Combining Multiple Gaming Interfaces in Epidemic Menace

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Abstract
This paper presents the multiple gaming interfaces of the crossmedia game Epidemic Menace, including a game board station, a mobile assistant and a mobile Augmented Reality (AR) system. Each gaming interface offers different functionality within the game play. We explain the interfaces and describe early results of an ethnographic observation showing how the different gaming interfaces were used by the players to observe, collaborate and interact within the game.

Keywords
Computer games, pervasive gaming, crossmedia, user interfaces, augmented reality, design, evaluation.

ACM Classification Keywords
H5.2. User Interfaces: Graphical user interfaces (GUI), input devices and strategies. H5.1. Multimedia Information Systems: Artificial, augmented, and virtual realities.

Introduction
Nowadays, we are using a variety of different computing and telecommunication devices in our everyday lives including mobile phones, desktop computers, personal digital assistants, television sets and public displays. Crossmedia games are based on

this variety of devices [4]. They provide a game space that is potentially accessible anytime and anywhere by allowing players to connect to the game with the gaming interface they have at hand.

Crossmedia games offer a new form of pervasive gaming. They are related to Pervasive Games [3] by their close integration of the physical world and its properties and raise additional research questions, such as: Do players like using different gaming interfaces in a game? How do the interfaces impact on the collaboration of players? How can the functionality of multiple gaming interfaces be balanced?

In order to answer these research questions we designed a storyline for a crossmedia game which combines multiple gaming interfaces and media. First, this paper introduces the game story and the basic game mechanics. Afterwards, the design objectives for the gaming interfaces and their basic functionality are outlined. The initial results of staging and observing the game play are presented. The paper concludes with a discussion and an outlook.

The Game Epidemic Menace

Epidemic Menace [2] is built upon the story of a humankind-threatening virus epidemic. A villain scientist, craving for power, creates a lethal virus mutation and contaminates a university campus. From there the virus shall spread and infect all humans. The virus can move, replicate and mutate into a more dangerous form. The virus behavior depends on real-world weather conditions influencing its movement direction and speed.

Epidemic Menace is played in teams. Each team plays as a “medical expert team”. They have the task to destroy the virus before it manages to escape the campus. To this end they are provided with different gaming interfaces (“tools”) to locate, capture, analyze and destroy viruses and to communicate and coordinate within the team.

During the game, players may change their gaming interfaces. This allows players for using the gaming interface they consider to be most suitable for the given tasks and the current game context.

Gaming Interfaces

To realize a crossmedia game, devices with different properties with respect to the shape, the interaction possibilities and the technical functionality are required. One of our design objectives was that the particular game functionality of a device fits to its intuitive affordances (referring to Norman’s definition of affordances [5]). By doing so we intended to reduce the learning effort and the seams between the gaming interfaces. With only a few instructions players should be able to use a gaming interface. Switching devices should be part of the game flow.

Another objective was to balance the experiences and amount of functionality different devices offer. One gaming interface should not be considerably superior to another one by means of appeal or power within the game. Based on tactical considerations, as well as on organizational and technical constraints, it should be advantageous for a player to switch gaming interfaces from time to time.

We also wanted to integrate the social quality of traditional non-computer games into the game play by providing for collaboration and social interaction among players. Epidemic Menace should facilitate a new kind of experience beyond video console and computer games by providing for social and bodily interactions.

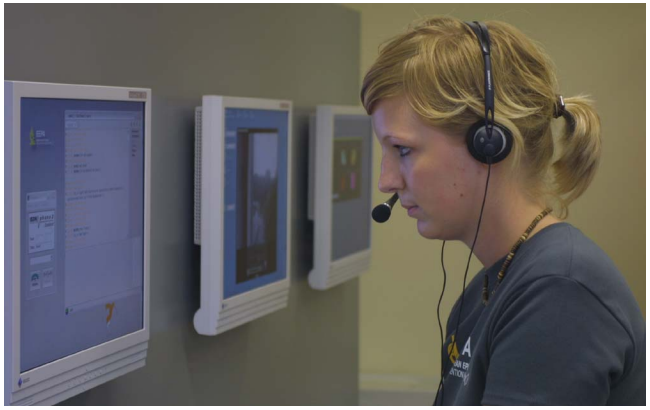

figure 1. A player using the communication station.

Mobile positioning
Depending on the gaming interface a player can either be in the mobile play mode (player is outdoors and her position is tracked) or in the stationary play mode (player is in the team game room). In the mobile play mode, each player is equipped with a mobile positioning device to track her position and to support social presence among players. The mobile positioning gaming interface consists of a personal digital assistant (PDA) and a Global Positioning System (GPS) receiver.

Game board station
The game board is available in the team game room and is based on a large touch screen display. It shows a map of the campus, the mobile players from both teams as tracked with GPS and all viruses with their respective positions. Players in the team game room are provided with a complete overview of the game area and the game status and are able to guide the mobile players who can only observe artifacts and activities in their close proximity.

Communication station
The communication station is another gaming interface offered in the team game room (see figure 1). It is similar to a web-based chat and supports the communication with mobile team players via text messages and phone calls.

Virus analysis station
The virus analysis interface supports the examination of viruses that were previously captured by mobile players. Players can see the composition of viruses and conclude properties of similar virus types.

Mobile malleable music
The mobile malleable music interface [6] allows for hearing the positions and properties of viruses (see figure 2). Based on the audio stream e.g. players are able to guess whether the virus can be spread by wind or whether it is fast growing.

figure 2. Player listening to viruses using the mobile malleable music interface (left) and scanning for viruses using the mobile assistant interface (right).

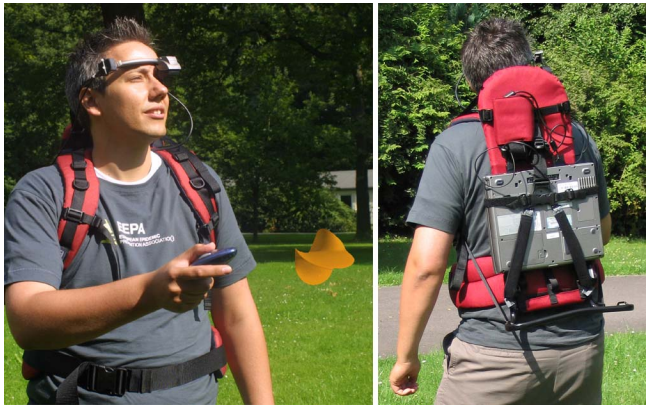

figure 3. A player seeing a virus with the mobile AR system.

Mobile AR

The mobile AR gaming interface consists of a see-through head-worn display, a notebook and an inertial tracker attached to the display (see figure 3). The semi-transparent display allows seeing the real environment as well as virtual representations of viruses in the surrounding. The viruses within the player's proximity can be attacked using a spray tool represented by a wireless mouse. The mobile AR gaming interface is rather powerful, since it directly overlays the viruses onto the player's visual perception of the environment. Chasing and attacking a virus is rather easy. To balance the functionality between the mobile AR system and the other gaming interfaces, we have equipped each team only with one AR system and we have limited the range of the spray to a few meters.

Mobile assistant

The mobile assistant (see figure 2) is based on a smart phone and supports scanning and capturing of viruses in proximity and calling the team game room. Each mobile player is equipped with a mobile assistant. The mobile assistant offers various functionality including observation, interaction and collaboration but is limited in spatial range.

Staging and observing the game play

The Epidemic Menace game has been played for two days on the campus of Fraunhofer FIT in Germany. The game area consisted of approx. 80.000 m² of meadow and a few indoor locations. The play test was performed with eight players split into two teams. In the beginning both teams watched a short movie that explains the story background. After that the functionality of the different gaming interfaces was explained and the game play began.

Core issues for the evaluation of the first Epidemic Menace game prototype were player collaboration and the game-play when crossing physical and virtual

spaces. We analyzed how the gaming interfaces were used by the players to pursue the goal of the game. During the game we applied ethnographic observation of player behavior with four observers. After the end of the game the players' assessments of the game were elicited in feedback discussions and through questionnaires. The following first findings combine results from all these methods.

During the two days of game play three kinds of game sessions occurred: 1. individual exploration of the game area through mobile play only, 2. a single stationary player and a mobile player team, 3. pairs of two mobile players and two stationary players. The latter way of playing in pairs of two appeared to be the most satisfying for players. We conclude this from observing an increased speed of player movements and a high immersion both for stationary and mobile players.

Mobile players explored the area in teams of two: a "communicator" and virus "snooper". The two stationary players were negotiating the tactics and were navigating the outdoor team mates together to infected locations, one became the "communicator" and the other one the "tactician". The following documents a characteristic scene in the team game room: the tactician stands in front of the touch screen and observes the activities of the virus and players in the field and listens to his team mate. The other player – the "communicator" wears the headphones and watches her colleague while talking to the mobile team mates. She says: "Move behind the castle. There is a large group of viruses. Rush, the other team is close… Now you are close. Do you have him? Yes, cool it is a mutated one". This scene shows a typical collaboration pattern across media. The stationary players guide their mobile team mates to a contaminated location. In co-operation across spaces the mobile player captures a virus with his mobile assistant, which subsequently appears in the analysis station and is analyzed by the stationary player. The communication also shows that there was clear competition between the two teams.

figure 4. Two players collaboratively exploring the game area.

Players used multipurpose devices for single purpose only. In mobile play mode, when using the mobile assistant for virus capturing the player understood himself as a "snooper", when using it as a phone he became a "communicator". In the stationary play mode, single purpose stations were available (see figure 1). Here we could also observe emergence of the roles of "communicator" and "tactician". The observations also disclosed that individual players used a device as a single purpose tool and never switched between different game interfaces in a single device. Instead, the players switched to another instance of the device or collaborated with another player who selected the other game interface in his device. This finding

supports Buxton's thesis that lesser functionalities of an interface increase its usefulness [1].

Over time players switched roles and used different functionality. Finally, each player used almost all gaming interfaces for a considerable amount of time. Players said that all gaming interfaces were necessary to them to play the game. We take this as an indication that the functionality offered by the different gaming interfaces was well-balanced.

The story conveyed through video clips at the start and end but also occasionally during the game contributed to the realism of the game. Life performances at the start and at the end of the game contributed to the suspense of the players. In total, as observers we had the impression that this crossmedia game was experienced by the players as a life-like challenge and the multiple gaming interfaces requested a comprehensive engagement, bodily and mentally.

Conclusions and outlook

We have designed and staged the pervasive crossmedia game Epidemic Menace that employs multiple gaming interfaces with different game functionality. The play test showed that the functionality offered by the multiple gaming interfaces was well-understood and suited the individual devices and their characteristics. However, players appeared to use an instance of a device as providing single affordances rather than as a multiple purposes tool. This behavior contributed to the collaboration among player and to the emergence of function-specific roles. Competition between teams and collaboration among team members were supported by the gaming interfaces and turned out to have a strong impact on the experienced fun of the game.

The results of the evaluation of the first game prototype motivate us to pursue further development of the multiple gaming interfaces of Epidemic Menace. We are also planning to test the next version of the game with larger user groups to verify our current findings.

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