# Investigating Computer Game Immersion and the Component Real World Dissociation

**Charlene Jennett**
UCL Interaction Centre
MPEB 8th Floor
Malet Place
London, UK WC1E 7JE
charlene.jennett@ucl.ac.uk

**Anna L. Cox**
UCL Interaction Centre
MPEB 8th Floor
Malet Place
London, UK WC1E 7JE
anna.cox@ucl.ac.uk

**Paul Cairns**
Computer Science Dept
University of York
Heslington
York, UK YO10 5DD
pcairns@cs.york.ac.uk


*CHI 2009*, April 4 – 9, 2009, Boston, MA, USA
ACM 978-1-60558-246-7/09/04.

## Abstract
In this paper we describe research being conducted to investigate the experience of computer game immersion, in particular the component "real world dissociation".

## Keywords
Immersion, Games.

## ACM Classification Keywords
H.1.2. User machine systems: Human information processing. K.8.0. General: Games.

## Introduction
In December 2006, following the release of Nintendo's new gaming console the Wii there were numerous reports of users in the UK having accidents. For example, in one case a man playing a ten-pin bowling game accidentally let go of the controller, acting as though it were a real bowling ball, and embedded it in the side of his TV [1]. Meanwhile in China, in February 2007 it was reported that an online games addict died after playing for seven days in a row [2]. These extreme examples demonstrate that games have an ability to draw people in. Sometimes people find the

game so engaging that they do not notice things around them, such as the amount of time that has passed, or another person calling their name. At that moment of time, almost all of their attention is focused on the game, even to the extent that some people describe themselves as being "in the game" [3].

This experience is referred to as "immersion", a term used by gamers and reviewers alike. Immersion is often viewed as critical to game enjoyment, immersion being the outcome of a good gaming experience. However, although there seems to be a broad understanding of immersion in the gaming community, it is still not clear what exactly is meant by immersion and what is causing it [3].

## Immersion Research

Carr [4] writes that immersion definitions can broadly be classified into two types: perceptual and psychological. Researchers that view immersion as a perceptual phenomenon refer to immersion as the degree to which a technology or experience monopolizes the senses of a user. In contrast, researchers that view immersion as a psychological phenomenon emphasise cognitive rather than sensory features of the game, referring to immersion as involving the player's "mental absorption" in the game world.

Clearly there is a discrepancy amongst the research community in terms of what immersion actually is. Furthermore, it is not clear which of these definitions is closest to that of gamers when they refer to immersion in their game play. In an attempt to resolve this disparity, Brown and Cairns [3] conducted a qualitative study in which they interviewed several gamers, asking them to talk about their experiences playing computer games. The resulting grounded theory found that immersion was used to describe a person's degree of involvement with a computer game, thereby supporting the idea of immersion as a cognitive phenomenon. Furthermore, the theory identified a number of barriers that could limit the degree of involvement, and the type of barrier suggested different levels of immersion: engagement, engrossment and total immersion.

Based on these findings, as well as findings of related research investigating the concepts of flow, cognitive absorption and presence, Jennett et al. [5] developed a questionnaire, administered it to a large sample of gamers, and conducted a factor analysis on the results. The factor analysis revealed that the questionnaire measured five components of the immersive experience: cognitive involvement, real world dissociation, emotional involvement, challenge and control.

The next step is to investigate these components in more detail and how they interact. In this paper we will describe our work in progress investigating the immersion component "real world dissociation".

## Real World Dissociation

The component dubbed "real world dissociation" (RWD) received strong loadings for items expected to measure losing track of time, lack of awareness of surroundings and mental transportation (e.g. "To what extent did you feel consciously aware of being in the real world whilst playing?") [5]. RWD is something that both perceptual and psychological theories of immersion refer to: as a result of immersion in the game world, people are less aware of the real world [4, 3].

However, one may ask to what extent are people less aware of their real world surroundings as a result of playing a game?

A qualitative study was conducted in order to explore this aspect of immersion. Gamers were interviewed for 45-60 minutes and transcripts were analysed using open coding [6]. There were originally 14 gamers interviewed, however Participant 6 was excluded from the study due to a corruption of the voice recording. Therefore the resulting grounded theory is based on the interviews of 13 gamers in total. 8 were male and 5 were female. Their ages ranged from 19-32 years (SD = 3.66). Between them they had experience in playing a wide range of games and consoles.

The grounded theory covered a number of research topics, including people's reasons for gaming, features of a good game, and the experience of immersion. For the purposes of this paper, only the part of the grounded theory related to real world dissociation shall be reported.

The resulting grounded theory suggested two main findings. The first finding was that not all aspects of the surroundings are processed in the same way. Irrelevant distracters, such as the TV playing in the background, are less likely to be noticed than relevant distracters, such as someone calling your name (personally relevant) or a sound related to the game but not coming from the game (game relevant).

This extends previous work on immersion as it suggests that there is an attentional filter at work: gamers are not just less aware of their environment, but they are less aware of certain aspects of their environment, depending on their relevance.

The second finding was that when a gamer does not respond to distracters this can be due to either bottom-up or top-down processing, depending on the type of distracter. Irrelevant distracters are not responded to because they are not noticed (bottom-up):

> *"Quite often I have my TV on when.. and so I might not notice that.. like anything that's happened in terms of the programme or that it's even.. or that it's ended or anything." ~ Participant 14*

Relevant distracters are noticed. However sometimes they are still not responded to, because the gamer chooses to ignore them (top-down):

> *"I would personally notice but it's.. you just ignore it basically... you are aware that someone's just screamed your name, or y'know just knocked you at the back of your head and said 'stop playing' or something, but it.. sometimes it doesn't stop you from playing, it won't literally break your concentration, it will interrupt it partially but not completely." ~ Participant 9*

This extends previous work on immersion as it suggests that as well as being less aware of the environment due to processing capabilities, there are also times when gamers consciously choose not to respond, i.e. they choose to stay immersed. At that moment in time, the game is simply viewed as more important than reality.

## Experimental Investigation

In order to validate the grounded theory, and test whether RWD is influenced in the way that is predicted, experimental studies were conducted.

The first experiment investigated the extent to which people are aware of auditory distracters (person relevant, game relevant and irrelevant) during a boring game (low immersion condition) or a more engaging game (high immersion condition).

There were 18 auditory distracters in total. These were played on a Casio cassette player, placed at the back of the testing room behind where the participant was sitting. Distractions relevant to the game were relevant to asteroids or spaceships, e.g. "Move the rocket to the right", "Space games are boring". Distractions relevant to the person were relevant to the situation of being in the testing room, e.g. "Tap your fingers to the right", "London is boring". Irrelevant distractions were not related to the game or the person, e.g. "Swing the bat to the right", "Collecting stamps is boring".

The same distractions were played in the low immersion and high immersion conditions. In order to vary immersion but yet keep the game as similar as possible, we created our own game called Space Trek. The "high immersion" and "low immersion" versions of the game differed in terms of graphics, sound, feedback, scoring, challenge and a sense of progression, see Table 1. These game elements were determined from another part of our grounded theory (not described in this paper due to limited space) in which we asked gamers "What features make a good game?" These game elements are also in line with Brown and Cairns' qualitative findings [3].

**Table 1.** Differences between the high and low immersion versions of the game Space Trek.

| *Action* | *High Immersion Game* | *Low Immersion Game* |
|---|---|---|
| Collect a star | • Spaceship glows<br>• "Swoosh" sound<br>• + 100 points | • Spaceship remains the same<br>• No sound<br>• No score |
| Crash into an asteroid | • Spaceship turns red and is stunned<br>• "Bash" sound<br>• - 50 points | • Spaceship remains the same<br>• No sound<br>• No score |
| Game play over time | • Asteroids fall at same speed<br>• Asteroids vary in size and colour | • Asteroids fall at same speed<br>• Asteroids remain the same size and colour |
| Graphical details | • Stars twinkle in background<br>• On "right press" the spaceship looks like it is leaning right, etc.<br>• Asteroids quake as they move downward | • Stars do not twinkle in background<br>• The appearance of the spaceship remains the same throughout<br>• Asteroids do not quake as they move downward |

The games were played on a Gateway laptop using Flash Professional 8.0 and lasted 10 minutes each. For both games participants were instructed that the aim of the game was to collect as many stars as possible while avoiding the asteroids. For the high immersion game, participants were also instructed that they should try their best to achieve the highest score possible. For the low immersion game, participants were instructed that there would be no score. A screenshot of the game can be seen in Figure 1.


**Figure 1.** A screenshot of the game Space Trek.

There were 18 participants in total. 14 were female and 4 were male. Ages ranged from 19-30 years, the mean age being 23 years (SD = 2.84).

After completing each game, participants completed a modified version of the immersion questionnaire [6], which asked them to rate their experience of the game. Participants also completed three questionnaires measuring their awareness of the distracters: a free recall test, a recognition questionnaire and a ranking task. The free recall test allowed us to obtain a measure of conscious processing. The recognition questionnaire allowed us to test for unconscious processing, as well as confidence levels. The ranking task allowed us to gain an idea of how distracting the person found the sounds in relation to one another. Overall the experiment took 50-60 minutes to complete. All participants were debriefed afterwards and received five pounds payment.

The results revealed that participants rated the high immersion game (mean = 148.22) significantly more immersive than the low immersion game (mean = 96.67). Participants in the high immersion condition recalled significantly fewer distracters (mean = 5 out of 18) than participants in the low immersion condition (mean = 7 out of 18).

In terms of types of distracters, participants in the high immersion game recalled significantly more game relevant distracters (mean = 3 out of 6) and person relevant distracters (mean = 2 out of 6) than irrelevant distracters (mean = 0 out of 6). In contrast, for the low immersion condition the differences in recall of game relevant distracters (mean = 3 out of 6), person relevant distracters (mean = 2 out of 6) and irrelevant distracters (mean = 2 out of 6) was not significant. These findings suggest that in the high immersion condition the player is more selective in terms of what information they attend to and is less likely to process irrelevant distracters, compared to the low immersion condition. This supports the idea of an attentional filter, thus supporting the grounded theory.

The findings from the other measures of awareness also support the grounded theory. Participants in the high immersion game recognised significantly more game relevant distracters (mean = 5.33) than irrelevant distracters (mean = 3.78). They were also significantly more confident at recognising game relevant distracters (mean confidence score = 51.00) and person relevant distractions (mean confidence score = 42.67) than irrelevant distracters (mean confidence score = 35.89). In contrast, for the low immersion condition the differences in recognition and recognition confidence of game, person and irrelevant distracters were not significant. Similarly, the ranking data revealed that whereas for the high immersion game the irrelevant distracters were all rated as the "least distracting", for the low immersion game there was more of a spread.

## Further Research

A limitation of the first experiment is that even though the "high immersion" game is more immersive than the "low immersion" game, it is still not as challenging as a real game. Currently we are analyzing the results of a second experiment, in which we replicated the method of the first experiment, but using an even more engaging game in the high immersion condition. These results appear promising and again in support of the grounded theory.

Another limitation of the first experiment is that it relies on subjective measures of awareness, i.e. recall, recognition. Therefore in future experiments we aim to conduct experiments using objective measures, such as reaction times. We also aim to investigate the differences in RWD between expert and novice gamers, and investigate other types of distracters (e.g. visual, tactile).

By conducting these subsequent experiments, it will help us to validate and build upon our grounded theory. Furthermore, by understanding the component of RWD in detail, this research allows us to gain a greater understanding of the experience of immersion itself.

In terms of its contribution to HCI, understanding immersion is important because it can provide insights into how to enhance immersion in contexts that desire to be more engaging, e.g. educational games. Understanding immersion can also provide insights into how to inhibit immersion in contexts that might be dangerous, e.g. game addiction [2].

## Acknowledgements

This research is supported by an EPSRC DTA studentship.

## References

[1] Blog logs Nintendo's Wii accident. Tuesday, December 12, 2006

http://www.metro.co.uk/news/article.html?in_article_id=29027&in_page_id=34

[2] Game addict dies after seven days online. Wednesday, February 28, 2007.

http://www.metro.co.uk/news/article.html?in_article_id=39315&in_page_id=34

[3] Brown, E., & Cairns, P. (2004). *A grounded investigation of game immersion*. CHI 2004, ACM Press, 1279-1300.

[4] Carr, D. (2006). Play and pleasure. In D. Carr, D. Buckingham, A. Burn, & G. Schott (Eds.), *Computer games: Text, narrative and play*, pp.45-58. Polity Press: Cambridge.

[5] Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T. & Walton, A. (2008). Measuring and defining the experience of immersion in games. *International Journal of Human-Computer Studies, 66*, 641-661.

[6] Strauss, A., & Corbin, J. (1998). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory.* SAGE Publications.