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ABSTRACT
We present the design of a location-based game called *Uncle Roy All Around You* that mixes elements of computer games and live theatre to create an experience that is accessed by both mobile and online inhabitants of a city. Street players journey through the city in search of an elusive character called Uncle Roy, guided by online players who journey through a parallel 3D virtual model of the same city and can choose to help or hinder them. In this way, both street and online players explore the theme of trust in remote players, in technology and even in passers-by. We present the design of *Uncle Roy All Around You*, summarize feedback from street and online players, and draw out three general design strategies for location-based games: use the city as your canvas, exploit ambiguity, and encourage social game-play.

INTRODUCTION

Pervasive games extend the gaming experience out into the real world, using a combination of mobile devices, wireless networking and sensing technologies to deliver experiences that respond to players' locations, activities and potentially even their feelings. One approach to creating pervasive games is to reinterpret classic computer games, mapping them onto real-world settings so that players have to physically run about in order to control their avatars, as demonstrated by *Human Pacman* (Cheok and others, 2004) and *ARQuake* (Piekarski and Thomas, 2002). Another is to focus on social interaction, for example *Pirates!*, a fantasy game about trading and fighting at sea (Björk and others, 2001). Educational pervasive games

encouraging learning through physical role-play as shown by *Savannah*, a game in which groups of six children hunt as lions on a school playing field (Benford and others, 2005).

In this paper, we focus on artistic pervasive games that combine gameplay with elements of live theatre within the setting of the city streets. We present a study of such a game called *Uncle Roy All Around You* that was created by the artists group Blast Theory and the Mixed Reality Laboratory at the University of Nottingham. This game was directly descended from previous collaborations between these two groups, beginning in 1997 with *Desert Rain*, a touring a performance that combined aspects of computer games with live performance by integrating a collaborative virtual environment into an extensive physical set (Koleva et al, 2001). This was followed in 2001 by *Can You See Me Now?*, a pervasive game of chase in which public players are chased through a 3D virtual model of a city that they access over the Internet by performers who, equipped with handheld computers, GPS receivers and walkie-talkies, have to run through the actual city streets in order to catch them (Flintham and others, 2003).

UNCLE ROY ALL AROUND YOU

Uncle Roy All Around You mixes street players who journey through a city in search of an elusive character called Uncle Roy, with online players who journey through a parallel 3D model of the same city, follow the progress of street players, communicate with them, choosing to help or hinder them. The core artistic theme of the work is trust in strangers – in remote players, Uncle Roy, the technology or even passers by.

A STREET PLAYER'S EXPERIENCE

A street player's experience lasts for a maximum of one hour. On arrival at the venue they hand over all of their personal possessions including bags, wallets, mobile phones and keys, in exchange for a handheld computer, a ritual that is intended to increase their sense of anticipation, vulnerability, dependence on Uncle Roy and isolation and disconnection from the everyday experience of the city. An actor briefs them that their mission is to rendezvous with Uncle Roy and explains how to use the handheld computer. They then head out into the city.

Their first task is to find a red marker on the PDA map (See Figure 1), to get to the physical location this indicates, and then declare their position to Uncle Roy. Street players declare their position by using the stylus to drag the 'me' icon on their PDA map to their current location and then pressing the 'I am here' button.

Figure 1. Street player's interface, zoomed out and in

Whenever they do this, they receive a short text message back from Uncle Roy that provides them with a clue as to where to go next. In this way the street players begin a journey through the city, following a trail of clues that lead them in search of their eventual goal – Uncle Roy's office.

Figure 2. Following clues in search of Uncle Roy's office

The pre-scripted clues are attached to different regions of the game map and are designed to be ambiguous – some are relatively direct and useful, while others are misleading to the point of being mischievous, encouraging players to follow diversions, drawing on the history of the local environment, implicating passers by in the game, heightening the sense of being watched and also casting doubt on the intent and personality of Uncle Roy, especially the extent to which he can be trusted. Clues also constantly remind players that they have limited time in which to reach Uncle Roy's office and that the clock is ticking.

For example:

Good. I want you to walk towards the Mall. Watch a tourist cross the road and follow them. There are some hidden steps among the buildings. You have NN minutes remaining.

As they follow clues, street players also begin to receive text messages from remote online players who, it becomes apparent, are following their progress through the city and who appear to know vital information such as the whereabouts of Uncle Roy's office. Street players can reply to these messages by uploading short audio messages and so can try to establish a relationship with online players and enlist their help. However, online players have their own objectives. They have been told to enlist street players in the task of retrieving a postcard from a location in the city so that it can be posted back to them. Postcard locations include bars, telephone boxes and even in the saddle bags of chained up bicycles. In this way, street players are encouraged to cross the boundaries of normal behaviour in the city which in turn tests the limits of their trust in online players and in the game itself.

This crossing of boundaries becomes more significant in the final stage of the experience. Eventually most street players find their way to an office door whereupon their PDA instructs them to press a buzzer. The door slides open and they are invited to step into a deserted office. The office shows signs of recent habitation – the lights and radio are on. They are now invited to sit down and complete their postcard, answering the question "when can you begin to trust a stranger?"

Figure 5. Writing the postcard in the office

They are then asked to leave the building – taking the postcard with them – and wait in a nearby telephone box. The phone rings and on answering it, a human voice tells them to walk around the corner and get into a waiting limousine. An actor climbs in beside them and the limousine pulls off. During the ride, the actor quizzes them about trust in strangers, and tells them that somewhere else in the game another player is answering these same questions. Finally, he asks them whether they are willing to enter a year-long contract to help this stranger if ever called upon. If they agree, he takes their contact details. The car pulls up by a public post-box and the player is asked to post their postcard – addressed to Uncle Roy – to finally seal the contract.

Figure 6. The telephone box, limousine and postbox

AN ONLINE PLAYER'S EXPERIENCE

An online player, connected to the game over the Internet, journeys through a parallel 3D model of the game space. They move their avatar through this model, encountering and (text) chatting with other online players. They also access details of current street players in the game, including their name, gender, description and a photograph that was taken when they registered to play. They can send private text messages to individual street players and can listen to their most recently uploaded audio message.

Figure 7. Online player's interface: own avatar (white figure), street player cards (right), street player's position (red sphere) and text message boxes (bottom).

Online players find photos embedded within the 3D model, showing the view on the actual city streets from this vantage point, one of which is labelled as Uncle Roy's office (Figure 8).

Figure 8. Accessing a photo of the office door

Finally, whenever a street player enters Uncle Roy's office, online players are invited to join them. This involves seeing a live webcam view looking into the office, which enables them to see the street player in person for the first time (Figure 9).

Figure 11. Seeing the street player on the office webcam

At this point, they are asked the same questions as for the street player in the limousine, including whether they will commit to help a stranger for the next year, in which case they enter their personal contact details.

After the game, street players and online players who made a commitment to help a stranger are (manually) paired up and sent each other's contact details. They have entered a year-long contract to help one another.

FEEDBACK FROM *UNCLE ROY ALL AROUND YOU*

We now focus on how players experienced *Uncle Roy All Around You*. At the time of writing, the work has toured to three U.K. cities, London, Manchester and West Bromwich. The following observations draw mainly on direct feedback from players through interviews, emails and completed questionnaires that were filled-in by street players directly after their experience, as well as on discussions among the production team during debriefing meetings.

It appears that *Uncle Roy All Around You* was often a compelling experience, especially for street players who used words such as "mistrust", "ambiguity", "scary", "paranoia", "safety", "fear", "lack of control", "strangers" and "trust" to describe it. Analysis of players' comments suggests that such reactions arose from several features of the experience. First, street players were conscious of the feeling of being watched while they were in a public place, which was heightened by being alone in the city:

"That whole feeling of being on your own and trying to do something which to me is quite scary – you don't know if you are doing it right." ... "scary but great."

These feelings were established through the initial briefing ritual, as one player described:

"Players were asked to leave all possessions at the ICA [Institute of Contemporary Arts] so I had no watch, mobile or map. This worried me because I didn't know the

area and when directed to Pall Mall or other places, I had no idea where these were and unfortunately, the people I asked for directions got it wrong resulting in me heading in the wrong direction. This, however, didn't detract from the experience."

As this player also suggests, a key strategy was to implicate passers-by in the game, even when they were not involved, for example through clues that suggested following strangers. Street players commented on this tactic:

"I liked the instructions to follow ppl [people]."

"The sense of looking at everyone and thinking that they are part of this."

"I don't think I saw any mad people in the street as I was expecting – although I suspected everyone."

"The area it was played in gave you the feeling of everyone in London passing being involved."

"Not knowing who at first was a performer and who was not a performer – everyone is a performer."

And some street players were even led to interact with strangers:

"Asked a bunch of strangers if they were Uncle Roy."

The use of live actors towards the climax of the experience was clearly a significant factor, especially as they were encountered close-up in a one-to-one situation:

"The physical intervention to street players was great."

"The feelings of uncertainty and mistrust I experienced when facing your street actors."

Street players also appreciated interaction with online players:

"The kind online gentleman guided me at just the right time."

"By asking online players I managed to engage their attention + help and find number 12."

"When it worked the communication between online & street players was excellent."

Although some players clearly wanted more contact:

"I didn't get any help from online players. I felt a bit abandoned or disconnected too."

"Sometimes difficult to get info from online players."

As anticipated, another key feature of the game was going into places where you wouldn't normally venture, such as the empty office and especially the limousine.

"Enjoyed going into the building."

"At one point near the end you were directed to get into a car. I felt uneasy about this because you 'never get in a car with a stranger' but you assume it must be part of the game because of the sequence of events that lead you to that point. I probably wouldn't have got in the car if there weren't this sequence of events leading up to it."

This latter comment shows that, ultimately, street players trust the game producers to look after them, assume that they have been given permission to cross certain boundaries and that they are operating within a safe framework. As one player put it:

"The last bit was very odd – but u didn't feel too uncomfortable. The set up is lightly connected - it is not blind trust as I have some institutional trust in Blast Theory and the ICA."

There were also suggestions for improvement. A common frustration was with the reliability of the technology (nearly always due to problems with GPRS networking). Although we tried to spot such problems early on from the control room and send an actor to help, ideally without breaking the flow of the experience too badly, street players would sometimes have to wait for minutes for reconnection or on a very few occasions abandon the game altogether. Several players commented that the clues were too simple and that the game could have been more taxing or could have avoided you following a set route. Certainly, a few players finished very quickly (within 20 minutes), perhaps because they were 'lucky' or maybe because an online player guided them to the office straight away. Related to this many players said that they would have liked a longer experience. There were also a few frustrations that arose

from physical bottlenecks, for example having to wait while the phonebox was being used. Finally, street players mentioned wanting to be able to share the experience with other street players afterwards. Given the highly subjective nature of an experience such as *Uncle Roy All Around You*, at least when compared to a conventional theatrical performance, it seems that it may be important to provide a way of players being able to discuss and compare experiences.

Turning now to the online player's experience, our overall sense is that thus was often less compelling or coherent than that of street players. The main role for online players was to guide street players and their main payoff was to persuade them to retrieve a postcard and to see them on the office webcam. We feel that this experience was most rewarding if a player had first completed the game as a street player as they would better understand the goals and structure of the game, emphasize with street players' feelings and possess enough knowledge to be able to guide them or indeed, otherwise manipulate them. Conversely, the experience often seems to have been confusing for those who hadn't first been on the streets.

ANALYSIS – THREE DESIGN STRATEGIES FOR LOCATION-BASED GAMES

Our analysis of these empirical results leads to three broad design strategies for location-based games.

Strategy 1: Use the city as your canvas

Our first strategy is to exploit the existing physical world – in this case the city, complete with its streets, buildings, history and not least its people – as the backdrop for the experience. Perhaps the most successful aspect of *Uncle Roy All Around You* is the way in which it draws on elements of the city, in both its general theme and through the details of its clues. Three specific tactics here are:

- Refer to real-locations and draw on the events associated with them. The clues in *Uncle Roy All Around You* refer to real places and events that happened there.

- Use physical locations. Another possibility is to make direct use of physical locations (in our case, the office, phonebox, and limousine) in a further attempt to blur the boundary between fiction and reality, although this can introduce physical bottlenecks into the experience (our crew in the control room and on the streets had to expend considerable effort in managing access to these spaces and stalling some players so that several did not reach these places at the same time).

- Implicate passers-by. The city is already full of actors even if they are not conscious of it. A particularly powerful feature of our experience is the way in which it suggests that they are part of the game.

- Mix live action with pre-programmed content. This is clearly a powerful tactic, although given the expense involved, it may be limited to a few key moments.

- Encourage participants to SAFELY cross the boundaries of normal behaviour - we have seen that this can lead to powerful experiences, but also that it needs to be employed carefully as part of a clearly defined relationship between participant and designer/producer. Under the surface, participants must be able to judge what is genuinely safe and what is not while being able to suspend disbelief and feel what is might be like to take risks – but without actually doing so.

Strategy 2: Exploit ambiguity

A second strategy is to use ambiguity to provoke participants, asking questions without giving answers. *Uncle Roy All Around You* employs ambiguity in several ways to create a provoking experience: the 'task' itself is open-ended; the clues are puzzling and invite interpretation, as does the nature of the relationships between players and Uncle Roy. This strategy captures one of the essential differences between artistic experiences and other more conventional applications of computers, which are concerned with giving accurate information and supporting efficient completion of tasks and in which ambiguity is seen as a problem. The deliberate use of ambiguity to create engaging interfaces has been discussed in (Gaver and others, 2003) which raised three general design approaches:

- Ambiguity of information: Present information in a way that demands interpretation, for example deliberately reducing its resolution or in contrast, presenting it in an overly precise way in order to question its validity. This strategy can be seen in the design of Uncle Roy's clues.

- Ambiguity of context: Where an experience deliberately juxtaposes different structures or genres and so provides multiple simultaneous contexts for interpretation. This is reflected in our mixing of game and performance and the

juxtaposition of the physical and virtual worlds.

- Ambiguity of relationship: Where an experience calls into question the relationship between the participant and the material, challenging them to make intellectual, aesthetic or moral judgments. *Uncle Roy All Around You* involves extensive use of ambiguity of relationship by questioning the relationship between a player, Uncle Roy, other players and passers by.

Strategy 3: Encourage social gameplay

Our third strategy is to draw on the social relationships between different participants. While there is a significant amount of pre-scripted content in *Uncle Roy All Around You*in the form of the map, the associated clue trail and scripted live performances, feedback from players shows that the improvised interactions between street and online players were also a significant part of the experience. One tactic here is to deliberately give different players distinct perspectives, motivating them to exchange information and work together. This means aiming for quite different, but connected, physical and virtual worlds, rather than a seamless augmented reality style experience. We see this approach in *Uncle Roy All Around You* where online players can help street players and also in the chase game *Can You See Me Now?*, where online players perceive the physical world through the talk of the street players rather than seeing it directly.

In conclusion, by carefully employing strategies such as these, we believe that artists will be able to create powerful and compelling experiences that directly involve the public as participants, that are situated in the city streets and that draw on mixture of live performance and theatre. While there are clearly many issues yet to be explored, we hope that our approach and the strategies that we have suggested will lead to compelling new forms of pervasive games and related experiences.

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MATT ADAMS co-founded Blast Theory in 1991 and has presented the work of the group in Eqypt, Canada, USA, Australia and throughout Europe. Blast Theory's work combines virtual environments, live interventions, interactivity and risk to interrogate the relationship between popular culture and social and political realities.

JU ROW-FARR co-founded Blast Theory in 1991. Based in London, the group of three artists creates new media work, performances and installations. Works such as *Desert Rain* (1999) and *Can You See Me Now?* (2001) have been nominated for Interactive Arts BAFTAs. *Can You See Me Now?* has recently been awarded the Golden Nica for Interactive Art at the Prix Ars Electronica 2003.