

Analysis of a Location-Based Multi-Player Game

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Introduction

The growing number of location-based services fosters the creation of multiplayer games that take place in real settings (see Uncle Roy¹ or Human Pacman² for instance) and leaves open the question of how to analyze data generated along the game. Analyzing game data is of interest for both designers and researchers: designers need feedback about their games in order to improve it and researchers could use it as a testbed to investigate various research questions. In our case, we are interested in ubiquitous computing games in order to use it as a platform to study how people rely on spatial features in terms of collaborative interactions.

The crux issue here is **how to analyze the wide load of data generated by the game in an ubiquitous computing context. How should it be studied?** What kinds of data may be captured and what sort of analysis should be conducted? Of course ethnography is one of the most important way to deal with this issue, but others methods could be of interest. This topic is not brand new since this question is of tremendous importance for collective sports managers (like rugby and football). They indeed hire analysts who use software and methods to gather data about the way teams play and then analyze them (Jonnsnons et al., 2003). This topic has also been tackled by Benford et al. (2002) who tried to show how to analyze event-like experiments. They propose to enrich audience feedback/discussion and common ethnographical methods with system logs analysis. The idea is that logfiles could be parsed so that you can obtain a replay of the game, reviewed by any perspective. In addition, logfiles allow statistical analysis of the activity. We propose here an example of such an analysis, using both quantitative and qualitative data.

In order to answer to the question of the game data analysis, we first present the game we developed at our lab and the different data which are generated. Then we explain our approach that uses quantified analysis of data.

The game platform: CatchBob!

We set up a mobile game in which groups of 3 team-mates have to solve a joint task. The aim of the game for the participants is to find a virtual object on our campus and surround it with a triangle. They are provided with a location-based tool running on an iPAQ. This tool allows each person to see the location of his or her partners with a colored dot on the campus map. Figure 1 shows a screenshot of the location awareness tool. Another meaningful piece of information given by this tool is whether the user is close or far from the object: a proximity sensor. In addition, the tool also enables simple communication: if a participant points on a

¹ <http://machen.mrl.nott.ac.uk/Projects/CitywidePerformance/Unlceroy.htm>

² <http://mixedreality.nus.edu.sg/research-HP-infor.htm>

dot (that represents a person) with his/her stylus, (s)he can draw a vector that correspond to a direction proposition for his/her partner: "go to this direction".

The team comes at our lab and we describe them the purpose of the game as well as the instructions, They have 5 minutes to discuss a strategy and then have to go on the field to find the object. The only way they could communicate is the structured communication tool. They leave their cell phones at the lab. The goal is therefore to coordinate with each other in order to catch this object and circle it with a triangle as shown on figure 1.

Users also have to press a "refresh" button in order to get a new representation of the map, the whereabouts of the partners and to send information about direction to their team-mates.

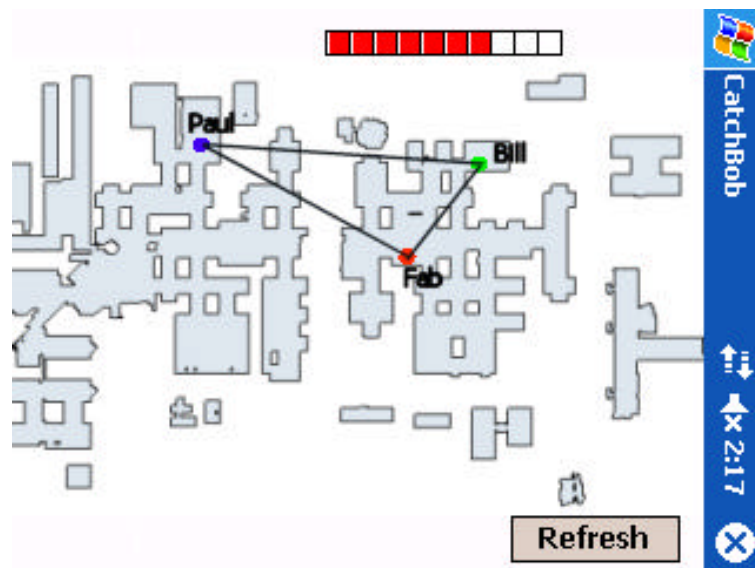


Figure 1: GUI example of the location awareness tool running on an IPAQ

Data analysis proposal

The idea here is to confront behavioral data that can be quantified (like time to complete the game, users' paths, players' interactions...) to much more qualitative data (like pre-game discussions about the strategy or verbalizations gathered after the game). We want to combine performance measure (like users path and time to complete the game) with process measures (interactions and location awareness tool use). We first have raw data consisting in a list of events with time and authorship. With regard to the data generated during the game interactions, we would discriminate two categories:

- interaction between the participants and the environment: when players pass by a certain location. Task division is calculated by adding the number of rooms that one participant only searched to the number of rooms that the other participants also visited. Overlap is calculated by counting the number of rooms two or three partners searched. Backtracking is calculated by adding up the number of times one partner entered a room they had already entered. From the logs, users paths could also be computed.
- interactions between the participants: when players do a refresh (to send his/her own position and to get others positions) or when they send direction proposition. This could be quantified: number of refresh, frequency and asymmetry (Does Bill send more message than Paul?). Looking if players obeyed to recommendation is another informative variable we can compute.

In addition to those quantitative data, we also have players' verbalizations stored before the game (when they set their strategy) and after. Those post game data consist in players' self confrontation with specific game episodes. This can be obtained thanks to a replay tool that shows various data: replay of their paths, of their interactions as well a different visualizations explained below. These verbalizations are meant to enrich our data and to be compared to the quantitative analyses.

From CatchBob! logfiles and the replay tool, we can compute different visualizations as depicted on figure 2. We can show players their previous paths as seen on figure 2a. Specific moments could be shown thanks to a slider. Figure 2b shows that we can also display more abstract visualizations of players' interactions. localized on the map.

As far as this workshop is concerned, the contribution to be made is not only linked to the methods to be presented, but also to the data extracted. We will then present examples of CatchBob! data illustrating the methods we described previously.

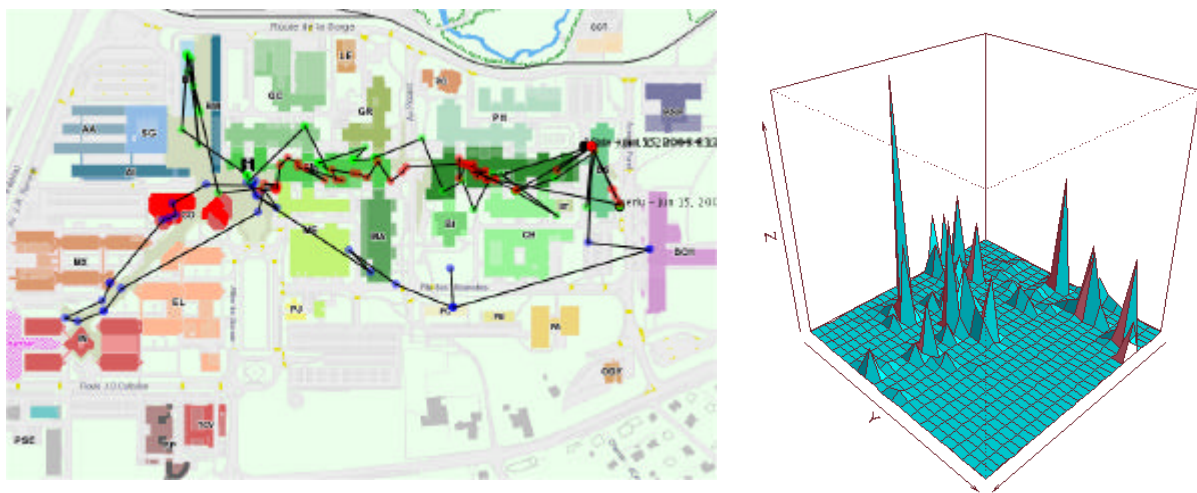


Figure 2: a) *users paths shown on the replay tool*, b) *visualization of players' activity. Each peak corresponds to the number of messages sent at a certain location. We could add other information like number of messages exchanged at specific location.*

About the authors

The authors are currently part of a team of researchers in Center for Research and Support of Training and its Technologies at the Swiss Federal Institute of Technology, Lausanne. Their work is headed towards the study of socio-cognitive processes involved during collaborative interactions through mobile technologies.

References

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