points in the game.
- Allows automation of a (large) number of functions, events and mechanisms and may allow interruption of those automated functions, events and mechanisms in order to update the instructions controlling them. Note that for these to be considered 'ambient' as opposed to just the normal AI of the game they must be player initiated.
- Uses abstract representation to allow many events to be located within the user interface. For example representing large complex systems with single icons.

9.3.1.1 Persistent gameplay

Game events continue, even when the player is not interacting with the game. The most extreme example of this are games that continue even when the player is away from them and not playing. For example, massively multiplayer online games like World of Warcraft (Blizzard Entertainment Inc., 2004) and EVE Online (CCP Games, 2003) have persistent worlds that exist and continue to function even when players are not accessing them on their computers.

9.3.1.2 Actions occurring away from the player's attention

Player initiated game events occur away from the player's immediate focus of attention. These events may be considered to be happening in the background.

The actions may be moved geographically distant from the player, may be obscured (for example: by fog of war) or may be placed in containers (for example: events within cities in Civilization IV).

9.3.1.3 Simultaneous events at different locations

An important way to identify ambience in a game is when it has a game world in which player initiated events are continuously occurring throughout the world and not just at the location where the player character or player's attention is currently situated.

For example, in The Elder Scrolls V: Skyrim there are many ambient background tasks occurring, hidden from the player; skills are increasing, experience points are being won and so on. However, although the world in Skyrim is large, complex and rich it is not functionally ambient, only aesthetically ambient. Events are only occurring in the immediate vicinity of the player, triggered by the player's presence and the missions the player has started. The game world is not active away from the player character. Compare this to Civilization IV where events are occurring throughout the game world, even in areas hidden by the fog of discovery.

9.3.1.4 Modelessness

By making mechanisms modeless designers give players the option of ignoring them. This gives players the possibility of a range of levels of engagement for the mechanisms. For example, when a player has enough experience points to level up in Skyrim a message appears on screen telling them they can go and level up. However, this is a modeless message and the player can choose to ignore it if they wish. A range of levels of engagement is available to the player.

The player has a decision to make when the levelling up message appears. They can ignore it or they can start the process of levelling up. This is a modeless decision point that has a direct effect on gameplay

9.3.1.5 Automation

When players automate actions in games they can relegate those actions to the background, away from their attention.

In Civilization IV a Worker unit can be instructed to automatically build roads. They continue this until the player instructs them to stop. Once started the road building continues modelessly in the background. The player can choose to inspect the Worker and see what they are doing, see how far they have progressed with their road building. The player can instruct them to change what they are doing. In this way, the player has a range of possible levels of engagement. The unit can function persistently in the background, simultaneously with other actions and at locations away from the player's immediate attention.

Note that automated actions that are interruptible provide modeless decision points. The possibility of interrupting an automated action, once started, is further increases ambience in games.

9.3.1.6 Abstract representation

Increasing levels of abstraction are possible through the use of symbols, icons and tokens to represent larger, more complex items and systems. This enables increased complexity within games. The result of increasing levels of abstraction is that items and, more importantly, whole systems are hidden from the player, forced into background (ambient) roles.

For example, cities in Civilization IV are represented on the map by a small group of building images. When opened up the city screen contains a wealth of information on the state and function of the city. The same packing away of information occurs in all role-playing games where characters represented by a character graphic contain (or have associated with them) attributes, skills, inventory, class, race and so on.

This method of using abstract representation of systems and events not only supports complexity but can also facilitate ambiguity, since players may incorrectly interpret symbols and their implications. For example, the map representation of a city in Civilization IV only gives limited information on that city and interpreting this incorrectly is easy to do without gathering more information. Consequently abstract representation is inherently ambiguous, always open to misinterpretation.

9.3.2 Questions arising from this research

Having established the existence of ambient gameplay events through the application of qualitative methods further investigations may be carried out using both qualitative and quantitative methods. Initial investigations into new areas of research are often qualitative, establishing the existence of phenomenon (Patton, 2002, p. 193). Having established the existence of an area of research a possible next step may be to quantify its properties. For some areas of research this works extremely well; for example, the existence of gravity is first inferred by observing events in the world (apples dropping from trees), next these events may be investigated using quantitative methods (measure the speed of the falling apple). However, in the case of an area as complex and multidimensional as ambience quantitative measures may only supply a small fragment of the whole picture, and qualitative investigations may yield more useful data. In particular deriving a single measure of the amount of ambient gameplay is unlikely to be possible.

There are many dimensions of ambient gameplay that may lend themselves to investigation:

- The existence of breaks in the persistence. What effects do these have?
- The distance of player initiated events from the player (in the game world) and the point at which events drop below a player's attention. Discovering if there is a threshold distance beyond which game events become ambient in any particular game. Though this may be a Boolean property, rather than a linear scale of distance. Measuring distances may be meaningless given the topologies of virtual worlds!

- Measurement of the number of player initiated gameplay events that occur simultaneously in games. The variation of this number over time.
- The number of modeless events that occur in games. The frequency that players interrupt modeless events.
- The percentage of a game's functions, events and mechanisms that the player can automate. How this varies between different games.
- Measuring the variation over time of the number of different pieces of game information that are available (both revealed and hidden) to the player. The variation over time of the percentage of this information that is hidden from the player. The percentage of possible pieces of information that the player actually accesses over time while playing a game.

Asking questions about ambient gameplay raises interesting issues about the nature of multidimensional constructs and the validity of quantitative measures of properties that may have subjective dimensions. Some of these questions may even have little real meaning, even though they could be addressed. Clearly, care will need to be taken when planning future research directions.

9.3.3 Ambient games

As previously noted, whether it is possible to define a class of games that might be called 'ambient games', as distinct from games that contain ambient gameplay, has not yet been established. If future research enables identification of the amount of ambient gameplay in a game then this may offer one route to a definition of a genre of 'ambient games'.

However, it may be that most games have some elements of ambient gameplay and that to define a separate genre of 'ambient games' is meaningless.

9.4 Closing remarks

When this research started in 2004 ambience had never previously been considered as an important component of games. At the beginning, the research did not have a clear end point in sight and for a time keeping it on track was extremely difficult. There were too many interesting avenues to explore. However, as the research progressed underlying themes emerged and the purpose and focus of the research materialized. The ambient lenses were not so much constructed as discovered. Ambience has always existed in games (as is shown by investigating existing games), but no-one had previously looked for it.

This research is focused on the analysis of games. However, being able to go beyond this by determining the effectiveness of ambience and providing a set of tools for creating ambience is an important future research direction. The investigative lenses should give rise to new ways of designing, developing and playing games. They are one step in a longer journey.

Ultimately games are largely focused on creating fun, and fun is not easily defined or measured. The hope is that an awareness of ambience will give us better ways of controlling and facilitating the creation of fun in games.

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Appendix 1 Interviews

Qualitative data analysis software NVivo (version 8) was used to assist with managing and coding the data. NVivo supports the coding of audio, video and images. Interviews were loaded into NVivo and coding was carried out using the audio. This facilitated direct access to the raw data, rather than at one remove as happens when interviews are first transcribed and then the transcription is coded.

As relevant phrases were found in the interview audio they were transcribed and then coded to one or more themes (themes are called ‘nodes’ in NVivo). At any time returning to the raw data (audio) was instantly possible if checks needed to be made on the precise meanings.

The audio window used for coding of an interview from study one in NVivo is given below. The audio is given at the top (this has been zoomed, there is a scroll bar for navigating it). The top few phrases for coding are listed below, along with their precise position in the audio.

Figure 50: NVivo audio window of a study one interview

Note that the relaxing green background colour is just how Windows 7’s appearance happens to have been set up and has no significance.

There is a table of interviews on the following page.

There is more on using NVivo for coding in Appendix 5.

Interview	Player	File name	Length mm:ss	Date
Interview one	Player 1	interview_09-12-08_player-1.wma	43:48	09/12/08
Interview two	Player 2	interview_12-12-08_player-2.wma	26:22	12/12/08
Interview three	Player 3	interview_12-12-08_player-3.wma	23:45	12/12/08
Interview four	Player 4	interview_11-12-09_player-4.wma	08:53	11/12/09
Interview five	Player 5	interview_11-12-09_player-5.wma	10:48	11/12/09
Interview six	Player 6	interview_11-12-09_player-6.wma	11:51	11/12/09
Interview seven	Player 7	interview_11-12-09_player-7.wma	10:30	11/12/09
Interview eight	Player 8	interview_16-12-09_player-8.wma	12:38	16/12/09
Interview nine	Player 9	interview_16-12-09_player-9.wma	09:35	16/12/09
Interview ten	Player 10	interview_16-12-09_player-10.wma	15:05	16/12/09
Interview eleven	Player 11	interview_05-03-10_player-11.wma	18:55	05/03/10
Interview twelve	Player 12	interview_23-06-10_player-12.wma	18:18	23/06/10
Interview thirteen	Player 13	interview_23-06-10_player-13.wma	19:10	23/06/10
Interview fourteen	Player 14	interview_23-06-10_player-14.wma	19:57	23/06/10
Interview fifteen	Player 15	interview_23-06-10_player-15.wma	21:43	23/06/10

Table 2: Interview list

Appendix 2 Photographs

Canon Utilities Zoom Browser ZX photograph viewing software was used to quickly navigate photographs. The photos from study 2 are shown below.

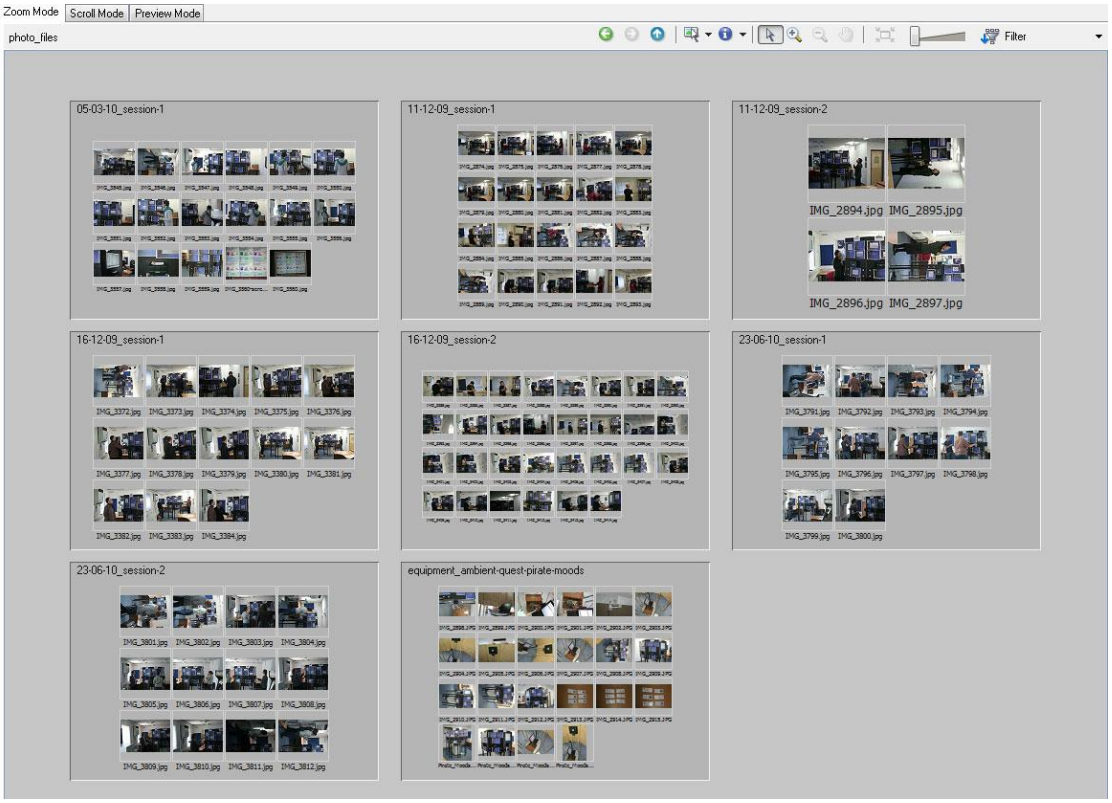


Figure 51: Study two photographs in ZoomBrowser

Appendix 3 Videos

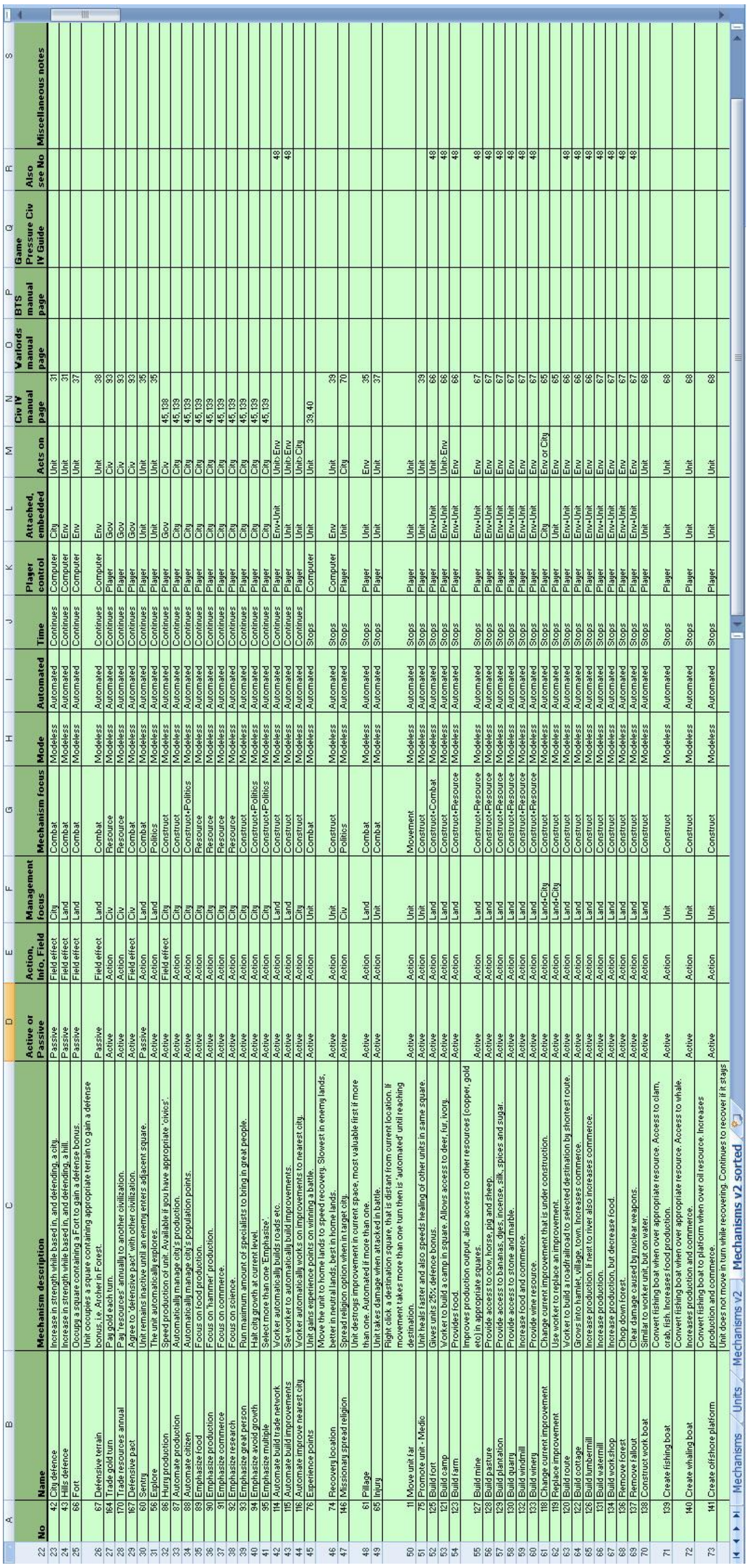
The videos are all of the Pirate Moods game sessions during study two. All players only took part in a single play session.

Play session	Number of players	Length (mm:ss)	File name	Date
One	Three	12:03	20091211101332.mov	01/02/2010
Two	One	05:02	20091211112838.mov	01/02/2010
Three	Two	10:35	20091216141451.mov	01/02/2010
Four	One	25:04	20091216152146.mov	01/02/2010
Five	One	19:31	20100305142238.mov	01/04/2010
Six	Two	09:16	201006231100.mov	25/06/2010
Seven	Two	12:51	201006231300.mov	25/06/2010

Table 3: Video list

Appendix 4 Study three mechanisms

Part of the Civilization IV Complete list of mechanisms is given below. The mechanisms were listed in an Excel spreadsheet. A total of 196 unique mechanisms were identified.



22	No	Name	Mechanism description	Active or Passive	Action, Info, Field	Management focus	Mechanism focus	Mode	Automated	Time	Player control	Attached, embedded	Acts on	Civ IV manual page	Warlords manual page	BTS manual page	Game Pressure Civ IV Guide	Also see No	Miscellaneous notes
23	42	City defence	Increase in strength while based in, and defending, a city.	Passive	Field effect	City	Combat	Modeless	Automated	Continues	Computer	City	Unit	31					
24	43	Hills defence	Increase in strength while based in, and defending, a hill.	Passive	Field effect	Land	Combat	Modeless	Automated	Continues	Computer	Env	Unit	31					
25	66	Fort	Occupy a square containing a Fort to gain a defense bonus.	Passive	Field effect	Land	Combat	Modeless	Automated	Continues	Computer	Env	Unit	37					
26	67	Defensive terrain	Unit occupies a square containing appropriate terrain to gain a defense bonus, i.e. Archer in Forest.	Passive	Field effect	Land	Combat	Modeless	Automated	Continues	Computer	Env	Unit	38					
27	164	Trade gold turn	Pay gold each turn.	Active	Action	Civ	Resource	Modeless	Automated	Continues	Player	Gov	Civ	93					
28	170	Trade resources annual	Pay 'resources' annually to another civilization.	Active	Action	Civ	Resource	Modeless	Automated	Continues	Player	Gov	Civ	93					
29	167	Defensive pact	Agree to 'defensive pact' with other civilization.	Active	Field effect	Civ	Combat	Modeless	Automated	Continues	Player	Gov	Civ	93					
30	60	Sentry	Unit remains inactive until an enemy enters adjacent square.	Passive	Action	Land	Combat	Modeless	Automated	Continues	Player	Unit	Unit	35					
31	56	Explore	The unit automatically explores.	Active	Action	Land	Politics	Modeless	Automated	Continues	Player	Unit	Unit	35					
32	86	Hurry production	Speed production of unit. Available if you have appropriate 'civics'.	Active	Field effect	City	Construct	Modeless	Automated	Continues	Player	Gov	Civ	45, 138					
33	87	Automate production	Automatically manage city's production.	Active	Action	City	Construct	Modeless	Automated	Continues	Player	City	City	45, 139					
34	88	Automate citizen	Automatically manage city's population points.	Active	Action	City	Construct+Politics	Modeless	Automated	Continues	Player	City	City	45, 139					
35	89	Emphasize food	Focus on food production.	Active	Action	City	Resource	Modeless	Automated	Continues	Player	City	City	45, 139					
36	90	Emphasize production	Focus on 'hammer' production.	Active	Action	City	Resource	Modeless	Automated	Continues	Player	City	City	45, 139					
37	91	Emphasize commerce	Focus on commerce.	Active	Action	City	Resource	Modeless	Automated	Continues	Player	City	City	45, 139					
38	92	Emphasize research	Focus on science.	Active	Action	City	Resource	Modeless	Automated	Continues	Player	City	City	45, 139					
39	93	Emphasize great person	Run maximum amount of specialists to bring in great people.	Active	Action	City	Construct	Modeless	Automated	Continues	Player	City	City	45, 139					
40	94	Emphasize avoid growth	Halt city growth at current level.	Active	Action	City	Construct+Politics	Modeless	Automated	Continues	Player	City	City	45, 139					
41	95	Emphasize multiple	Select more than one 'Emphasize'.	Active	Action	City	Construct+Politics	Modeless	Automated	Continues	Player	City	City	45, 139					
42	114	Automate build trade network	Worker automatically builds roads etc.	Active	Action	Land	Construct	Modeless	Automated	Continues	Player	Env+Unit	Unit> Env					48	
43	115	Automate build improvements	Set worker to automatically build improvements.	Active	Action	Land	Construct	Modeless	Automated	Continues	Player	Unit	Unit> Env					48	
44	116	Automate improve nearest city	Worker automatically works on improvements to nearest city.	Active	Action	City	Construct	Modeless	Automated	Continues	Player	Unit	Unit> City						
45	76	Experience points	Unit gains experience points on winning a battle.	Active	Action	Unit	Combat	Modeless	Automated	Stops	Computer	Unit	Unit	39, 40					
46	74	Recovery location	Move the unit to home lands to speed recovery. Slowest in enemy lands, better in neutral lands, best in home lands.	Active	Action	Unit	Construct	Modeless	Automated	Stops	Computer	Env	Unit	39					
47	146	Missionary spread religion	Spread religion option when in target city.	Active	Action	Civ	Politics	Modeless	Automated	Stops	Player	Unit	City	70					
48	61	Pillage	Unit destroys improvement in current space, most valuable first if more than one. Automated if more than one.	Active	Action	Land	Combat	Modeless	Automated	Stops	Player	Unit	Env	35					
49	65	Injury	Unit takes damage when attacked in battle.	Active	Action	Unit	Combat	Modeless	Automated	Stops	Player	Unit	Unit	37					
50	11	Move unit far	Right click a destination square, that is distant from current location. If movement takes more than one turn then is 'automated' until reaching destination.	Active	Action	Unit	Movement	Modeless	Automated	Stops	Player	Unit	Unit						
51	75	Promote unit - Medic	Unit heals faster and also speeds healing of other units in same square.	Active	Action	Unit	Construct	Modeless	Automated	Stops	Player	Unit	Unit	39					
52	125	Build fort	Gives units 25% defence bonus.	Active	Action	Land	Construct+Combat	Modeless	Automated	Stops	Player	Env+Unit	Unit	66				48	
53	121	Build camp	Worker to build a camp in square. Allows access to deer, fur, ivory.	Active	Action	Land	Construct	Modeless	Automated	Stops	Player	Env+Unit	Unit> Env	66				48	
54	123	Build farm	Provides food.	Active	Action	Land	Construct+Resource	Modeless	Automated	Stops	Player	Env+Unit	Env	66				48	
55	127	Build mine	Improves production output, also access to other resources (copper, gold etc) in appropriate squares.	Active	Action	Land	Construct+Resource	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
56	128	Build pasture	Provide access to cow, horse, pig and sheep.	Active	Action	Land	Construct+Resource	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
57	129	Build plantation	Provide access to bananas, dyes, incense, silk, spices and sugar.	Active	Action	Land	Construct+Resource	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
58	130	Build quarry	Provide access to stone and marble.	Active	Action	Land	Construct+Resource	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
59	132	Build windmill	Increase food and commerce.	Active	Action	Land	Construct+Resource	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
60	133	Build winery	Provide wine resource.	Active	Action	Land	Construct+Resource	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
61	118	Change current improvement	Change current improvement that is under construction.	Active	Action	Land+City	Construct	Modeless	Automated	Stops	Player	City	Env or City	65					
62	119	Replace improvement	Use worker to replace an improvement.	Active	Action	Land+City	Construct	Modeless	Automated	Stops	Player	Unit	Env	65					
63	120	Build route	Worker to build a road/railroad to selected destination by shortest route.	Active	Action	Land	Construct	Modeless	Automated	Stops	Player	Env+Unit	Env	66				48	
64	122	Build cottage	Grows into hamlet, village, town. Increases commerce.	Active	Action	Land	Construct	Modeless	Automated	Stops	Player	Env+Unit	Env	66				48	
65	126	Build lumbermill	Increase production. If next to river also increases commerce.	Active	Action	Land	Construct	Modeless	Automated	Stops	Player	Env+Unit	Env	66				48	
66	131	Build watermill	Increase production.	Active	Action	Land	Construct	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
67	134	Build workshop	Increase production, but decrease food.	Active	Action	Land	Construct	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
68	136	Remove forest	Chop down forest.	Active	Action	Land	Construct	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
69	137	Remove fallout	Clear damage caused by nuclear weapons.	Active	Action	Land	Construct	Modeless	Automated	Stops	Player	Env+Unit	Env	67				48	
70	138	Construct work boat	Similar to worker unit, but on water.	Active	Action	Land	Construct	Modeless	Automated	Stops	Player	Unit	Unit	68					
71	139	Create fishing boat	Convert fishing boat when over appropriate resource. Access to clam, crab, fish. Increases food production.	Active	Action	Unit	Construct	Modeless	Automated	Stops	Player	Unit	Unit	68					
72	140	Create whaling boat	Convert fishing boat when over appropriate resource. Access to whale. Increases production and commerce.	Active	Action	Unit	Construct	Modeless	Automated	Stops	Player	Unit	Unit	68					
73	141	Create offshore platform	Convert fishing boat to platform when over oil resource. Increases production and commerce.	Active	Action	Unit	Construct	Modeless	Automated	Stops	Player	Unit	Unit	68					
			Unit does not move in turn while recovering. Continues to recover if it stays																

Figure 52: Civilization IV Complete mechanism list excerpt

Note that the numbers in the ‘No’ column do not run consecutively. The mechanisms were assigned a number as they were identified. In this version of the table the mechanisms have been sorted to group together mechanisms with similar properties (such as modelessness), which shuffled the table rows.

Appendix 5 Coding with NVivo8

In NVivo themes are gathered in containers called ‘nodes’. NVivo uses the name ‘node’ rather than ‘theme’ since they can not only contain themes, but also references to places, people or other things of interest. There are two different types of node in NVivo. Free nodes are ‘stand-alone’ and are often used when coding starts. Tree nodes allow nodes to be gathered together in a hierarchical structure with categories and subcategories (QSR International Pty Ltd., 2012). The figures below show tree nodes collapsed and then with subcategories showing.

Figure 53: NVivo tree nodes

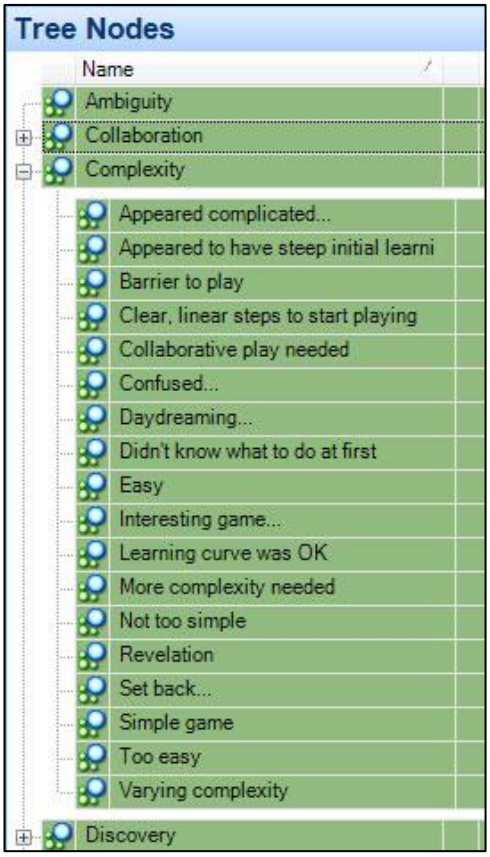


Figure 54: Tree nodes with subcategory open

Appendix 6 Ethical approvals list

Study one

Applied 01/09/2008 Ambient Quest Dice Game: Exploring Player Experience
Approved 24/09/2008
Reference number FO: 09/08-0015

Applied 07/10/2008 Player experience of ambient games
Approved 03/11/2008
Reference number FO: 11/08-0022

Study two

Applied 07/05/2009 Player experiences of Ambient Quest: Pirate Moods RFID game
Approved 19/06/2009
Reference number FO: 06/09-0031

Applied 07/05/2009 Observing players of the Ambient Quest: Pirate Moods RFID game
Approved 19/06/2009
Reference number FO: 06/09-0032

Applied 23/04/2010 Player experiences of Ambient Quest: Pirate Moods RFID game - minor amendment
Approved 27/04/2010
Reference number FO: 04/10-0040

Appendix 7 Ambient Quest study information sheet

Project Title: *"Ambient Quest: Variations in distance travelled and player experience when playing an ambient role playing game."*

Supervisor: *Dr Roger Eglin, Department of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5467*

Email: *roger.eglin@port.ac.uk*

Researcher: *Mark Eyles, Department of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5468*

Email: *mark.eyles@port.ac.uk*

You are being invited to take part in a research study. Before you decide whether to volunteer, it is important that you fully understand why the research is being done, and what it will involve for you. Please read the following information carefully, and if there are any parts you do not understand, or would like more information, please ask Roger Eglin or Mark Eyles (contact details above).

What is this project?

The project is a pilot study to investigate ambient games (ignorable games playable as a background activity). A test game called Ambient Quest has been created for this pilot study. Ambient Quest is played by measuring the distance travelled over each day and using this distance to determine how far a player avatar may move in a simple virtual world, portrayed as a 2D map on a computer.

There has been previous research into games in which players move around in the real world and their movements affect characters in a virtual world, but this research is into a new type of game in which the player can be actively playing the game 24 hours a day as a background task while continuing with their normal activities.

How are participants chosen?

A general invitation will be extended to students in the faculty of Creative Technologies on the Computer Games Technology and Enterprise in Computer Games Technology courses. Initially we will need sixty participants, who will be chosen at random from all suitable volunteers. We will keep a reserve list until the end of the study, in case further participants are needed. Participants must be between 18 and 40 years of age.

What if I change my mind?

Taking part in this project is entirely voluntary, and you are not obliged to participate. If you decide you would like to take part, you will be asked to keep a copy of this information sheet and to sign a consent form. You are completely free to withdraw at any stage in the project, without giving a reason, and without suffering any penalty as a result.

If I take part, what will I have to do?

Participants in this research study will be asked to wear a pedometer (similar to the one in the picture) which measures the number of steps taken. The pedometer is clipped onto your belt, shorts or slacks near to your hips and the movement you make when walking enables it to count your steps.

Participants in the research project will be divided into two groups, one of which plays the game and another control group which does not play the game.

Game players will spend one week before starting playing the game measuring their daily distance walked, two weeks playing the game and measuring the distance they walk and then one week after playing the game measuring the daily distance they walk. Members of the control group only measure the distance walked. Membership of these groups (control group and player group) will be determined randomly at the end of week one.

The Ambient Quest game has been made as simple as possible in order to investigate fundamental ambient game properties. A small Ambient Quest PC game client will be made available to participants so that they can play Ambient Quest and monitor their progress in the game.

To play the game players record the distance they walk each day and forward this by email to Mark Eyles (mark@ambientquest.com). This distance is used to determine the distance the players' warrior-adventurer avatars may move in the Ambient Quest virtual world (displayed on screen by the Ambient Quest client as a simple 2D map). During the experiment players are alternately able to determine the direction of avatar movement or have the direction of movement determined automatically by the game engine.

The study will run for six weeks.

You will be asked to complete a short questionnaire at the start, middle and end of the study. There will be no time limit in which to complete the questionnaires.

Are there any risks?

Since the study does not require participants to engage in any activities apart from their normal day to day activities we do not anticipate any risks. Participants are expected to send an email and monitor their progress in the game by looking at a computer screen.

There may be changes in distances walked over the course of the study; however during the study participants are not required to walk any more than they would when not participating in this study.

Will my participation be confidential?

The data from each participant in the study will be identified by a code rather than a real name. Consent forms and questionnaires will be securely stored with access limited to authorised researchers.

All the data recorded in the study is required to be kept for several years after completion, but will be securely stored in a form which will not enable identification of individual participants.

What will the results be used for?

The results of the study may be published in a journal or presented at conferences. They may be used as part of a post-graduate research thesis.

Who is funding this research?

This project is part of a PhD research project funded by the Department of Creative Technologies at the University of Portsmouth.

How can I find out more?

If you have any questions, please contact Roger Eglin or Mark Eyles (details given above).

If you have any concerns about the conduct of the study, please contact Tony Kalus (Tony.Kalus@port.ac.uk)

Thank you for taking the time to read this information!

Appendix 8 Ambient Quest study informed consent

Project Title: *"Ambient Quest: Variations in distance travelled and player experience when playing an ambient role playing game."*

Supervisor: *Dr Roger Eglin, Department of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5467*

Email: *roger.eglin@port.ac.uk*

Researcher: *Mark Eyles, Department of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5468*

Email: *mark.eyles@port.ac.uk*

Please read the statements below, tick the boxes, and then sign and date the form if you consent to participate. Participants must be aged between 18 and 40 years of age.

1. I confirm that I have read and understood the information sheet for the above project, and have been given the opportunity to ask questions about it. ☐
2. I give consent for any photographs or videos taken during the experiment to be published or otherwise made public. ☐
3. I understand that the data are to be coded and held in such a way that only Roger Eglin and Mark Eyles will know which participant produced which data. ☐
4. I understand that I have the right to withdraw my participation at any time and for any reason and I will still receive participant pool credit, although it will not be possible to withdraw my data after May 2007 because analysis of the data will have started. ☐
5. I understand that I am not obliged to give any reason for such a withdrawal and will suffer no penalty as a result. ☐
6. I understand that I will be able to obtain general information about the results of this research by contacting Mark Eyles after August 2007, although it is not departmental policy to provide individual feedback on my performance (for example, my individual results). ☐

7. I am giving my consent for my data to be used for research purposes. ☐

8. Any questions I have about my participation have been answered. ☐

If you have any questions about the above, please ask the researcher to clarify them before you sign.

Name of volunteer: _____ Email: _____

Signature: _____ Date: _____

Name of researcher: **Mark Eyles** _____ Email: mark.eyles@port.ac.uk__

Signature: _____ Date: _____

PLEASE NOTE THAT THIS FORM WILL BE KEPT SEPARATELY FROM YOUR DATA

Appendix 9 Ambient Quest study debriefing

Project Title: *"Ambient Quest: Variations in distance travelled and player experience when playing an ambient role playing game."*

Supervisor: *Dr Roger Eglin, Department of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5467*

Email: *roger.eglin@port.ac.uk*

Researcher: *Mark Eyles, Department of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5468*

Email: *mark.eyles@port.ac.uk*

Thank you for taking part in this study.

This study is part of a doctoral project for a *Doctor of Philosophy (PhD)* degree. The research is investigating the playing of games in an interactive real world environment. Your participation in the study, the Ambient Quest game, the walked distances you recorded and the questionnaires you completed were designed to measure aspects of this.

If you are interested in the results of the study or if you have any other questions about this study then, please contact the experimenters at the following email address: mark@ambientquest.com. You may also find information at www.ambientquest.com.

If for any reason you wish to withdraw your data from the investigation, please contact the researcher on the email address above. However, withdrawing after May 2007 is not possible since the data analysis will have started by this date.

Please return your pedometer to Mark Eyles at your earliest opportunity.

Mark Eyles
Department of Creative Technologies
University of Portsmouth

Appendix 10 Pirate Moods study information sheet - interview

Project Title: "Player experiences of Ambient Quest: Pirate Moods RFID game."

Supervisor: *Dr Roger Eglin, School of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5467*

Email: *roger.eglin@port.ac.uk*

Researcher: *Mark Eyles, School of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5468*

Email: *mark.eyles@port.ac.uk*

You are being invited to take part in a research study. Before you decide whether to volunteer, it is important that you fully understand why the research is being done, and what it will involve for you. Please read the following information carefully, and if there are any parts you do not understand, or would like more information, please ask Roger Eglin or Mark Eyles (contact details above).

What is this project?

There has been previous research into games in which players take part while moving around in the real world, but this research is looking into the a type of pervasive game in which the player can be actively playing as a background task. The game uses RFID tags to monitor the player's position as they move around eight poster display boards.

This study is to investigate the player experience of this game and compare this to a theoretical model of player experience.

How are participants chosen?

A general invitation will be extended to students and staff in the Eldon Building at the University of Portsmouth where the display boards are intended to be displayed. Interviewees will be chosen from those who express interest in this current study.

What if I change my mind?

Taking part in this study is entirely voluntary, and you are not obliged to participate. If you decide you would like to take part, you will be asked to keep a copy of this information sheet and to sign the consent form to show that you consent to taking part in the research. You are completely free to withdraw at any stage in the project up to one week after taking part in an interview, without giving a reason, and without suffering any penalty as a result.

If I take part, what will I have to do?

Participants chosen for this research study will be asked to take part in one or more (though no more than two) interviews (less than 60 minutes in length each) in which they will be given the opportunity to discuss their experience of playing the Ambient Quest: Pirate Moods RFID game.

Are there any risks?

No risks are anticipated.

Will my participation be confidential?

Yes. All computer files containing research information will be anonymised through the use of psuedonyms and stored in password protected folders for the duration of the research. Digitally recorded copies of the anonymised files will be stored in locked drawers at the School of Creative Technologies, University of Portsmouth.

What will the results be used for?

The results of the study may be published in a journal or presented at conferences. They may be used as part of a post-graduate research thesis.

Who is funding this research?

This project is part of a PhD research project funded by the School of Creative Technologies at the University of Portsmouth.

How can I find out more?

If you have any questions, please contact Roger Eglin or Mark Eyles (details given above).

If you have any concerns about the conduct of the study, please contact Tony Kalus (Tony.Kalus@port.ac.uk)

Thank you for taking the time to read this information!

Appendix 11 Pirate Moods study informed consent - interview

Project Title: *"*Player experiences of Ambient Quest: Pirate Moods RFID game.*"*

Supervisor: *Dr Roger Eglin, School of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5467*

Email: *roger.eglin@port.ac.uk*

Researcher: *Mark Eyles, School of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5468*

Email: *mark.eyles@port.ac.uk*

Please read the statements below, tick the boxes, and then sign and date the form if you consent to participate. Participants must be aged between 18 and 40 years of age.

1. I confirm that I have read and understood the information sheet for the above project, and have been given the opportunity to ask questions about it. ☐
2. I give consent for any photographs or videos taken during the experiment to be published or otherwise made public. ☐
3. I understand that the data are to be coded and held in such a way that only Roger Eglin and Mark Eyles will know which participant produced which data. ☐
4. I understand that I have the right to withdraw my participation at any time and for any reason while playing the game or during an interview. ☐
5. I understand that I am not obliged to give any reason for such a withdrawal and will suffer no penalty as a result. ☐
6. I understand that I will be able to obtain general information about the results of this research by contacting Mark Eyles after August 2009, although it is not departmental policy to provide individual feedback on my interview. ☐
7. I am giving my consent for my data to be used for research purposes. ☐
8. Any questions I have about my participation have been answered. ☐

If you have any questions about the above, please ask the researcher to clarify them before you sign.

Name of volunteer: _____ Email: _____

Signature: _____ Date: _____

Name of researcher: **Mark Eyles** _____ Email: mark.eyles@port.ac.uk__

Signature: _____ Date: _____

PLEASE NOTE THAT THIS FORM WILL BE KEPT SEPARATELY FROM YOUR DATA

Appendix 12 Pirate Moods study debriefing - interview

Project Title: *"*Player experiences of Ambient Quest: Pirate Moods RFID game.*"*

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This study is part of a doctoral project for a *Doctor of Philosophy (PhD)* degree. The research is investigating the playing of games in an interactive real world environment. Your participation in the study is to discover more about the experience of playing this type of game.

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Mark Eyles
School of Creative Technologies
University of Portsmouth

Appendix 13 Pirate Moods study information sheet - observation

Project Title: "**Observing players of the Ambient Quest: Pirate Moods RFID game**"

Supervisor: *Dr Roger Eglin, School of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5467*

Email: *roger.eglin@port.ac.uk*

Researcher: *Mark Eyles, School of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

Tel: *023 9284 5468*

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What is this project?

There has been previous research into games in which players take part while moving around in the real world, but this research is looking into the a type of pervasive game in which the player can be actively playing as a background task. The game uses RFID tags to monitor the player's position as they move around eight poster display boards.

This study is to investigate the player experience of this game and compare this to a theoretical model of player experience.

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What if I change my mind?

Taking part in this study is entirely voluntary, and you are not obliged to participate. If you decide you would like to take part, you will be asked to keep a copy of this information sheet and to sign the consent form to show that you consent to taking part in the research. You are completely free to withdraw at any stage in the project up to one week after taking part in the game, without giving a reason, and without suffering any penalty as a result.

If I take part, what will I have to do?

Participants chosen for this research study will be asked to play the Ambient Quest: Pirate Moods RFID game. They will be observed and videoed while playing the game.

Are there any risks?

No risks are anticipated.

Will my participation be confidential?

All computer files containing research information will be anonymised through the use of psuedonyms and stored in password protected folders for the duration of the research. Digitally recorded copies of the anonymised files will be stored in locked drawers at the School of Creative Technologies, University of Portsmouth. However, sections of the video, and stills from the video, may be used in papers and presentations. Hence it will be possible to identify participants, even though their names will not be used.

What will the results be used for?

The results of the study may be published in a journal or presented at conferences. They may be used as part of a post-graduate research thesis.

Who is funding this research?

This project is part of a PhD research project funded by the School of Creative Technologies at the University of Portsmouth.

How can I find out more?

If you have any questions, please contact Roger Eglin or Mark Eyles (details given above).

If you have any concerns about the conduct of the study, please contact Tony Kalus (Tony.Kalus@port.ac.uk)

Thank you for taking the time to read this information!

Appendix 14 Pirate Moods study informed consent - observation

Project Title: *"***Observing players of the Ambient Quest: Pirate Moods RFID game***"*

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Tel: *023 9284 5467*

Email: *roger.eglin@port.ac.uk*

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2. I give consent for any photographs or videos taken during the experiment to be published or otherwise made public. ☐
3. I understand that the data are to be coded and held in such a way that only Roger Eglin and Mark Eyles will know which participant produced which data, though I may be recognisable in photographs or videos. ☐
4. I understand that I have the right to withdraw my participation at any time and for any reason while playing the game. ☐
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8. Any questions I have about my participation have been answered. ☐

If you have any questions about the above, please ask the researcher to clarify them before you sign.

Name of volunteer: _____ Email: _____

Signature: _____ Date: _____

Name of researcher: **Mark Eyles** _____ Email: mark.eyles@port.ac.uk__

Signature: _____ Date: _____

PLEASE NOTE THAT THIS FORM WILL BE KEPT SEPARATELY FROM YOUR DATA

Appendix 15 Pirate Moods study debriefing - observation

Project Title: *"***Observing players of the Ambient Quest: Pirate Moods RFID game***"*

Supervisor: *Dr Roger Eglin, School of Creative Technologies, Eldon Building, Winston Churchill Avenue, Portsmouth, Hampshire, PO1 2DJ.*

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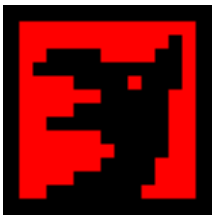
If you are interested in the results of the study or if you have any other questions about this study then, please contact the researchers at the following email address: mark@ambientquest.com. You may also find information at www.ambientquest.com.

Mark Eyles
School of Creative Technologies
University of Portsmouth

Appendix 16 Ambient Quest design



High Concept

Exploration and dragon fighting across a small 2D map based on distance walked.

Game Genre

Single player pervasive role-playing game.

Game Objectives

Short term: gain movement resources that can be used in the game world.

Medium term: move around the game world, fighting enemies where necessary to gain experience points.

Long Term: Gain levels and develop a more powerful character. Explore the whole map defeating all enemies. Collect gold.

Game Overview

Ambient Quest is a single player game in which aspects of players' everyday activities are quantified and converted into data that is used to affect the player's character in the Ambient Quest virtual game world. Each player starts the game with a personalised character, weapons and equipment which are affected by game events.

In this initial version of Ambient Quest players record the distance they walk each day. This distance is then used to calculate the distance player characters travel in the Ambient Quest virtual game world.

There are two ways of controlling player characters. Either they move in random directions, without player intervention, automatically fighting enemies they encounter and so on. Or the player may decide the direction their player character travels, and hence determine the occurrence of fights and so on.

The game world comprises a two dimensional grid. Player characters can move north, south, east or west (not diagonally). If they pass through a square containing a pickup then this is automatically picked up and any actions triggered by the pick up are resolved immediately. If they pass through a square containing an enemy then they automatically enter into combat, which is resolved by comparing player 'attack' against enemy 'defence', modifying the outcome with a dice roll.

If the enemy is defeated then there is a chance it will drop something the player can take and the player will also earn experience points.

Plot

Dragons have taken control of Shimmerisk a wilderness region in the mystical Universal States of Ambience. The player takes the role of a penniless wandering adventurer-warrior exploring Shimmerisk.

Game world

The game world, Shimmerisk, is represented by a 10x10 grid, each square representing 10 km in the game world. The play area 'wraps around' at the edges (i.e. if the player moves northwards off the northernmost square they pass onto the southernmost square of the same column).

Land types:

Land type	Colour coding
Lake/sea/shore	Blue
Swamp	Indigo
Jungle	Violet
Forest	Green
Plains	Yellow
Desert	Orange
Mountains	Red

Table 1: Ambient Quest land types

Screen layout

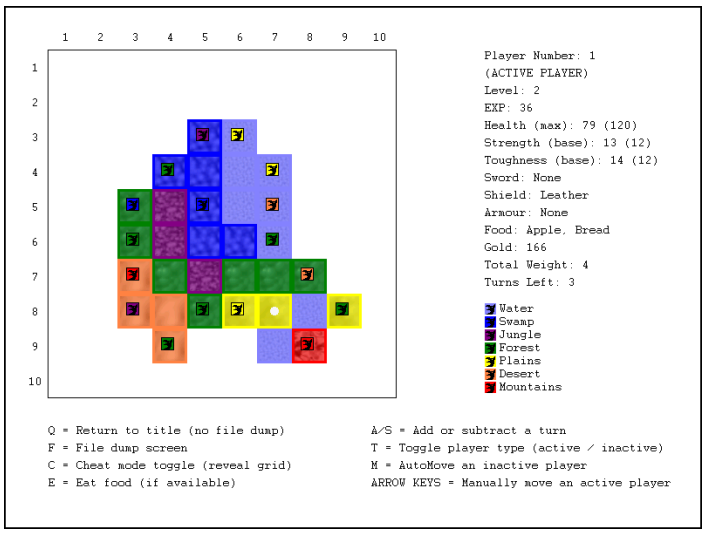


Figure 1: Ambient Quest screen layout design

Player character

The player takes on the role of a down on their luck penniless adventurer-warrior who has strayed into Shimmerisk.

Character races and classes

Character races and classes are not used in this version of the Ambient Quest game.

Player character attributes

Maximum health: maximum health points allowed. These increase when the character levels up.

Health: actual physical condition of character.

Strength: attack prowess.

Toughness: resistance to damage.

Exp. level	Max. health	Base strength	Base toughness
1	100	10	10
2	120	12	12
3	140	14	14
4	160	16	16
5	180	18	18
6	200	20	20
7	220	22	22
8	240	24	24
9	260	26	26
10	280	28	28

Table 2: Ambient Quest attributes

If the player character dies then they are returned to the start square.

Non player characters: dragons

The land is infested with seven types of dragon:

Dragon type	Strength	Toughness	Health	Home land	Reaction speed
Blue	10	10	11	Lake/sea/shore	D20 – 12
Indigo	14	14	14	Swamp	D20 – 10
Violet	17	17	17	Jungle	D20 – 8
Green	20	20	20	Forest	D20 – 6
Yellow	23	23	23	Plains	D20 – 4
Orange	26	26	26	Desert	D20 – 2
Red	28	28	29	Mountains	D20

Table 3: Ambient Quest dragons

The dragons always attack the player's character when they enter the area (square) occupied by the dragon.

Figure 2: Enemy distribution

Gameplay Mechanisms: Travel

Players wear pedometers that record the distance they walk each day. This is then used to determine the distance moved in a game world (in this version drawn out as a map). For every 500 steps the player walks in the real world they may move their player character one square (ten kilometres) in the game world.

The player characters encounter monsters as they move around the map, whenever they encounter a monster they are forced to fight it, the outcome of the fight determines whether their characters gain experience, items and money (gold pieces).

Gameplay Mechanisms: Fog of War

The play area is obscured at the start of the game. As the player moves around the play area is revealed.

Players can see one square north, south, east and west from their position, so when playing actively it is possible to decide whether to engage in combat or not.

Gameplay Mechanisms: Inventory

Player characters can carry or wear up to 5 items. They start the game with nothing.

Item	Description	Weight	Health modifier	Strength modifier	Toughness modifier
Gold	Gold pieces	1	0	0	0
Sword	Iron sword	3	0	+2	+1
Sword +1	Steel sword	2	0	+3	+2
Sword +2	Silver sword	1	0	+4	+3

Shield	Leather shield	1	0	+1	+2
Shield +1	Wood shield	2	0	+2	+3
Shield +2	Iron Shield	3	0	+3	+4
Armour	Leather	1	0	0	+1
Armour +1	Steel	3	0	0	+2
Armour +2	Silver	2	0	0	+3
Food	Apple	1	30 health	0	0
Food +1	Apple and bread	2	60 health	0	0
Food +2	Apple, bread and cheese	3	90 health	0	0

Table 4: Ambient Quest inventory items

If the player is inactive any food collected is eaten automatically.

Active players may store food in their inventory. The most powerful weapon, shield or armour is automatically installed.

	Chance(%) of finding item on defeating dragon							**Chance on any empty square**
Item	**Blue**	**Indigo**	**Violet**	**Green**	**Yellow**	**Orange**	**Red**	
Gold	100	100	100	100	100	100	100	10 (5 coins)
Sword	50	50	0	0	0	0	0	0
Sword +1	0	0	30	50	0	0	0	0
Sword +2	0	0	0	0	30	50	70	0
Shield	50	50	0	0	0	0	0	0
Shield +1	0	0	30	50	0	0	0	0
Shield +2	0	0	0	0	30	50	70	0
Armour	50	50	0	0	0	0	0	0
Armour +1	0	0	30	50	0	0	0	0
Armour +2	0	0	0	0	30	50	70	0
Food	10	20	0	0	0	0	0	30
Food +1	0	0	10	20	0	0	0	20
Food +2	0	0	0	0	10	20	30	10

Table 5: Pick-up probabilities

The sword, armour and shield items listed in the pick-up table above are revealed according to the given probabilities when a dragon is defeated. Note that gold is always revealed when a dragon is defeated (see the ‘Experience’ section for amount calculation).

Next, randomly, any one of ‘armour’, ‘shield’ or ‘sword’ is revealed, if they have successfully been ‘found’ (see table above). If the equipment is less powerful than that which you are already holding then its presence is not revealed. In this way the player only ‘finds’ new equipment that is of use to them.

Finally food is revealed, if successfully ‘found’. The type of food that might be found on any square is determined by using the percentages in the table above. After this calculation there is a further 25% chance that the food will be seen and collected by the player.

If the dragon defeats the player no items are revealed.

Gameplay Mechanisms: Combat

To resolve combat compare:

Attacker D20 + Attacker strength – Defender toughness

With:

Defender D20 + Defender strength – Attacker toughness

Where strength and toughness are calculated by adding base strength with Strength modifier.

If the result is a draw then compare the reaction times of the two opponents. Reaction time is calculated by a dice throw modified by the weight carried, the character with the lowest reaction time wins. Weight carried is in the range: 0 to 15.

Reaction time of player = D20 – Weight

Reaction time of Dragon is between D20 and D20 – 12, see the table of dragons for a full list.

Damage inflicted by player character:

Weapon	**Description**	**Damage**
None	Fists	D6 + 5
Sword	Iron sword	2D6 + 5
Sword +1	Steel sword	3D6 + 5
Sword +2	Silver sword	4D6 + 5

Table 6: Ambient Quest player character damage

Damage inflicted by dragons:

Dragon type	**Damage**	**Damage if on home land**
Blue	D6	D6 + 2
Indigo	D6 + 2	D6 + 4
Violet	D6 + 4	D6 + 6
Green	D6 + 6	D6 + 8
Yellow	D6 + 8	D6 + 10
Orange	D6 + 10	D6 + 12
Red	D6 + 12	D6 + 14

Table 7: Ambient Quest dragon damage

Gameplay Mechanisms: Experience

Exp. level	Exp. Points	Exp. needed for next level
1	0	25
2	25	50
3	75	75
4	150	100
5	250	125
6	375	150
7	525	175
8	700	200
9	900	225
10	1125	

Table 8: Ambient Quest experience levels

Experience gained on defeating a dragon:

Dragon type	Experience	No. on map	Total experience
Blue	10	10	100
Indigo	15	10	150
Violet	20	10	200
Green	30	10	300
Yellow	40	8	320
Orange	55	7	385
Red	70	5	350
			1805

Table 9: Ambient Quest experience earned

Gold earned on defeating a dragon: Experience * (D6/2)

Appendix 17 Pirate Moods design

High concept

Keep your pirates happy and your ships afloat.

Game genre

Multiplayer ambient role playing pirate simulation.

Game objectives

Short term

Individual second to second

Increase attributes that you have too little of.

Medium term

Individual minute to minute.

Keep the ship in good repair, the pirates happy and the kraken at bay.

Long term

Multiplayer minute to minute.

Work together with the other players to make all the pirates (of all the players) happy. Work together to not only make all the pirates happy but also all the krakens attacking all the pirates defeated.

Game overview

Each player has a crew and pirate vessel. They must keep the attributes which control the ships, pirates and krakens in balance. The attribute balance determines whether the pirate ships are sinking or afloat, the mood of the pirates and the success in battling krakens.

The game is played by using RFID ‘pirate’ tokens to increase various attributes by moving them close to RFID aerials, which are mounted on notice boards. The status of the pirates is shown on a monitor screen.

Attributes

There are seven attributes which correspond to seven of the eight notice boards.

Timber	Rum	Gold	Cannons
Canvas	Food	Cannon Balls	

Pirate Mood Indicator, Ship State and Kraken Watch

Attribute	Connections	Text string	Too much	Just right	Too little
Ship State					
timber	Pair A	String 1	sinking	afloat	leaking
canvas	Pair A	String 2	uncontrollable	sailing	adrift
Pirate Mood Indicator					
food	Pair B	String 3	vomiting	full	hungry
rum	Pair B	String 4	drunk	merry	angry
gold	Pair C	String 5	fearful	rowdy	jealous
cannon balls	Pair C	String 6	suspicious	ready	nervous
Kraken Watch					
cannons		String 7	lurking	defeated or attacking*	attacking
*The krakens are 'defeated' when all other attributes are balanced or 'attacking' when other attributes are not balanced.					

There are 1680 attribute points shared between all seven attributes, 240 for each attribute. Players increase an attribute by standing in front of the board that corresponds to that attribute. The rate of increase is around 1 point per second (it would take four minutes to go from 0 to 240).

As one attribute of a pair increases its twin decreases. The 'cannon' attribute is a special case without a twin. In the case of 'cannon' the attribute automatically decreases over time (perhaps link this to player gains/losses of other attributes) and must be topped up by the player standing in front of the 'cannon' board.

Attributes are 'Too little' when 60 or under.

Attributes are 'Just right' when between 61 and 179.

Attributes are 'Too much' when 180 or over.

Indicators show which items you need more of, when they are 'Too little'.

The indicators say 'GET MORE <attribute name>' of any attribute that goes below the required amount.

In addition to changes in attributes caused by the player standing in front of the boards there will also be small random changes to attributes over time. In this way the player will constantly have to adjust the attributes.

Note that the cannon will only fire when all the attributes are balanced and also the cannon attribute is balanced.

The three states of the cannons are labelled:

- ‘CANNONS NOT READY’ the attribute is too low or too high.
- ‘CANNONS READY’ the cannon attribute is balanced, but one or more of the other attributes are not balanced.
- ‘CANNONS FIRING’ the cannons are ready and the other attributes are balanced

In each pirate indicator it says: ‘BALANCE BARS TO FIRE AT KRAKEN’. When ‘CANNONS FIRING’ is showing then this message is replaced with ‘KRAKEN DEFEATED!’

The display for each pirate shows:

> Your ship is <String 1> and <String 2>
>
> Your pirates are <String 3>, <String 4>, <String 5> and <String 6>
>
> The kraken is <String 7>

Pirates can be either happy or sad, shown by two different pirate images. If Pair A and Pair B are ‘Just right’ then your pirates are happy, otherwise your pirates are sad.

Your ships are either afloat or sinking as determined by String 1. They may also have full sails (String 2 ‘Too much’ or ‘Just right’) or empty sails (String 2 ‘Too little’).

So there are three ship images:

- Full sails – Afloat
- Empty sails – Sinking
- Full sails – Sinking

Krakens are either not present, dead or attacking as determined by String 7. This is shown by three different images:

- Attacking kraken
- Dead kraken
- Lurking kraken (out of range of the cannon)

If all the pirates (of all the players) are happy then a message appears with the title on the game screen (or in the individual pirate text areas):

‘All Pirates Are Happy!’

If all the krakens attacking all the pirates are also defeated then the message:

‘All Pirates Are Happy! All Krakens Defeated!’

Note that if one of the six players is not present then the corresponding attributes are set to ‘balanced’; kraken defeated.

Messages shown on screen

Message: pirate name

[CAPTAIN RUBY]

[CAPTAIN EMERALD]

[CAPTAIN AMBER]

[CAPTAIN SAPPHIRE]

[CAPTAIN AMETHYST]

[CAPTAIN TOPAZ]

Message: attributes

[GET MORE]

[TIMBER] or [CANVAS]

[,]

[FOOD] or [RUM]

[,]

[GOLD] or [CANNON BALLS]

Message: cannons

[CANNONS READY]

[CANNONS NOT READY]

[CANNONS FIRING]

Message: balance

[BALANCE BARS TO FIRE AT KRAKEN]

[KRAKEN DEFEATED]

Message: ship

[YOUR SHIP IS]

String 1: [SINKING] or [AFLOAT] or [LEAKING]

[AND]

String 2: [UNCONTROLLABLE] or [SAILING] or [ADRIFT]

Message: pirates

[YOUR PIRATES ARE]

String 3: [VOMITING] or [FULL] or [HUNGRY]

[,]

String 4: [DRUNK] or [MERRY] or [ANGRY]

[,]

String 5: [FEARFUL] or [ROWDY] or [JEALOUS]

[AND]

String 6: [SUSPICIOUS] or [READY] or [NERVOUS]

Message: kraken

[THE KRAKEN ARE]

String 7: [LURKING] or [DEFEATED] or [ATTACKING]

Screen display

Pirates

Captain Ruby  Ship colour: red	**Captain Emerald**  Ship colour: green	**Captain Amber**  Ship colour: yellow
Captain Sapphire  Ship colour: blue	**Captain Amethyst**  Ship colour: purple	**Captain Topaz**  Ship colour: orange

Pirate Card 1

Captain Ruby

Make your pirate happy by balancing these:

Timber-Canvas
Rum-Food
Gold-Cannon balls

Collect these supplies by holding this *pirate card* near the poster boards

When your pirate is happy hold this *pirate card* near the 'fire cannons' board to defeat the attacking kraken!

Ambient Quest: Pirate Moods

Pirate Card 2

Captain Emerald

Make your pirate happy by balancing these:

Timber-Canvas
Rum-Food
Gold-Cannon balls

Collect these supplies by holding this *pirate card* near the poster boards

When your pirate is happy hold this *pirate card* near the 'fire cannons' board to defeat the attacking kraken!

Ambient Quest: Pirate Moods

Pirate Card 3

Captain Amethyst

Make your pirate happy by balancing these:

Timber-Canvas
Rum-Food
Gold-Cannon balls

Collect these supplies by holding this *pirate card* near the poster boards

When your pirate is happy hold this *pirate card* near the 'fire cannons' board to defeat the attacking kraken!

Ambient Quest: Pirate Moods

Technology

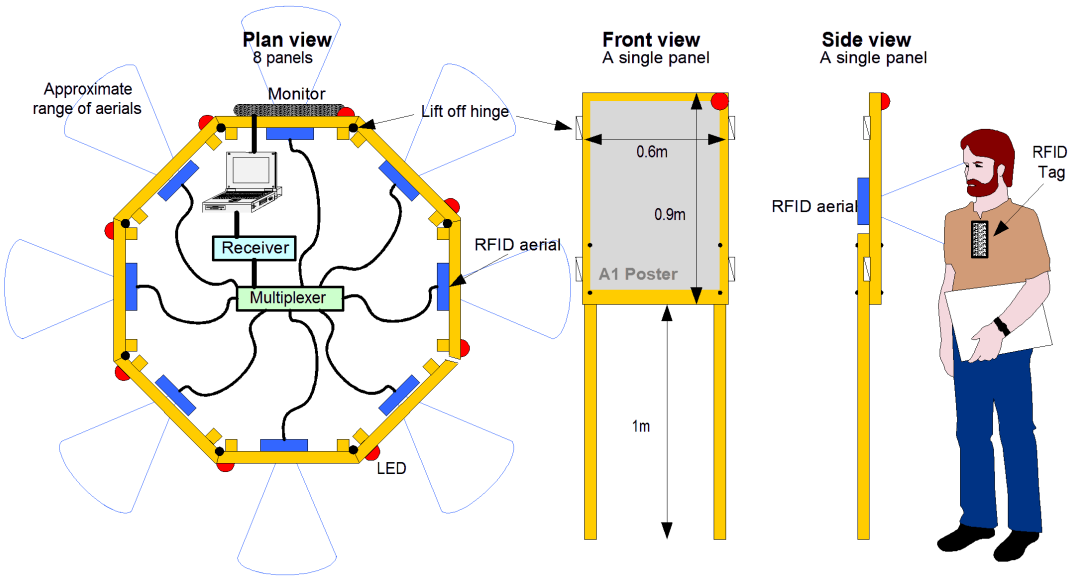


Figure 55: RFID enabled display boards

The game is embedded in eight display boards, each concealing an RFID aerial. As players move around the display boards looking at posters RFID tags they are wearing are detected. The player movements around the boards are then translated into moves in the virtual game world. The virtual game world is displayed on a flat screen monitor mounted on one of the display boards.

A light emitting diode (LED) is mounted on each display board and this lights when an RFID tag is detected near the board. This gives the player immediate feedback that they are close enough to the board to be detected.

Optionally a data projector might be connected to the computer to display the game world away from the display boards.

Appendix 18 Ambient Quest paper and dice game

This was handed to students in induction week, September 2008.

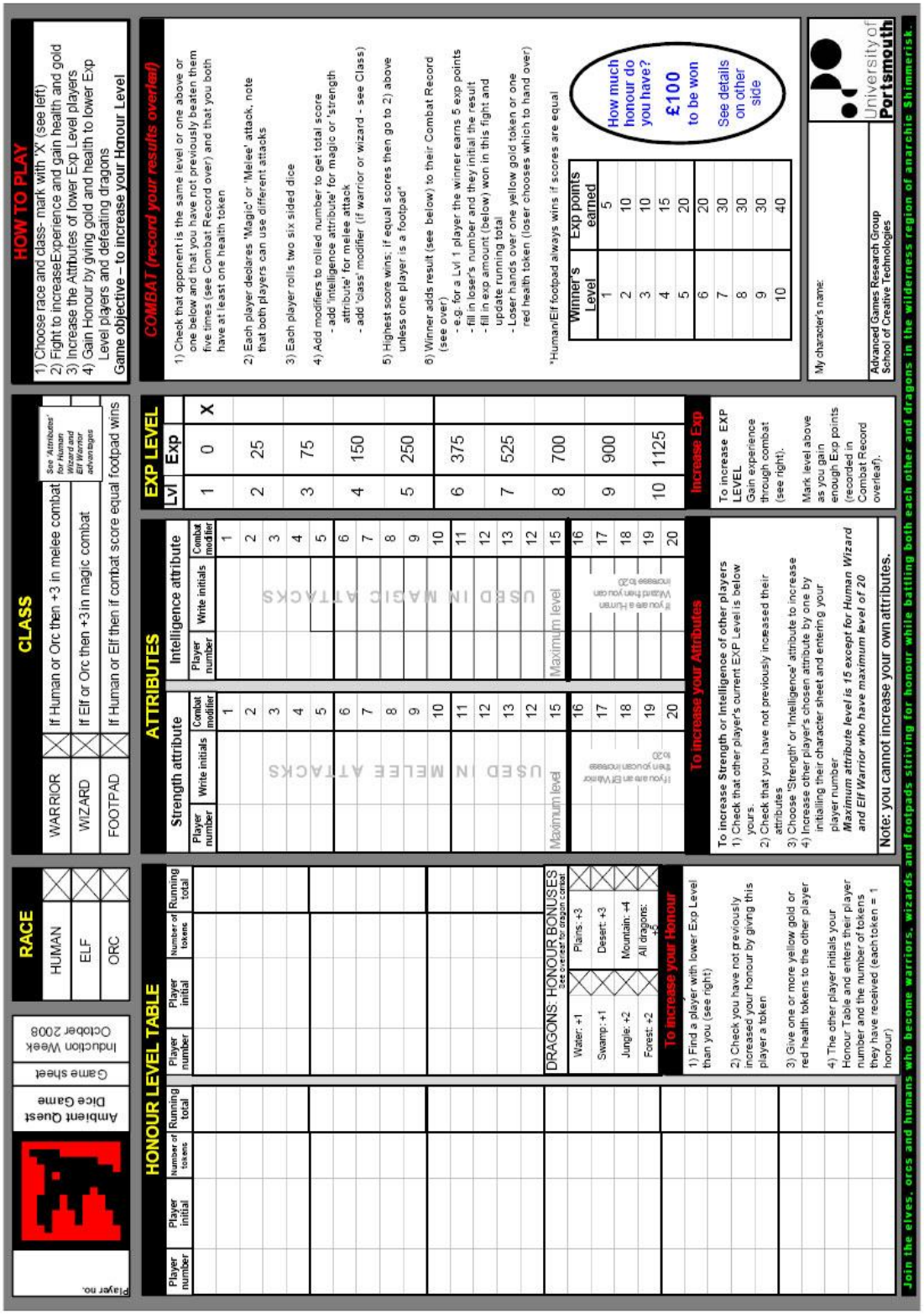


Figure 56: Ambient Quest paper and dice game page 1

COMBAT RECORD: record experience (exp) points won here. Remember you can only beat another player a total of up to five times (ie. if they appear in the list below five times you cannot fight them again)

Fight No	Opponent: Player number	Opponent: Write initials	Exp points: Amount won	Exp points: Running total
1				
2				
3				
4				
5				
6				
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99				
100				

Number of Health Tokens at end of game:

Number of Gold Tokens at end of game:

DRAGONSLAYER

Assemble a team to defeat a dragon (player + 2 others for Water, player + 3 others for Jungle etc). Decide on a dragon name and write this in on all player sheets. All players number and initial each other's sheets. Turnover and place 'X' on 'Dragons: Honour Bonuses' for defeated dragon. Players can only fight together against one dragon i.e. only able to initial below once - must be a new group of players against each dragon.

WATER DRAGON		SWAMP DRAGON		JUNGLE DRAGON		FOREST DRAGON		PLAINS DRAGON		DESERT DRAGON		MOUNTAIN DRAGON	
write dragon name here		write dragon name here		write dragon name here		write dragon name here		write dragon name here		write dragon name here		write dragon name here	
Player number	Write initials	Player number	Write initials	Player number	Write initials	Player number	Write initials	Player number	Write initials	Player number	Write initials	Player number	Write initials

£100 to be won and also the opportunity to take part in games research

To enter the competition to win a first prize of £50 or one of five runner up prizes of £10 hand in your game sheet to the Creative Technologies office before 4pm on Monday 6th October. The most honourable player will win the first prize (judged by Mark Eyles).

Remember to fill out your name and email on this game sheet before handing it in. Also fill in how many tokens you have ended up with (see right).

If you also wish this game sheet to be used for research into role playing games then read the 'Information Sheet' supplied with this game. If you agree with this then fill out the Consent Form and return it with your game sheet. Note that you can enter the competition without taking part in research.

Thanks, Mark Eyles

Advanced Games Research Group School of Creative Technologies

My email:

My name:

Figure 57: Ambient Quest paper and dice game page 2