A Report on the Crossmedia Game Epidemic Menace

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Crossmedia games employ a wide variety of gaming interfaces based on stationary and mobile devices to facilitate different game experiences within a single game. This article presents the crossmedia game *Epidemic Menace*, introduces the game concept, and describes experiences from two Epidemic Menace game events. We also explain the technical realization of Epidemic Menace, the evaluation methodologies we used, and some evaluation results.

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1. INTRODUCTION

Pervasive games employ emergent pervasive technology to enhance computer games with physical and social aspects of the real world [Magerkurth 2005]. In contrast to traditional computer games, which typically take place in rather limited and well-defined settings, pervasive games blur the boundaries between spatial, temporal, and social expansion [Montola 2005].

Crossmedia games are a genre of pervasive gaming played with a variety of gaming devices and gaming interfaces that support different forms of participation and deliver different game experiences. Crossmedia games offer various gaming interfaces based on stationary devices at different locations and on mobile devices carried by players. The various interfaces offer different functionalities, allowing for more active or more passive involvement in the game and for different combinations of the physical environment and the virtual game world.

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In this article we present the cossmedia game, *Epidemic Menace* – a game developed by the IPerG project [IPerG 2007]. The article is structured as follows: Section 2 presents the concept for Epidemic Menace, including the storyline and the game rules;. Section 3 describes the course of the game; Section 4 explains the technical realization of Epidemic Menace; Section 5 explains the evaluation methodologies and our findings; and Section 6 concludes the article.

2. GAME CONCEPT

In Epidemic Menace, players become medical experts to save mankind threatened by a mutated virus. A villain scientist, craving power, creates a lethal mutation and contaminates a university campus with it. From there the virus spreads and infects all humans. Teams of experts – the players – are assigned the task of defeating this threat. They have three hours in which to destroy the virus before it escapes the campus; the teams must also uncover where the mutant virus came from and how it came to be.

Epidemic Menace is a collaborative game. Each team has a room equipped with stationary devices that allow players to observe and analyze the virus and to communicate with other team members. In addition to the stationary devices in the game room, each team receives a set of devices that can be used outdoors to capture and destroy the virus. Players are tasked to clear the campus of the threatening virus and to stop it from spreading by uncovering the conspiracy behind it. The gameplay is introduced by a movie featuring evidence provided by a police witness and printed testimony based on the evidence. Depending on their individual scores, players are given a number of observation tapes during the game. They are also are asked to uncover the conspiracy and to stop the virus from spreading.

First, players receive a gaming device that can be exchanged during gameplay. Depending on the gaming interface, a player can either be in mobile play mode (player is outdoors and her position is tracked) or in stationary play mode (player is in the team game room). In mobile play mode, a player, in addition to the mobile gaming interface, is equipped with a mobile positioning device to track her position. To exchange a gaming device, the player must go to the technical support station, hand back her current gaming device, and chooses a new one from the stock available to her team. (Gaming devices cannot be exchanged between players directly.)

Gaming interfaces in Epidemic Menace that run on mobile phones, stationary computers, mobile augmented reality (AR) systems, and so on, offer different functionalities and deliver different game experiences. In designing the cossmedia game, we tried to meet the technical, design, commercial, and ethical requirements described in Lindt et al. [2005]. In particular, we had the following design goals [Lindt 2006]: (1) To reduce training time, the functionality offered by a gaming interface should fit the device, that is, it should be intuitive [Norman 1988]; (2) the experience and functionality provided by the various devices should be balanced; (3) we wanted to integrate the social quality of traditional noncomputer games into gameplay by requiring collaboration and social interaction among players; and (4) we wanted to merge movie elements into the crossmedia game [Ghellal 2006] to achieve a high level of immersion,

The virus mutations that players seek in Epidemic Menace are virtual and appear differently on different gaming interfaces. The virus is closely interlinked with the real world: its growth and power to replicate, as well as its movements, depend strongly on real-world weather conditions; its growth rate is influenced by the current temperature. The warmer it gets, the quicker the virus grows. If the virus reaches a certain size, it automatically splits into two smaller ones. The direction in which the virus moves

corresponds to the current direction of the wind; the speed with which it moves depends on the strength of the wind.

We tried to create an interesting player-virus interaction by interlinking the behavior of the virus to the physical world. Players had to observe their physical surroundings in order to understand and determine the behavior of the virus. The virus could also infect players: if a player became infected, his or her gaming interface would start to malfunction.

Epidemic Menace is designed for people who are interested in technology generally. Although such a user group might not be acquainted with pervasive games, we assumed they would quickly learn the rules of the game and the functionality of the different gaming devices and that they would experiment and come up with new or modified rules and behaviors during gameplay. We also chose this target group because we expected the feedback to be extensive and constructive.

3. COURSE OF THE GAME

Epidemic Menace is an event-based game, which was staged in August 2005 and July 2006 on the Birlinghoven campus in Sankt Augustin, Germany. The campus is approximately 80.000 m^2 with a lot of different areas, such as a park, meadows, parking lots, trees and bushes, a rose garden, a former stable, and a castle (see Fig. 1). Approximately half the campus was selected as the playing area and equipped with five WiFi access points in order to cover most of the playing area with Internet access.

In August 2005, the game was played by eight players divided into two teams for several hours over two days. Based on the outcomes of the first game [Ohlenburg 2006], we decided to shorten the game to two to three hours, similar to the duration of a film or theatre performance, in order to improve the game's commercial viability and to create a denser game experience. In July 2006, the second version of Epidemic Menace was played by 30 players in four subsequent games. Each game was played by six to ten players in two teams. Below, we describe the course of a game in the second game event.

The two game rooms for the two teams were in a building adjacent to the playing area, allowing the players to switch easily between mobile and stationary play modes. Each game room had facilities for the stationary players to observe and monitor the outdoor gaming area, as well as communication facilities to coordinate team members. The stationary gameboard (see Fig. 2, left) – a large touch-display – shows the entire gaming area, the location of each mobile player, and the location and size of each virus.

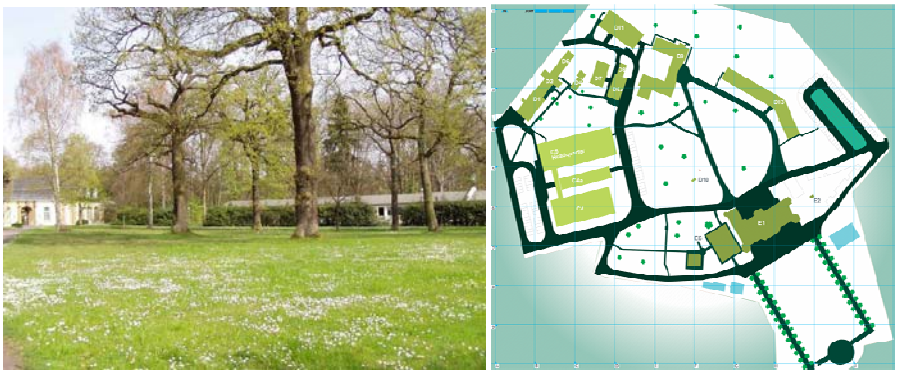

Fig. 1: A picture (left) and a map (right) of the game area.

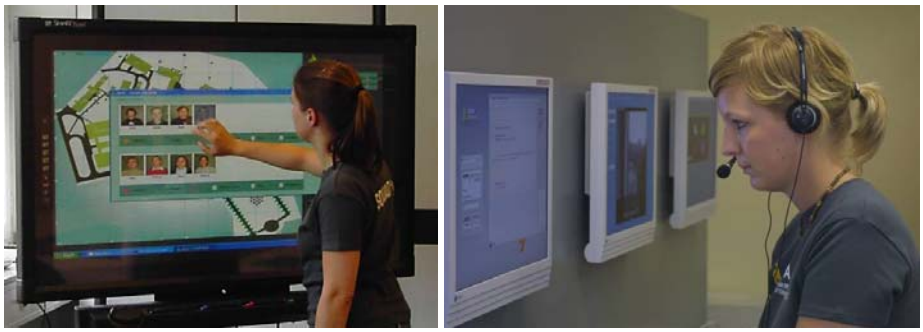

Fig. 2. A player using the stationary game board (left) and a player in front of the media wall (right).

By using the touch-screen the stationary players can get more information about each player and both teams, via information dialogs that show the current devices, the rate of infection, and the team points. Both game rooms were equipped with a media wall (see Fig. 2, right).

The media wall is made up of three screens that show vital information and provide important functionalities. One of the screens shows live streaming from two indoor and two outdoor cameras. The outdoor cameras monitored the playing field and were augmented with 3D representations of the virus. The two indoor cameras featured both team rooms. A decision board appeared on another screen where players could take decisions that influenced the course of the game. The third screen was a communication center so that the stationary players could call the mobile players on their smart phones.

A technical support station was set up in a central position of the gaming area where devices for outdoor play were charged, configured, and handed out.

Players were asked to be at the main gate of the campus at a certain time, they were then picked up by an actor and brought to their team game rooms. Each team was equipped with matching shirts for easy identification. After a moment of suspense, a video and an interrogation transcript were given to the players. The video explained the plot of the game: to wit, an unknown person had released a deadly virus on the campus and the teams were there as medical experts to clear the campus and to discover how this could have happened. A few minutes later, an actor walked into the team room and started to explain the stationary gaming interfaces to each team separately. But the explanation was disrupted by an alarm: a virus was discovered in the game area. The actor asked one player from each team to follow him. The actor rushed outside with the two players and explained the mobile phone-based gaming interface to them.

Two different gaming devices were made available for the mobile virus hunt. Each player was equipped with a PDA and a GPS device to track his or her position (the so-called “positioning belt”) and with either a mobile augmented reality system or a smart phone. Since the mobile AR system is the most powerful (and the most expensive) of the devices, only one was available per team (see Fig. 3, left). The mobile AR system is a laptop strapped onto a backpack with a monocular head-mounted display, allowing the player to see the virus in his proximity as animated 3D models overlaid on the real world. By using a spray can that is based on a wireless mouse, the player can attack the virus if it is close enough, but he risks getting infected by the virus. The smart phone could either

Fig. 3: Players with the mobile augmented reality system (left) and the smart phone (middle and right).

be used to communicate with the team game room or to catch the virus in the players' proximity (see Fig. 3, middle and right). The smart phone's display shows a fragment of the map of the game area where the player is currently located. As the player movesaround, the display updates the fragment automatically. The player can also see the virus in his surroundings and try to catch them.

The game follows a prescripted plot. After the alarm goes off, two players go outside and start to destroy the virus. For each destroyed virus, the team receives points. If a mobile player becomes infected, he or she has to switch with a stationary player, since the original player's gaming interface will then start to malfunction. After the mobile gameplay starts, more and more viruses appear, leading to an out of control situation. Teams are then given additional smart phones to fight the virus. After a certain number of points is reached, the team receives the mobile AR system, allowing them to destroy more viruses at a time.

This is the typical gameplay scenario: In order to become familiar with the various gaming devices and their interfaces, all players are initially in stationary game mode. After a team player is sent outside, the stationary players observe the game area and communicate with the mobile player to direct him or her towards the virus. Subsequently, more and more players go outside to play and the speed of the game increases.

Once the teams gain a certain number of points, they receive additional video material that allows them to discover who actually created and released the deadly virus. The decision board in the team game room becomes activated and players can take decisions to immediately put a stop to virus replication. If a wrong decision is made (e.g., arresting an innocent scientist), the team could lose the game.

Finally, if both teams manage to destroy all the viruses within three hours, the team that destroyed the most and chose the correct answer on the decision board wins the game. The teams are then debriefed and notified that, thanks to their support, the evil scientist was caught.

4. TECHNICAL REALIZATION

Epidemic Menace is set-up using a classical client-server network layout. The game server receives all data from each of the gaming devices and distributes the current game state to all connected interfaces. The game state consists mainly of the current locations of all players, their currently assigned devices, the location and the composition of the viruses as well as current weather information. The game state is sent to each of the gaming interfaces at different frequencies, depending on their real-time capabilities, e.g., the smart phone receives game state updates at a lower frequency than the stationary game board. Each gaming interface displays the current game state in its own way, since

each device offers a different functionality. While the mobile AR system displays a high-resolution model of the virus, the smart phone only shows a 2D map.

Each mobile player was equipped with a PDA and a Bluetooth GPS receiver to provide the location of all mobile players. The PDA sent the current GPS location via a WiFi connection to the game server every few seconds. Although the game area had very good WiFi coverage, there were a lot of spots where the PDAs had no, or very bad, connectivity. Since the game server did not receive position updates in such areas and interaction with the viruses was limited, the players received audio feedback about the quality of the signal.

The game server controls virus' behavior such as its movement, growth, and the rates at which players are infected. The server connects to a weather engine to adapt the behavior of the virus to the current weather situation, e.g., the virus moves with the wind.

The stationary game board receives the changed game states and displays all the information on its screen; that is, it updates the locations of the mobile players and the virus. A special stationary game board, used by the game administrators, also allows the creation of new viruses as well as changes in their location and size. The game board is also used by the technical staff to assign devices to the outdoor players; these manual updates are fed back to the game server.

The mobile AR system displays the virus as animated, high-resolution 3D models (see Fig. 3) at the correct location on the campus, which allows players to walk around the virus and look at it from different perspectives. A hidden virtual model of the campus and its buildings is used to hide the virus behind buildings. The mobile AR system also receives, at a high frequency, updates on the game state. The locations of the virus are updated and the user's viewpoint is adapted according to the current GPS location. An inertia tracker is used to track the orientation of the user's head. The spray can of the mobile AR system sends the action *spray* to the game server as long as the mouse button is pressed. The game server will evaluate the action and update the size of the virus. The result of the action is not returned directly, but via the update of the next game state.

Contrary to the mobile Augmented Reality system, the smart phone, because it is connected via GPRS to the game server, receives an updated game state at a much lower frequency. Following the player's new location, the map is centered around the player, which makes the virus in his proximity visible. Using a small crosshair and the keys of the phone, the player can try to catch the virus. The action *catch* is sent to the game server where the result is evaluated. If the catch is successful, the virus is removed from the map. The result – whether successful or not – of the *catch* action is sent directly to the smart phone and the information is shown to the player. All devices note the removal of the virus via a new game state update.

5. EVALUATION METHODS AND RESULTS

The evaluation of the first and second versions of Epidemic Menace was mainly based on detailed field observations. Four observers followed 32 players in four subsequent games via the cameras installed on the game area and in the team game rooms. The observers wrote down what they observed with respect to player-environment, player-devices, player-to-player, and player-actor interactions. The observers indicated the time and location of each interaction. Field observations were combined with player feedback, discussion, and pre- and post-event questionnaires.

The evaluation of the first version of Epidemic Menace gave us some interesting results on the collaboration between team members. Depending on the gaming device, players took on different roles. It was discovered that mobile players took on the roles of

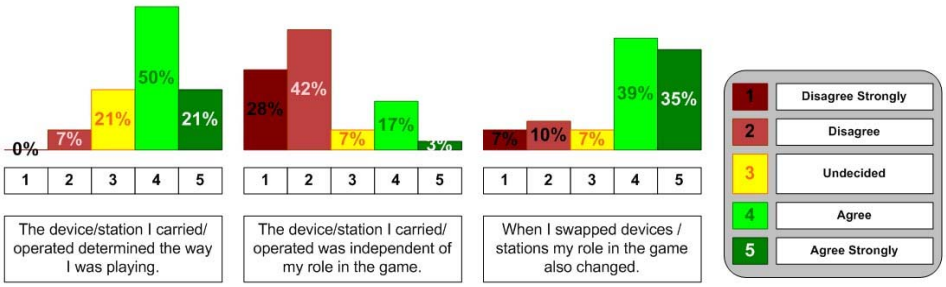

Fig. 4. Answers from players regarding device-specific roles in Epidemic Menace.

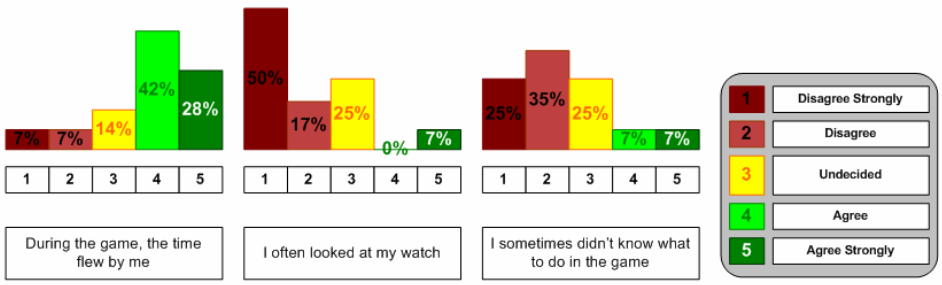

Fig. 5. Some answers (from players) indicating their degree of immersion.

"snoopers" and "communicators" and stationary players took on roles of "communicators" and "tacticians." The roles players took did not (only) result from stationary or mobile play, but mainly from the type of device players carried. This observation was confirmed by the evaluation of the second version of Epidemic Menace (see Fig. 4).

The objectives of the second version of Epidemic Menace were to provide an increased game flow and better comprehension of the game story and concept, such that players could experience a continuously immersive game. Some questions and answers on player immersion are shown in Figure 5.

Players liked the story and the way it unfolded on video clips. To them, the story and the location (the campus at Birlinghoven) were appropriate for the gameplay. The intermediate video material contributed to the players feeling that they were part of the story. Players liked the two play modes: stationary play in the team room and mobile play outdoors on the campus. We observed that collaboration across media and play modes worked well. Surprisingly, in both play modes, players moved with great speed, indicating high player immersion. Players easily understood the meaning and use of devices. It turns out that players preferred to play in pairs in both play modes and that device-specific roles emerged. The players liked communication and collaboration within their team and competition with the opposite team.

Overall, the players approved of the concept -- as one player put it was "a new kind of game." They liked the mixture of story, movie, bodily action, collaboration, strategy, adventure, the diversity of devices, and techniques.

6. CONCLUSIONS

This article describes the game concept and the technical realization of a crossmedia game, called Epidemic Menace. A first version of the game was staged on the campus of

Birlinghoven for two days in August 2005; a second, revised version was presented in July 2006. This article summarized the course of the game, explained evaluation methods, presented the players' experience and the evaluation results.

We revised several aspects of the second version of Epidemic Menace, which led to a better game experience and a viable business model. We shortened the game time from two days to three hours and prescripted the progress of a typical game. This begins with a moment of suspense while learning about the various gaming interfaces in an "out of control" situation and leads to feelings of relief when the game is resolved by discovering the person who actually created and released the virus. We also reduced the number of persons required to stage Epidemic Menace. While it took about eight to ten persons in the first version of Epidemic Menace, we brought the number down to four for the second version (an actor, one person responsible for the dramaturgy, and two persons responsible for the technology). This was achieved via subsequent introduction of various gaming interfaces via a revised control interface that supports a quicker exchange and assignment of gaming devices.

The changes to the second version of Epidemic Menace, including shortened play time and decrease in the number of people necessary to stage the game, show that it could work as a commercial game. Players would pay an amount of money similar to a theatre or amusement park visit and receive gaming devices so they could play for a few hours. In the feedback discussions on the second version of Epidemic Menace, players stated that they would pay for a commercial version and that they would recommend the game to a friend.

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