Blowtooth: Pervasive Gaming in Unique and Challenging Environments

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Abstract
This paper describes *Blowtooth,* a Bluetooth-implemented pervasive game where players smuggle virtual drugs through real airport security with the help of unknowing bystanders. The game explores the nature of pervasive game playing in unique and challenging environments; environments that are not generally regarded as playful or "fun," and where people are subject to particularly high levels of intrusive surveillance and monitoring. Six participants who were travelling internationally within a two-week period were recruited to evaluate the game. The study found that players engaged readily in virtual drug smuggling at airports and reported enjoyment at doing so. Our findings suggest that creating pervasive games that incorporate the unique features of their context as part of the game may provide enjoyable, novel and thought-provoking experiences for players.

Keywords
Pervasive Games, Airports, Mobile Games, Non-players, Non-places, Provocative Games, Critical Games

ACM Classification Keywords
K.8.0 [General] – Games; K.4.1 [Computers in Society] - Privacy; K.4.0 [Computers in Society] – General.

Introduction

The current paper presents an example of a pervasive game that is played in a high security environment. It is important to note that the primary intention of the authors is to provoke discussion on the suitability of such environments as locations within which to situate pervasive games, rather than to conduct a thorough experimental evaluation of this particular game.

Pervasive games [10, 16] are entertainment applications in which the real-world is used as a game-board and the alternate reality of the game-world is exposed to the player via some form of pervasive technology such as a mobile phone [13]. Pervasive games aim to provide new and engaging experiences for players by harvesting information about the user's context and incorporating it within the structure of the game. These games typically take the form of treasure hunts, where repetitive activities such as the daily commute to work, or the weekly shopping trip, may be enhanced via a fantasy narrative, or with a goal-directed game-world task. Example tasks include the visiting of new places or discovering of virtual objects in real space in order to gain points or access to new types of task [15].

The currently popular treasure hunt-style pervasive games aim to use interesting game elements to enhance the supposed uninteresting, bland, or boring real-world environments of game-players. In doing so, these games typically fail to take advantage of any interesting or unique elements of that real-world environment that may enhance the user experience. They are typically not designed to interact with environments that are already interesting, engaging, or that invoke emotional reactions in people. Indeed, it could be argued that the most interesting potential application of pervasive games lies in the careful matching of game-world tasks to the particular features of the real-world environment that the player is currently experiencing. Pervasive games that do carefully assign tasks to the player according to the unique features of the player's particular context have the potential to provide hugely enjoyable, novel and thought-provoking experiences for players.

One possibility for providing interesting and thought-provoking experiences to players of pervasive games is to situate those games in places that are not traditionally thought of as playful or fun. One can imagine the cognitive and emotional impact of playing a gun fighting game at a shooting victim's funeral, or a disease-spreading game on a hospital ward. We believe that such experiences would offer the game player a unique opportunity to reflect on both the nature of game playing and the nature of the environment in which they are being played, while also providing a unique and engaging game-play experience (see [6]).

This paper describes the application *Blowtooth,* which has been developed to create interesting interactions between game players and a very unique and challenging environment: international airports. Blowtooth is specifically designed to exploit the affordances of this environment in which people are subject to particularly high levels of intrusive surveillance and security monitoring [19]; indeed airports are places that previous researchers have identified as unsuitable for pervasive game playing [11]. In everyday experience surveillance such as that encountered at airports can be both simultaneously

thrilling and frightening; the possibility of harnessing these sensations in a game, or indeed any other art form, has great potential [1]. Thus, airports appear to be the ideal extreme environment in which to explore the process of enhancing pervasive game-play experiences through careful matching of game-world tasks to the particular features of a player's real-world environment.

In addition to demonstrating how the unique features of the real-world environment may enhance users' experience of pervasive games, Blowtooth, in concentrating heavily on the features of the social and physical environment of the airport, has the potential to provide commentary and the opportunity for reflection on the nature of that environment itself. As such it may be considered a critical game [6]. Critical games are designed to stimulate critical thinking about important social, political or physical structures. While Blowtooth was not designed solely with this purpose in mind, it certainly has the potential to stimulate critical thinking in users on the nature of the airport environment.

To our knowledge, no existing games have specifically exploited the uniqueness of the airport experience as the backdrop to a pervasive game. In this context, we set out to design a game that combined widely-available and simple technology, and a requirement for participants to interact with some interesting and unique features of the airport environment, in order to create a novel, engaging and thought-provoking experience for the player.

THE UNIQUENESS OF AIRPORTS

The airport constitutes a very different type of place to that which we usually inhabit in our everyday lives. Airports have attracted the attention of researchers from disciplines as diverse as anthropology, sociology, social psychology and political science, who have each attempted to explain the unique effect of the airport on those who use them. Airports have been described variously as: national frontiers in the middle of a country, as cities, as transition spaces, places for commercial interchange, non-places, sites of surveillance, crossroads, symbols of mobility, and no-mans land (see [8] for in-depth discussion of these points). Many writers (e.g. [5]) have also talked about airports as constituting a *non-place* [2] i.e. a place that people pass through without meeting, and co-exist in without living together. Such places are typically inherently uniform to the point that they resist any emotional attachment or sense of belonging [7].

It is commonly noted that the airport is a place that generates tension and anxiety amongst travellers, staff and officials alike [17]. Indeed, airports have been described as constituting the most authoritarian facility designed for the use of free civilians, an authoritative structure rivalled only by army bases and maximum-security prisons [8]. Kellerman [8] describes the movement of passengers through the various security checks imposed by airport authorities in great detail and discusses the impact of these checks on the experience of the international traveller. Throughout this analysis he draws attention to the ubiquitous presence and power of authority figures and the effect of causing tension and anxiety amongst travellers, staff and officials alike (see also [18]). Indeed, airports are places in which oppressive control technologies are

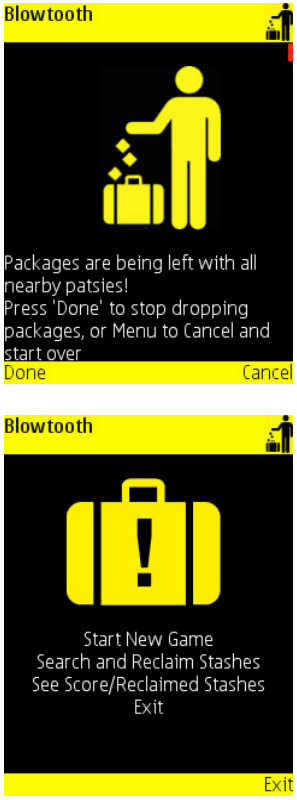

Figure 1. Screenshots from Blowtooth, giving an example of the tongue-in-cheek airport-themed way in which the game is presented.

implemented and people's expectations of privacy are altered. Authorities have extra powers to search and detain individuals and there are different expectations on travellers' behaviour than would be expected outside of this context.

GAME DESIGN AND IMPLEMENTATION

Blowtooth is designed with a fictional narrative that is deliberately provocative given the environment in which it is set. Game-play involves the covert smuggling of a virtual cache of illegal drugs through real airport security checks. From a player's perspective, the game begins when they reach the airport, by planting small amounts of contraband on unwitting fellow travellers. Players are encouraged to do so in places where groups of passengers tend to congregate, such as check-in lines, cafes, and information screens. When the player is satisfied that enough drugs have been stashed, the game forces a wait of ten minutes before the second phase of the game begins. In this phase, the player must retrieve as much of their stash as possible, once it is "safe" to do so. Specifically, players must seek out those passengers who they have stashed their drugs on at the other side of the airport security check. Players are awarded points based on how many of the original "patsies" can be found on the other side of the security check, and the length of time taken to retrieve the drugs. In essence, players must use their phones after passing through security to identify people that they have encountered before passing through security.

In reality, of course, no drugs are involved and the game simply polls a player's vicinity for Bluetooth devices, produces an internal list of these nearby devices and allows the player to conceptually dump or retrieve contraband. No interaction with the other devices is made other than to discover it's unique, anonymous and factory allocated hardware address. In addition, the "patsies" or drug mules are never made aware that they were involved in the game. While the technology required to play this game is not novel or innovative, we feel that the combination of the drug smuggling narrative, the task of finding previously tagged passengers and the high security airport environment should produce a unique and engaging experience for players.

Blowtooth is implemented on Bluetooth-enabled mobile smart-phones and exploits the fact that many people in airports also carry powered up, Bluetooth-discoverable, mobile devices. A number of studies elsewhere have demonstrated the ubiquity of personal Bluetooth-enabled devices in everyday environments (see [20] for a short review). The game has been implemented using the Java Micro Edition (formerly J2ME) and is available as an experimental prototype from http://www.blowtooth.com. The game is compatible

with most MIDP 2.0 devices and works particularly well on Nokia Series 60 class phones (see Figure 2).

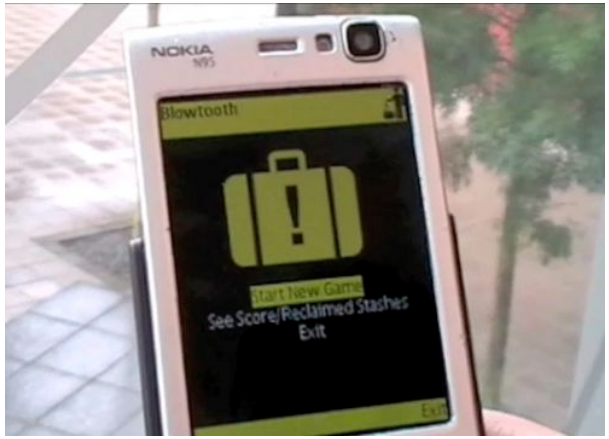

Figure 3. Blowtooth running on a Nokia N95 device

Evaluation

The current study investigates a number of themes relevant to pervasive game playing in unique and challenging environments. Specifically, we expect the drug-smuggling narrative of the Blowtooth game to create a highly engaging experience. In the context of a high-security airport environment, we expected that the playing of Blowtooth would affect participants' self-reported levels of anxiety.

We were also interested in whether participants felt comfortable engaging with a narrative based on illegal activity whilst in a high-security environment. In other words; did the matching of game task to the high-security real-world environment result in a game that participants wanted to play, or enjoyed playing.

A further issue of interest relates to the potential of Blowtooth as a critical game; we were interested whether the security-conscious narrative of the game affected participant's experience of the high-security airport environment. Specifically, we expected the drug-smuggling narrative of the Blowtooth game to affect participants' awareness of both security and their fellow passengers.

We were also interested in whether participants felt comfortable with the requirement to interact with non-players, particularly in terms of the requirement to seek out and find tagged fellow passengers after they had passed through security checks.

In order to evaluate these issues, six participants were recruited from personal contacts and acquaintances of the authors. All participants were travelling internationally within two weeks of the trial dates. These participants downloaded and played the Blowtooth game while travelling through an airport, before answering a questionnaire featuring both open-ended questions regarding the participants' experiences of the game and context, plus two separate quantitative scales. The first of these presented a number of questions taken from an established questionnaire that was developed as a part of a major EU project (FUGA) aimed at developing tools for measuring and evaluating player enjoyment in games [14]. The second, a short 12-item questionnaire, was designed to sample three factors; Anxiety, Security Awareness and Awareness of Other Passengers.

Results

In order to evaluate whether participants were comfortable with, or indeed enjoyed, playing a game

with a narrative based on illegal activities while in a high-security environment, a questionnaire was distributed to all six participants who played the game. This questionnaire consisted of eight questions taken from the Games Experience Questionnaire (GEQ) [14] designed to measure enjoyment of digital games and answered via a 5-point Likert scale.

Four of the seven factors in the GEQ were identified as useful in the current context. These were Competence, Positive Affect, Frustration and Negative Affect. Positive affect refers to positive emotions such as happiness and enjoyment, while negative affect refers to negative emotions such as boredom and tiredness. Two questions were chosen from the GEQ to probe for each of the four factors. Results of the six game players' responses to these questions are presented in table 1.

Table 1. Mean scores for Competence, Positive Affect, Frustration and Negative Affect in Blowtooth players.

Competence	Positive Affect	Frustration	Negative Affect
3.16 (SD=1.16)	3.75 (SD=1.21)	1.41 (SD=1.02)	1.66 (SD=1.69)

Table 1 illustrates that the participants who played the Blowtooth game reported high levels of competence and positive affect, while also reporting low levels of frustration and negative affect. Thus, it appears participants were quite content to play the Blowtooth drug smuggling game in the high-security environment of an international airport. This result supports the assumption suggesting that matching pervasive game content to the unique features of a challenging environment can produce an enjoyable experience for game players.

The current study also investigated the effect that playing a security conscious game in a high-security environment had on participants' perceptions of that environment. In order to do this, a questionnaire was presented to the six participants who played the Blowtooth game. The questionnaire presented 12 questions that probed for three overall factors; security awareness, anxiety and awareness of fellow passengers. Questions were answered via a 5-point Likert scale.

Table 2. Mean scores reported for security awareness, anxiety and awareness of fellow passengers.

Security awareness	Anxiety	Awareness of fellow passengers
2.75 (SD=1.25)	2.5 (SD=1)	2.75 (SD=0.95)

Table 2 suggests that participants who played Blowtooth did not report very high ratings of anxiety, despite the provocative nature of the game narrative, and the high security environment. In addition, participants did not report particularly high or low levels for awareness of security personnel or awareness of fellow passengers. This result is surprising, due to the

game task, which required participants to interact with these groups in ways that they would not normally.

Results of these short questionnaires are certainly surprising, as it was envisioned that Blowtooth would lead to anxiety in game players, and increased awareness and scrutiny of both security staff and the behaviour of other passengers. However, the sample size (n=6) is very small, so responses to open-ended questions was deemed equally, if not more valuable. The open-ended questions presented to participants probed a number of topics.

The principal aim of the study was to investigate whether the matching of game narrative and game tasks to a unique and challenging environment would create an engaging and enjoyable experience for game players. Participants generally reported that they enjoyed the drug-smuggling narrative of the game. Partiticant 1 reported "I liked the names for items and people. They made it fun." Participant 2 stated "I enjoyed the theme, it gave it a purpose," while Participant 6 reported that the narrative "works, because you are at an airport and it fits together."

We were interested in whether playing the game affected participants' behaviour and the emotions they experienced while at the airport. While participants were, "very aware it's just a game," they typically reported some anxiety caused by playing Blowtooth. Participant 2 reported that they *"left the game running whilst going through security so was slightly concerned if they chose to search my bag I would have to explain what it was doing."* Participants 4 and 5 made sure that their phone was locked when passing through security so that staff would not see the distinctive blowtooth graphics. Indeed, four of the six participants reported making minor adjustments to their behaviour (e.g. ensuring that their game screen, with the striking graphics, could not be seen by security personnel) due to playing the game.

We were interested in whether Blowtooth provoked participants to think more critically about the nature of airports. Three participants reported that they noticed interesting aspects of the airport environment that they had not previously noticed. Specifically, participant 1 "noticed the ways the different airports 'herd' the passengers to their gates. Some get you there soon after the security and you wait there, others have a more general waiting area," while participant 2 "took more notice of where other planes were taking off from, also looked for places where large groups of people gathered." It appears that playing Blowtooth provoked these participants into more critical thinking about their surroundings.

We were interested in whether Blowtooth provoked participants to think more critically about the nature of play and the idea of playing games in high security environments. None of the participants reported any unease with the drug-smuggling game narrative, nor did any of the six Blowtooth players report feeling that the airport was an unsuitable venue for pervasive gaming. Indeed, none of the participants reported that they were worried about breaking the law while playing the game. When asked whether there was any environment in which it would be inappropriate to play pervasive games, participants provided a number of imaginative responses such as funeral homes, churches, hospitals, saunas, theatres/cinemas, libraries and courtrooms.

As the game required participants to interact with other, unsuspecting, passengers, we were interested in what effect this requirement would have on participants' interactions with those fellow passengers. Participant 2 reported that it was "fun guessing who the phones belonged to, for example sitting in a restaurant having my lunch 2 patsies were located just as two men entered the restaurant." Participant 6, noticed "people i'd seen before more frequently even if they weren't a bluetooth person." Participants did not appear to be worried about any ethical implications to do with playing such games, with participant 5 even requesting "a direction finder or distance finder to know how "close" to a package I was."

Overall, player comments appear to suggest that Blowtooth was an engaging, fun, and thought-provoking experience that, importantly, "really helped relieve boredom," related to international travel.

Conclusions

The current study investigated a number of themes relevant to pervasive game playing in unique and challenging environments. We found that players reported being content to engage in virtual drug smuggling at airports and enjoyed doing so. It is possible that engaging in subversive games in tense environments actually has the result of relaxing those game players. This is an issue that merits further research.

We also found that Blowtooth provoked participants to think more critically about both the nature of airports, and the idea of playing games in high security environments. This is an exciting finding, as it suggests that the process of carefully creating pervasive game tasks that take advantage of the unique and challenging elements of "taboo" environments in which they are played creates the possibility to construct engaging, thought-provoking critical games about those environments.

We are aware that Blowtooth raises some interesting privacy and ethical implications. It is clear that Blowtooth has an edginess and a risqué nature, due to the authors intention to demonstrate the interesting possibilities of playing pervasive games in environments that are not traditionally thought of as playful or fun. Indeed, it is conceivable that an enhanced version of this game that had server connectivity could be used to derive information about which airports, or types of airports, are easier to smuggle contraband trough. Indeed, it is possible that the game in its current state could actually be used to aid in the smuggling of real drugs through airports; it would be simply a matter of substituting real drugs for the virtual Bluetooth variety. However, it must be remembered that the game is delivered in a playful and tongue-in-cheek manner through its user interface, graphics and narrative and that all participants in the current study mentioned how it was just a game. Thus, the game created an interesting and thought provoking experience for participants, while remaining fun and not causing undue amounts of anxiety.

Additionally, the notion of using 'non-players' as part of a game mechanic is a common theme in pervasive games that has been explored, for instance, in the EU FP6 iPerG project [12]. Indeed, none of the participants in the current study expressed any concern over the use of non-players. In fact, some players expressed a wish to have more powerful tools for

finding those people after they had passed through security.

It appears that the carefully creating pervasive games that take the nature of their context into account and incorporate it as part of a game structure may provide enjoyable and thought-provoking experiences for players, even in environments that would appear, at first, to be unsuitable locations for pervasive game play.

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