Geogames – Intention recognition and data quality in location-based gaming

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1 Introduction

Mobility is often regarded as a necessity we cannot avoid due to professional and private activities in our daily lives. Waiting for the train, being trapped in a traffic jam, and the like, are generally perceived as time-consuming and enervating. Mobile computing has opened a bunch of new possibilities for entertainment which can help us to make the best of our journey. Mobile phone games and mobile TV (e.g. [9]) are typical examples. Most of these systems try to port a stationary entertainment experience to a mobile device. The spatio-temporal movement is seen as an unavoidable precondition for which we must find a technical solution, but not as an entertaining element itself.

Exactly this issue is addressed by *location-based games* (LBG), which make use of positioning technology (e.g. GPS) and integrate the player's position into the logics of a game [11]. This approach of not only creating entertainment *for* mobility, but also creating entertainment *from* mobility seems quite promising. Projects in the pervasive gaming community have proposed a number of LBGs [3], and addressed various research questions. However, the AI aspects connected with LBGs have largely been ignored.

The Geogames project aims at exploring how methods from AI can be used in all phases of a LBG: before, during, and after the game. The research directions addressed in the project follow these three phases. We are especially interested in the implications of space and time on AI in LBGs. The following questions guide our research:

1. *Game design and setup*: how can we create a game that addresses both, the player's intellectual and sportive skills? How does the choice of geographic footprints influence the spatio-temporal flow of a game? And, closely related: how can we help the game designer to port a game to a new geographic area? (section 2)
2. *During the game*: how can we infer the player's intentions to act from her spatio-temporal behavior (*mobile intention recognition*)? How can we model complex connections between intentions, space, and time? How can we use the spatial context to make the inference process more efficient? (section 3)
3. *After the game*: how can the spatial data collected during the game help us to improve geographic data quality? Can we use LBGs for the community-based collection of geographic data? (section 4)

In this project report we will only briefly review the main findings of the first research direction and then concentrate on the current project phase which is concerned with the second and third. These two directions are closely related to ongoing PhD research projects. We present the central findings of previous and current work, and conclude our report in section 5.

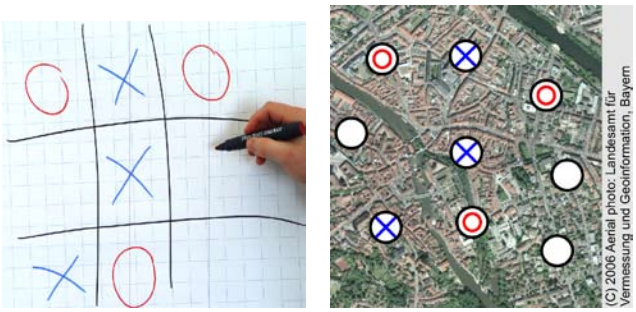

Figure 1: Board game Tic Tac Toe (left) and the spatialized version GeoTicTacToe (right)

2 AI support during game design and setup

Game creators tend to have a metaphor in mind when conceiving a new game. While other LBGs follow metaphors like arcade games or catch games (PacManhattan, Can You See Me Now, see [3]), the Geogames project creates games from the metaphor of traditional board games. The strategic elements of the board game are combined with the sportive challenge of moving in a city. Geogames define not only a single game but a whole class of LBGs.

The simplest example of a Geogame is GeoTicTacToe, a location-based variant of Tic Tac Toe (see Fig. 1). In Schlieder et al. [21] we explained why it is not trivial to bring a board game to the real world: due to the real-time nature of gameplay, trivial strategies that support pure race games are possible. We call this the *synchronization problem*. We showed that a temporal solution to this problem exists: players are forced to wait a certain amount of time (synchronization time) after each move before they are allowed to change their position.

But why do we need AI research in this context? The game creator has several parameters she needs to adjust for a specific game: regarding the spatial parameters, she has to decide about the size of the gaming area, and the spatial layout of the relevant coordinates. Obstacles, road network, and elevation profile must be considered. With respect to the temporal parameters, she must select an appropriate synchronization time interval. Testing an arbitrary number of possible configurations in the real world is not possible, for organizing and playing a LBG takes quite some time and