Report about the Crossmedia Game Epidemic Menace

Jan Ohlenburg[1], Irma Lindt[1], and Uta Pankoke-Babatz[1]

Fraunhofer FIT, Schloss Birlinghoven, 53754 Sankt Augustin, Germany,
jan.ohlenburg@fit.fraunhofer.de,
WWW home page: http://www.fraunhofer.fit.de

Abstract. Crossmedia games employ a wide variety of gaming interfaces including stationary and mobile devices to facilitate different game experiences within a single game.
This paper presents the Crossmedia game Epidemic Menace, introduces the game concept and describes the first Epidemic Menace game event. Furthermore, we are explaining the technical realization of Epidemic Menace, the employed evaluation methodologies and initial results of the evaluation.

1 Introduction

Pervasive games employ emergent pervasive technology to enhance computer games with physical and social aspects of the real world [5]. In contrast to traditional computer games typically taking place in rather limited and well-defined settings, pervasive games are blurring traditional boundaries of games with respect to their spatial, temporal, and social expansion [6].

Crossmedia games are a genre of pervasive gaming that is played with a variety of gaming devices and gaming interfaces to support different forms of participation and to deliver different game experiences [4]. Crossmedia games offer different gaming interfaces: stationary gaming interfaces available at different locations and mobile gaming interfaces carried by the players. The different gaming interfaces offer different functionality, allowing for a more active or a more passive involvement in the game and for different combinations of the physical environment and the virtual game world.

In this paper we are presenting the Crossmedia game Epidemic Menace - a game developed within the IPerG project [2]. The paper is structured as follows: Section 2 describes the game concept of Epidemic Menace including the storyline and the game rules. Section 3 describes the first Epidemic Menace game event that took place in August 2005. Section 4 explains the technical realization of Epidemic Menace. Section 5 explains the evaluation methodologies and our initial findings. Section 6 concludes the paper.

2 Game Concept

In Epidemic Menace players become medical experts and need to save mankind from threatening virus mutations. A villain scientist, craving for power, creates a lethal virus mutation and contaminates campus Birlinghoven. From there the viruses shall spread

and infect all humans. To master this threat, expert teams - the players - are appointed. They have the task to destroy the viruses before they manage to escape the campus and to uncover how this could have happened.

Epidemic Menace is a collaborative game played in teams. Each team has a team game room equipped with stationary gaming devices allowing players to observe and to analyse the virus and to communicate with their team members. Additionally to the stationary devices in the team game room, each team receives a set of gaming devices that can be used outdoors to capture and destroy the virus. Players are tasked to clear the campus from the threatening viruses. At the same time, they have the goal to uncover a conspiracy story. To do so, players are capturing and disinfecting viruses distributed on the campus and they are trying to find video messages explaining the conspiracy.

At the beginning of the game, players select a gaming device that can be exchanged during the game play. Depending on the gaming device 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. To exchange a gaming device, a player goes to the technical support station, hands back her current gaming device, and chooses a new gaming device from the gaming devices available for her team. (Gaming devices cannot be exchanged between players directly.)

The gaming interfaces in Epidemic Menace running for example on mobile phones, stationary displays, mobile Augmented Reality etc. offer different functionality and deliver different game experiences. For the design and realization of the Crossmedia game we tried to meet different technical, design, commercial and ethical requirements, described in Lindt et al. [4]. In particular we pursued the following design goals [3]: Firstly, the functionality offered by a gaming interface should fit to the device, e.g. should be intuitively afforded by the device [7] to reduce training times, secondly, the experiences and functionality different devices offer should be balanced and thirdly, we wanted to integrate the social quality of traditional non-computer games into the game play by providing for collaboration and social interaction among players.

The viruses players are seeking are virtual and appear differently on different gaming interfaces. Viruses are closely interlinked with the real world: Their movement and replication properties depend strongly on real-world weather conditions.

A virus consists of different cell types that determine its behaviour in detail: growth, damage, stealth, and/or spread-by-wind cells. Growth cells influence the virus growth speed. The more growth cells a virus has, the quicker it grows. The growth of a virus is also influenced by the current temperature. The warmer it is the quicker a virus grows. If a virus reaches a certain size, it automatically splits up into two smaller viruses. Damage cells determine the probability of a player being infected if he is in close proximity of the virus. If a player gets infected, the gaming interface of the player starts to malfunction. Stealth cells determine how quickly it becomes visible that a player is infected. Spread-by-wind cells determine the movement of a virus. A virus with spread-by-wind cells moves according to the current wind direction and its movement speed is influenced by the current wind strength.

With the elaborated virus behaviour that is closely interlinked with the physical world, we tried to create an interesting player-virus interaction. Each virus behaves

differently. Players need to observe the physical surrounding and the viruses in order to determine the intrinsic behaviour and the possible threats of viruses.

Epidemic Menace is primarily designed for undergraduate students of arts, media, media informatics and related subjects. Although the players might not be acquainted with pervasive games, we assume that they rather quickly learn the rules of the game and the functionality of the different gaming devices and that they experiment and come up with new rules and emergent behaviour during the game play. We also assume that the feedback we get from this user group is rather extensive and constructive. This is the reason why we chose this user group as target group for the Epidemic Menace game.

3 The Game Event

The game event was staged in August 2005 at the campus Birlinghoven in Sankt Augustin, Germany. The campus has a size of 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 remise and a castle (Fig. 1). Approximately half of the campus had been selected as the playing area and was equipped with five WiFi routers in order to cover most of the playing area with internet access. The event lasted for two days.

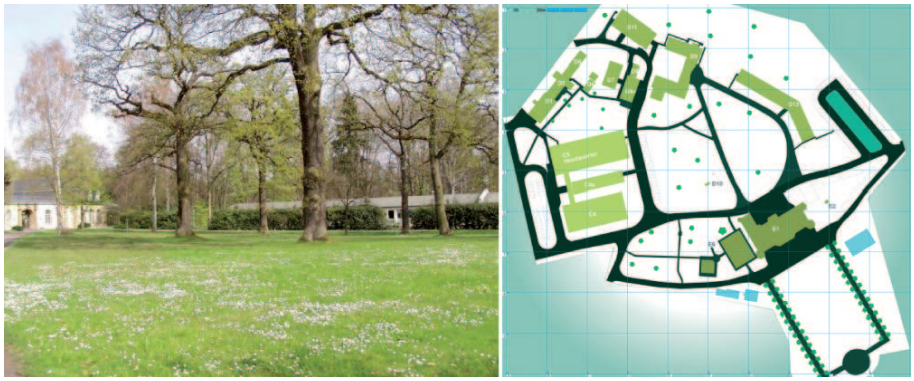

Fig. 1. Picture and map of the game area

The two team game rooms were located in a building adjacent to the playing area, allowing the players to switch easily between mobile and stationary play mode. Each team game room provided facilities for the stationary players to observe and to monitor the outdoor gaming area as well as communication facilities to coordinate the team members. The stationary game board (Fig. 2) – a large touch display – showed the whole gaming area and the location of each mobile player and the location and the size of all viruses. Using the touch screen the stationary players were able to get more information about each player and both teams by information dialogs showing the current devices, the infection status and the team points. Additionally, both team game rooms were equipped with a media wall (Fig. 2). The media wall consisted of three screens showing

vital information and provided important functionalities, one of the screens showed the life stream of an observation camera monitoring the playing field, also allowing the players to rotate the view and to zoom in through an interface on the screen. Another screen provided a virus analysis tool, where the caught viruses could be analysed and broke apart in their different substances. The third screen was a communication centre allowing the stationary players to call the mobile players on their smart phones.

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

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

The game event started by an introduction for all players, describing them the situation that a scientist has released deadly viruses on the campus. The introduction was disrupted by a crew member telling the players that they had just received a video about an interrogation of one of the scientist working on the campus, which might bring more light into the situation at hand. The players were lead into a different room where they watched the introduction movie. Afterwards, the teams were formed and brought to their team game rooms. Each team was equipped with matching T-shirts to be easily identified as a team member. Separately, the different interfaces of the team game room were introduced to the teams before the game started.

Mobile players could choose from different gaming devices with quite different interfaces for the virus hunt. While each player was equipped with a PDA and a GPS device to track her position, they were additionally equipped with either a mobile AR system, a smart phone or a headphone. Since the mobile AR system was the most powerful (and most expensive) of the devices, only one was available per team (Fig. 3). The mobile AR system consists of a laptop strapped onto a backpack with a monocular head-mounted display allowing the player to see the animated 3D viruses in his proximity overlaid on top of the real world. By using a spraying can, the player could attack the virus if it was close enough, also risking of getting infected by the virus. The smart phone could either be used to communicate with the team game room, to send text messages to other players, or to set traps and catch viruses in the players proximity (Fig. 3). The display of the smart phone showed a fragment of the map of the game area where the player was currently located, the display automatically updated the fragment

Fig. 3. Player with mobile AR system (left), player with headphones (middle), smart phone (right).

while the player was moving. Additionally to the map the player could see viruses in his surroundings and try to catch them. In case a virus was successfully caught, it could be analysed later using the virus analysis tool. The headphones could be used in conjunction with the PDA forming the malleable music device (Fig. 3). Depending on the player's position, the sound, which was streamed to the PDA, was a mix of all viruses in the proximity depending on their mutation and their distance. Each of the mutations produced a very specific sound, the volume of this sound depended on the size of the mutation, letting a player figure out how the viruses in his proximity where composed.

The event was divided into different playing sessions for evaluating the two play modes. Also ensuring that each player would play at least once in the stationary play mode and once in the mobile play mode. During the first session all players where in the mobile play mode in order to get introduced the different gaming devices and their interfaces. During the second session we evaluated how the communication between the team game room and the mobile players worked. Two team members were in the team game room, one monitoring the game area, the other one communicating with the outdoor players. The mobile players were supposed to locate and catch or destroy the virus and also communicate with the team game room. In the third session the mobile players were moving in groups of two, one was advised to handle the communication and the other should fight the viruses.

Between the different sessions the teams would receive video messages from the game masters and interact with a robot dog (Sony AIBO) to inspect rooms, which were contaminated so that the players could not enter the room by themselves (Fig. 4). The robot dog played also an important role since it found – led by the players – an unconscious scientist. After waking up, she could give the teams the final clue, who was responsible for this situation.

Finally, both teams were debriefed in the castle, watched a last video message, and got the notice that the evil scientist has been caught thanks to their support.

Fig. 4. Players inspecting a room by using the remote interface of the robot dog.

4 Technical Realization

The Epidemic Menace game is set up using a classical client/server network layout. The game server receives all data from each of the devices and interfaces and distributes the current game state to all connected interfaces. The game state consists mainly of the current location of all players, their currently assigned devices, the location and the composition of the viruses as well as the current weather information. This game state is sent to each of the different gaming interfaces at different frequencies, depending on their real-time capabilities, e.g. the smart phone receives game state updates at a lower frequency as the stationary game board. Each gaming interface displays the current game state in its own way, since each device should provide a different level of presence and capabilities. While the mobile AR system displays a high resolution model of the virus, the mobile malleable music streams the sounds of the viruses to the players and the smart phone only shows a 2D map.

In order to provide the location of all mobile players, each of them was equipped with a PDA and a Bluetooth GPS receiver. Every few seconds, the PDA sends the current GPS location via a WiFi connection to the game server. Although the game area had a very good WiFi coverage, there were a lot of spot where the PDAs had no or very bad connectivity. Since the game server would not receive position updates in such areas and the interaction with the viruses is limited, the players get an audio feedback about the signal quality.

The game server takes care of the virus behaviour like movement, growth and infection of players and connects to a weather engine to adapt the behaviour of the viruses to the current weather situation, e.g. the viruses move with the wind.

The stationary game board receives the changed game states and displays all the information on the screen, i.e. the locations of the mobile players and viruses are updated. A special kind of the stationary game board, which is used by the game administrators also allows to create new viruses and change the location and the size of the viruses. Ad-

ditionally, this orchestration game board is used by the technical staff to assign devices to the outdoor players. These updates are fed back into the game server.

The virus analysis tool is informed by the game server each time the team has caught a virus, which is displayed in a list and which can be selected by a player in the stationary play mode in order to analyse it.

The mobile AR system displays the viruses as high resolution 3D models (see Fig. 3), which morph from one type to the other, at the correct location on the campus, allowing the user 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 obscure viruses behind buildings which cannot be seen by the players. The mobile AR system also receives the game state updates at a high frequency. The locations of the viruses are updated and the viewpoint of the user is adapted according to the current GPS location. An inertia tracker is used to track the orientation of the head of the user. The spraying 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, update the size of the viruses and the ammunition of the spray, the result of the action is not returned directly, but through the next game state update.

Contrary to the mobile AR system, the smart phone receives updated game states at a much lower frequency, since it is connected via 3G to the game server making game state updates a limited resource. According to the new location of the player the map is centred around the player and the virus in the proximity are shown. Using a small crosshair and the keys of the phone, the players can try to catch the virus. The action catch is send to the game server, where the result is evaluated depending on the crosshair and the distance between the player and the virus. In case the catch is successful, the virus is removed from the map and is send to the virus analysis tool. The result - success or failure - of the *catch* action is send directly back to the smart phone and a dialogue with the information is shown to the user. All devices notice the removal of the virus by a new game state update.

The mobile malleable music developed by Tanaka [8] is a streaming server, which streams an individual audio stream to each player depending on his location and the location and composition of the viruses in her surroundings. Therefore it is also depends on the game state updates of the game engine. Each cell type, i.e. growth, stealth, damage and wind, has a unique sound. The sound of a virus is mixed together by the individual sounds of each of the cell types. The amount of cells of a type influences the volume of that sound. Therefore each virus has a quite unique audio footprint. For each mobile player, which uses the mobile malleable music, the sounds of each virus in the proximity are mixed in real-time and streamed to the PDA of that player. While the player walks around the campus and while the viruses move themselves and mutate, the sound stream for the player will change, giving the player a hint whether viruses are near or whether a very threatening virus is coming closer.

5 Evaluation methodologies and initial results

The Epidemic Menace game was evaluated to improve the understanding of the game and the game dynamics and to provide a basis for future development of the game.

In particular, we wanted to evaluate the game concept and story, the game play across media, and the role of the devices.

The evaluation was mainly based on detailed field observations. Four observers were constantly following the players, writing down their observations with respect to player-environment, player-devices, player-to-player and player-gamemaster interaction. Observers indicated time and location for each notice. Observations were combined with player feedback discussions and questionnaires. During the play test we got results with respects to the game story and game concept, the social play, the suitability of devices, and the technical aspects and game orchestration experiences. In the following we will briefly outline some of the results.

Players liked the story and how it unfolded in the course of the game through video clips. To them, the story and the location campus Birlinghoven fit the game play. The intermediate video material interlinked the different play sessions during the two days and contributed to the players feeling of being 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, the speed of movement was rather high in both play modes. The speed of movement was suitable as a means to indicate high player immersion. Players easily understood the meaning and use of devices. However, it turned out that players preferred to play in pairs of two 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 concept of the game was approved by the players. They found it was ”a new kind of game” as one player put it. They liked the mixture of story, movie, bodily action, collaboration, strategy, adventure, the diversity of devices and techniques to be used.

The play test disclosed that players missed all those parts from the full game concept which were not implemented for the first prototype. It also gave a large number of details how the game could be improved for the second iteration. In particular, the player's engagement was sometimes rather low, e.g. during the explanations of the gaming devices and during breaks caused by technical problems. For the next iteration of Epidemic Menace we would like to achieve a more constant immersion of the players, by introducing gaming interfaces successively and by reducing breaks caused by technical problems.

6 Conclusions and next steps

This paper describes the game concept and the technical realization of the Crossmedia game Epidemic Menace. A first version of Epidemic Menace has been staged for two days on campus Birlinghoven in August 2005. The paper summarizes main aspects of the game event, explains employed evaluation methods and presents initial results.

For the next version of Epidemic Menace we are improving the configurability of the game, such that different combinations of gaming devices can be employed for play tests. We would like to investigate the effect of different gaming devices on the game experience in more detail. How do team members collaborate if each of them receives

an equal set of gaming devices? How do a wide variety and a limited set of gaming devices influence the game experience? How do teams compete if they receive different sets of gaming devices? We are also realizing further alternative gaming interfaces for the next version including low cost Augmented Reality interfaces based on Tablet PCs and PDAs and we are investigating augmented video streamed to mobile devices.

7 Acknowledgements

The design, implementation and staging of Epidemic Menace have been done by several partners of the IPerG project. We would like to thank Sabiha Ghellal, Christof Danzl and Christian Wenninger from Sony NetServices, Leif Oppermann from the University of Nottingham, Matt Adams from Blast Theory, Tom Soderlund, and Wolfgang Prinz, Sabine Kolvenbach, Joel Fischer and Karl-Heinz Klein from Fraunhofer FIT for their contributions. We would also like to thank Atau Tanaka from Sony CSL Paris for allowing us to use the mobile malleable music. IPerG is partially funded by the European Commission as part of the IST program.

References

1. Epidemic Menace Website, http://www.epidemic-menace.de.
2. IPerG Website, http://iperg.sics.se.
3. Lindt, I., Ohlenburg, J., Pankoke-Babatz, U., Prinz, W., Ghellal, S.: Combining Multiple Gaming Interfaces in Epidemic Menace. Experience Report. In Proc. of CHI 2006, Montreal, Quebec, Canada (to be published)
4. Lindt, I., Ohlenburg, J., Pankoke-Babatz, U., Ghellal, S., Oppermann, L., Adams, M.: Designing Cross Media Games. In Proc. PerGames Workshop at Pervasive 2005, Munich, Germany.
5. Magerkurth, C., Cheok, A. D., Mandryk, R. L., Nilsen, T.: Pervasive games: bringing computer entertainment back to the real world. In Computers in Entertainment (CIE), Volume 3, Issue 3, July 2005.
6. Montola, M.: Exploring the Edge of the Magic Circle. Defining Pervasive Games. In Proc. of DAC 2005, Copenhagen, Denmark.
7. Norman, D.: The Design of Everyday Things. New York, Doubleday, 1988.
8. Tanaka, A.: Malleable Mobile Music. In Proc. Ubicomp 2004. Springer-Verlag, 2004.