ECHOES – A Crazy Multiplayer Pervasive Game

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Abstract: Computer games play an increasing role in our modern information society. Besides pure entertainment, games can provide valuable input for social interaction, learning, etc. Recently, new pervasive game genres have been developed, including mobile games, tangible games, table-top games, exhaustive games, mixed reality games, etc. Pervasive games extend the traditional game experience by supporting natural contexts within game experiences. In this paper we present ECHOES as a new mobile pervasive multi-player game which is played outside the boundaries of a building. ECHOES combines the classic features of hunting games with the logic of riddles to create a fun and exhaustive experience in a city.

1 Introduction

Pervasive games are usually described as extending the computer game experience into the real physical world. While computer games generally take place in virtual environments and limit user interactions to available input / output devices, pervasive games aim to enhance computer games with "physical movement and social interaction" [Ma05]. Benford, Magerkurth and Ljungstrand picture pervasive games as taking place in any real-world setting, where game players are equipped with mobile devices and sensors are used to provide the dynamic gaming experience based on the changing context [Be05]. Chalmers et al. refer to pervasive games as multi-user games played outside using pervasive computing technologies [Ch05].

Many pervasive games support mobility and context-awareness as the main ingredients of a smart game experience in the real world. Therefore, mobile game devices and context data acquisition methods are necessary. In general, dedicated smart toys with integrated sensing and communication capabilities can be used to support various reactions in response to changes in the toy's state. Usually, using existing mobile devices, like smart phones or PDAs, offers the advantages of high market penetration for developers and reduced learning requirements for gamers.

Recently, a number of mobile, location-aware pervasive game projects have been developed. TREASURE is a multiplayer game [Ba05] where players use hand-held computers equipped with GPS receivers to collect virtual coins in a large outdoor area. In Treasure, the 802.11b wireless connection is not available everywhere in the game area and this is cleverly incorporated into the game – players can hide in the no-connectivity areas and sneak up on other players to steal their coins. In *Can You See Me Now?* and *Uncle Roy All Around You*, developed by Blast Theory [Blast], players are equipped with GPS, Walkie-Talkies and WiFi devices. Real-world players run in the city to catch virtual players in an online world. Online players can listen to the exchanged messages on an audio stream to keep informed about the situation outside and to give hints for the players. FIASCO [Ch04] plays in New York City and allows gamers to conquer and control city areas which are represented on a virtual map.

Other games have incorporated Web 2.0 tools into pervasive game concepts. E.g. REXplorer [Ba08] uses blogging and Manhattan Story Mashup [Tu07] uses collaborative story making.

In this paper we present ECHOES as a novel approach for mobile gaming. ECHOES does not rely on standard location detection techniques (GSM signal strength or cell ID, RFID, etc.) Rather, our game incorporates the location-guessing into the game-play and uses an existing online image platform (Flickr) as the communication channel. In this way, social communication of Web 2.0 portals is extended to the real life scenario using a game approach.

2 ECHOES – The Game

In the following, the story and game-play of ECHOES are introduced. Afterwards, we outline the implementation of the ECHOES game in terms of system architecture and interface design.

2.1 Story and Game-play

The story of ECHOES is based on a crazy man (the fugitive) who is locked up for treatment of his schizophrenia in a mental institution. This patient is sure that there are sounds chasing him; telling him a special message that he must decipher. The patient manages to escape from the hospital and embark in a quest to find the source of the sounds and prove to the world that he is not crazy. He has to run across the streets of the city, searching, retrieving and recognizing sounds in a race that will take him either to his freedom, or back to the mental institution.

Two overeager psychiatrists from the hospital (the chasers) notice that fugitive has escaped when they start receiving pictures of him in the places where he has been. The doctors need to follow the fugitive's track based on the pictures they receive and trap him before he finds his common sense and thus, becomes cured.

The journey begins when the fugitive receives a hint in his mobile device about where to find those mysterious sounds he wants to decipher. The player needs to hurry to the indicated location (e.g. a landmark of the city) and search for a special card that will let him retrieve the sound and the hint to the next spot. The cards are hidden in the surroundings of the specified place. Once found, they must be scanned with the mobile device to retrieve their message. For each sound heard, the fugitive needs to answer a question related to it. This task is supposed to test his level of insanity and capacity to recognize the sounds for what they really are. In addition, he has to take a picture of himself in the current location which is sent to the doctors.

The goal of the fugitive is to find a final card hidden somewhere in the city before the doctors catch him. Incorrect answers increase the number of cards to be found, making the path to victory longer and giving the doctors more time to trap the patient. The doctors have to figure out the location of their lost patient based on the received pictures, hurry to these places and also scan the card that was deposited again by the patient. The game ends either when the doctors manage to physically trap the fugitive or when the fugitive finds the last card and answers correctly the corresponding question. In this case, the patient needs to upload a final picture of victory that will be retrieved by the doctors, letting them know that the game is over.

2.2 System Architecture

The system is based on two Sony Vaio UX180P Micro-PCs (UMPCs) which run the Windows Vista operating system and provide built-in camera support. A compact flash RFID reader interface card was attached to each UMPC. Internet connection was realized via cell phones connected as UMTS modems in order to be independent of WLAN coverage in the city.
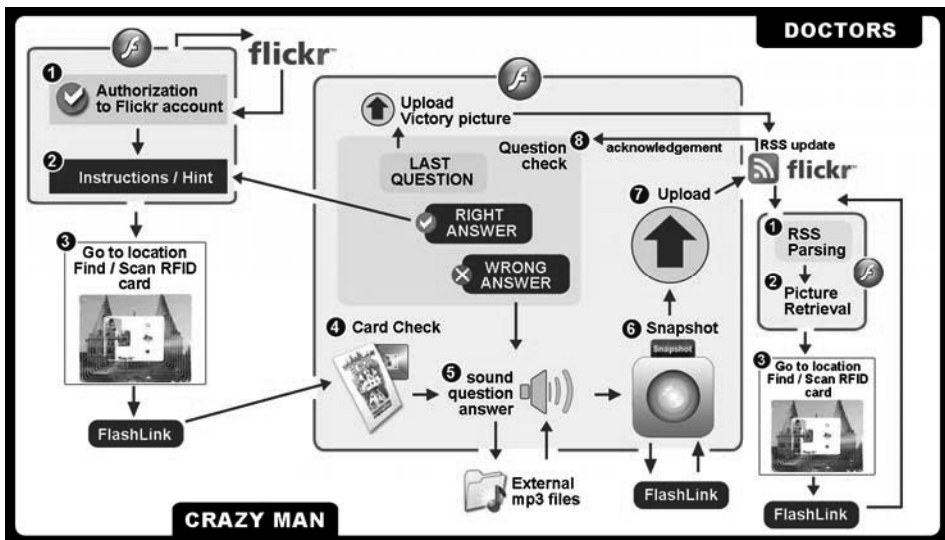

Figure 1: System Architecture Overview

We developed two user interfaces in Adobe Flash – one for each type of player – and used the touch screen functionality of the Micro PC to provide interface navigation. The Flash applications display the hints, questions, retrieve the sounds in mp3 format, allow the users for interacting with the camera in an intuitive way and guide the users throughout the game states. We also created FlashLink, a C# application, which provides additional hardware platform functionality for our Flash-based game engine through the use of the .NET runtime on our target device.

Our project takes advantage of the possibilities that Web 2.0 platforms can offer to pervasive gaming. In this regard, we used Flickr to upload the images taken by the fugitive and make them available to the chasers. We rely on the RSS feeds from Flickr to synchronize both interfaces and maintain the game state.

2.3 Interface Design

The application installed in the fugitive's mobile device lets him retrieve the hints linked to the RFID tags embedded in the hidden cards, access the sounds, take pictures and upload them to a previously created Flickr account. The cards are hidden in a specific order; which the application tracks in order to determine if the right card is being scanned according to the order. Only then a sound is retrieved. There are several question-sound pairs recorded and stored as mp3 files in a folder external to the application, which are accessed in a random manner. After hearing a sound, the player must answer a single choice question. But before the fugitive patient knows the results of the answer, he must take a picture of the place where he is. By pressing a snapshot button on top of the image of a camera, the application connects to FlashLink, which handles interactions with the UMPC's camera and indicates when the picture has been taken. Graphics and animation simulate a real camera, thus enabling the player to see the resulting image as a thumbnail on the screen (see figure 2, step 6).
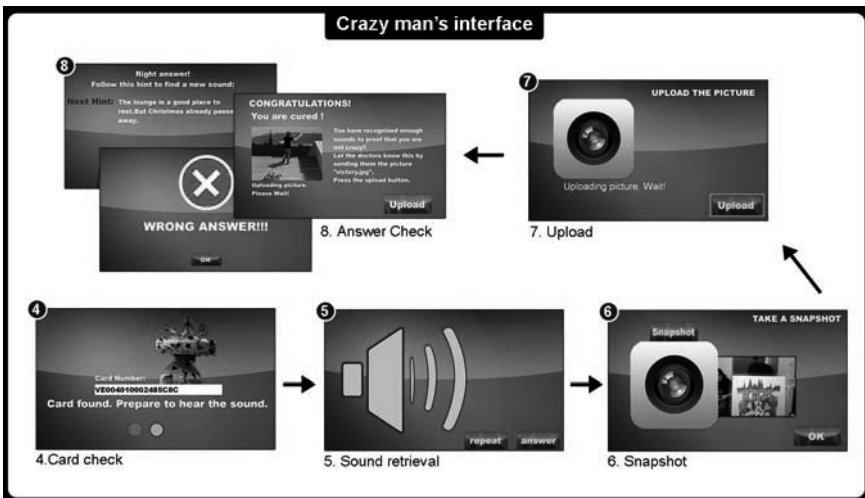

Figure 2: Visualization of central steps in the fugitive's interface

An "Upload" button on the next screen lets the player send the image to the Flickr account. In the background, the application adds a special tag to the picture and names it in an ordered way. This procedure is crucial to maintain the game state and synchronize both applications. Once the image is uploaded, the application receives an acknowledgement and shows if the answer was correct or wrong (see figure 1, steps 7 and 8). In the first case, the player has to hear a sound again and repeat the procedure from that point. If the answer was correct, a hint for the next place is shown. Finally, if it was the last answer and it was correct, the interface asks the player to upload the victory picture.

The doctor's interface is a single screen application that lets the chasers read the RFID cards and retrieve the images accordingly. The application parses and filters the RSS feed of the game's Flickr account and renders the image data in the center of the interface. A "Get Photo" button lets the players retrieve the pictures and a dynamic instructions field gives them hints about what they should do. The doctors are not able to receive any picture until the fugitive has uploaded a minimum of two images. The first image can be retreived without finding any card. To get the next picture, the players need to go to the place indicated by the first image and scan the card found there. The application logic with ordered image title names ensures, that the players do not retrieve more than one image per card found in the same order as the patient uploads them.

3 Experiences

ECHOES was tested at the ISNM campus with multiple volunteers. Comparing the students' experiences, we argue that the fugitive's role was more enjoyable because he had a chance to explore the environment and become immersed into the game-play. Besides exploring the environment, finding proper answers and locations, cooperation, and physical interaction, players may keep the taken images after the game as documentation, souvenir or for strategic purposes, and potentially even share the Flickr account with other interested people. This combination of physical and online world usage is unique with the ECHOES game approach.

As with all mobile games, ECHOES requires a battery supply and online connections for synchronisation. Also, playing outside in the city can cause multiple logistic, technical and human problems. The equipment electronics and players are exposed to the weather, meaning wind, cold or rain. Since the pervasive game is played inside a social framework, people might remove or dislocate the cards, disturbing the game play or influence the game flow in other ways. Also, if the game is played by the same players several times, then obviously new sounds and locations would have to be created in order to avoid boredom and keep the players involved. The provided 27 sounds and questions in the prototype have proven to be sufficient for playing the game two or three times. Sometimes, the pictures could not be resolved sufficiently to indentify the location. While our volunteer fugitives attempted to take unambiguous pictures, we recognize that additional game-play strategies may be needed to promote fairness. Finally, adding a map might help to improve the smoothness of the game flow.

2 Conclusions

ECHOES is a pervasive multi-player game in the city that utilizes a web 2.0 image service (Flickr) for synchronising players and game state. Our prototype implementation on a UMPC using Flash interfaces has proven to be a useful setup. Future prototypes should support more common devices, like smart phones.

The production of new clues and the mapping of cards to places in the city have been identified as challenging. In order to open the game for collaborative clue contributions, an open sound library might be an appropriate solution. As a drawback, providers of clues could not participate in the game itself.

ECHOES combines the positive experience of social outdoor gaming with the efficiency and power of virtual online services on mobile devices. By using existing online services, no additional game infrastructure is necessary.

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