

First-year Students' Paper Chase - a Mobile Location-Aware Multimedia Game

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ABSTRACT

The latest achievements in the field of mobile networks and ubiquitous computing enable the integration and combination of technologies like Internet, Java, and multimedia in a new kind of application that employs distribution, wireless networking, localisation, and movement—mobile location-aware multimedia games. The approach presented is an innovative re-invention of a paper chase/scavenger hunt as a mobile location-aware game. The video demonstration illustrates the technical foundation and the system design of the mobile game. We also show the fun and the action of the game following some students when they play the game on our university campus.

Categories and Subject Descriptors

H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems; K.8 [Personal Computing]: Games

General Terms

Design, Experimentation, Human Factors

Keywords

location-aware mobile games, physical navigation, geo-referenced multimedia, auditory, and graphical user interface

1. INTRODUCTION

The term mobile game typically stands for an isolated interactive game on a mobile device which does not utilise location and movement of the player. The availability of positioning technology such as GPS, together with more powerful mobile devices, and mobile networking infrastructures allows us to develop mobile location-based multimedia games. Our video demonstration presents a game which lets first-year students play a location-based paper chase game on a mobile device on our university campus. The game is realized as a client/server application using wireless communication networks and Web infrastructure. The game client reacts proximity-aware and signals to the players when they approach a checkpoint representing a virtual riddle on the

campus. Hence, by using their physical movement and location, the players have to find the different riddles. To support orientation and to find the riddle on the campus the players do not have to rely on a map visualization only but can also get some auditory hints (hot/cold) to find the next riddle. Using the location of the player, the game server selects the suitable riddle for the user's context and communicates it back to the client. Afterwards, the player tries to solve the riddle with the help of the interactive user interface and returns the result to the server before he or she moves on. The game server not only serves as the game's backend but also monitors the different player's position and progress. We developed different riddle types and interaction/input strategies to enter the result that meets the user requirements using mobile devices. The video demonstration shows how much fun the players had when exploring the university campus and when collaborating with other people on the campus in order to solve the riddles. In addition to the action of the game, we present the general design and realisation of the mobile game.

Existing mobile games that introduce location in their application context often go into the direction of augmented reality, e. g., [5], using extensive hardware and software. Integrating the location, such games bridge the real and the virtual world. Pirates! [3] uses additional proximity sensors to locate the players and hence is not very suitable for an (ad hoc) outdoor game. With GPSdrawings [2] we find systems that use GPS to draw a picture in the virtual world by physical movement, however, have not life game momentum.

2. OUR PAPER CHASE GAME DESIGN

Paper chase (also known as *scavenger hunt*) is an old children's game in which an area is explored by means of a set of questions and hints on a sheet of paper. Each team tries to find the locations that are indicated on the questionnaire. Once a place is found, they try to best and quickly answer the questions on the sheet, note down the answer, and proceed to the next point of interest (POI). Based on this game idea we developed a mobile location-aware game [4].

Figure 1 illustrates the design of the paper chase game and the system components involved. The game mainly consists of a set of geo-referenced *checkpoints* associated with multimedia riddles. With the mobile game client a player logs in to the game server, receives a map and the different checkpoints the player has to find during the game. Each of

the checkpoints is geo-referenced by a Gauss Krueger¹ coordinate which is transformed into a screen coordinate and drawn on the map. The player's device includes a GPS receiver which continuously tracks the current position of the device. As the checkpoints are proximity-aware an event is raised and the server is contacted, whenever a player physically approaches one of the virtual checkpoints. The server responds by sending the information about the corresponding riddle, which is presented in a hypermedia presentation to the user. Each riddle has associated resources like an image or other additional (media) information that are needed to solve the riddle with the respective interaction(s). The player tries to solve the riddle not only correctly but also as quick as possible, because the time needed to solve all the riddles is accumulated and added to the overall score. The answer to the riddle is communicated to the game server. It is possible for the player to interact with the system but also with other people, e.g., by asking them for help with the riddles.

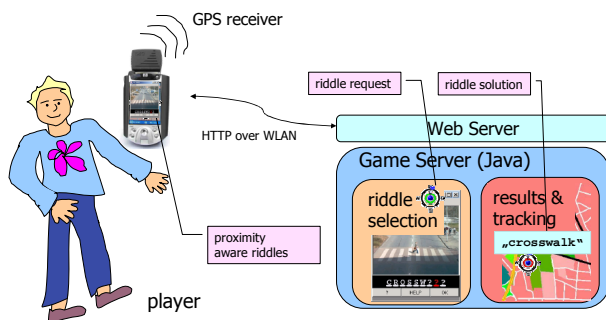


Figure 1: Paper chase game design

3. THE DESIGN OF THE RIDDLES AND USER INTERFACE

Multimedia riddles contain different media types to visualize the question. We designed two general riddle types: multiple choice and line text fields. For multiple choice riddles one correct answer out of a set of given choices has to be selected. For line text fields the answer has to be manually inserted. Each interface of the different riddles types provides a help support. Some riddles provide additional pictures that provide a more detailed version or another view on the object in question. Players can zoom into the given picture to see more details and gain more information. Finally, an initially blurred picture can be cleared up stepwise.

4. THE NICCIMON PLATFORM

The paper chase game is based on the *Niccimon platform* developed in our Research Center of Excellence of Lower Saxony for Mobile Applications, Germany [1]. This platform provides different autonomous modules for visualisation, POI definition, location sensing, etc., which can be reused in different application domains. These modules cooperate with each other only via distinguished interfaces but are otherwise independent. The interfaces of the Niccimon platform provide life-cycle control, visualisation, network communication, and inter-component communication.

¹German standard format for geo-references

By this specific design the rapid development of new mobile services is possible. For the development of a new mobile application, consequently, different existing autonomous modules can be combined using the Niccimon platform. By its interfaces they share functionality, solve the problem, and support the user in different scenarios.

Figure 2 illustrates the different modules which realise our sample application “paper chase game”. The game module itself realises the actual paper chase and uses the modules which address mobile geographic information systems (GIS) and positioning by the location module.

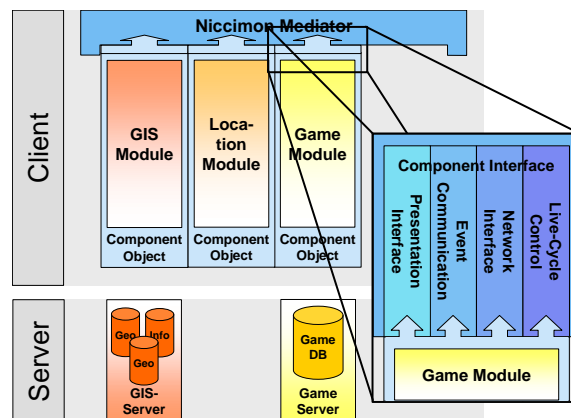


Figure 2: Paper chase game on the Niccimon platform

5. CONCLUSIONS

In this paper, we presented the concept and implementation of a location-aware paper chase game in which a real world area is explored by finding and solving geo-referenced multimedia riddles in the virtual space. The video illustrates both the game idea and the technical realisation, and gives an impression of the players' fun. The techniques of the paper chase game can be used for a wide area of further applications, such as a context-aware mobile multimedia sightseeing tour.

6. REFERENCES

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