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Virtual Worlds for Serious Applications (VS-GAMES'12)

## Towards Location-based Augmented Reality games

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### Abstract

Location-based games have become more popular thanks to the growth of mobile device's technology. This paper presents a framework for the development of location-based augmented reality games and wARms, an augmented-reality location-based mobile game prototype based on said framework that uses the player's real position and orientation in order to play against others. The game shows how modern mobile device's sensors can be used for providing new and unusual gaming experiences.

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Keywords : Mobile Games, Augmented Reality, Location-based Games

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### 1. Introduction

Videogames, like all software, are prone to bugs and issues. Location-based games are even more so as they share most traits with usual videogames with the unpredictability of the locations that they rely on. This paper presents a framework for the development of location-based augmented-reality mobile games that will serve as a foundation for the development of future serious games. wARms, a location based mobile game that uses augmented reality, based on a modern smartphone's vast array of sensors, so as to provide a unique gaming experience, was developed as a proof-of-concept. The framework then served as the basis for the implementation of a prototype comprising a mobile game client and server.

### 2. Framework for Location-based Augmented Reality Games

This work consists of the development of a framework for the creation of Location-based Augmented Reality mobile games and the implementation of a game prototype. This section covers the design of the framework and the game design.

## 2.1. Framework Design

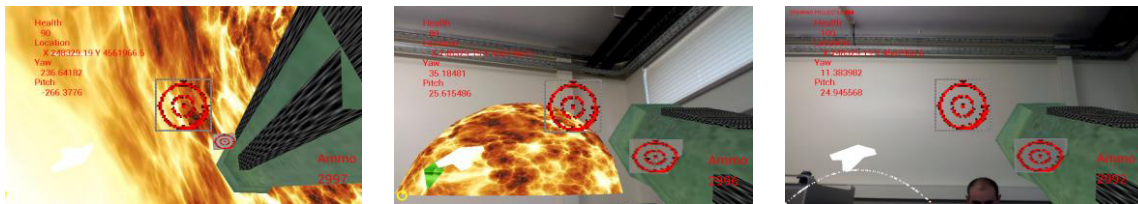
The framework handles different functions necessary for Location Based Augmented Reality, network communications and general gaming functions, like 2D/ 3D graphics, sound, collision detection, and mobile sensor input handling (GPS, Gyroscope, Accelerometer, etc). This framework was based on OpenGL ES 1.1 and the Android SDK.

## 2.2. Game Design

Warms is a multiplayer action game for mobile devices that relies on the players' physical location and orientation to be played. A player attempts to fire projectiles against other players by aiming the device in their direction. However, in order to hit the others, the player must take into account the target's distance and the angle and strength of the shot while avoiding incoming projectiles by moving around..

## 3. Results

The images bellow are gameplay screenshots of wARms. The game was fully implemented and is, as of now, only missing better 3D models, as all of the gameplay elements are present. A usability survey was conducted with a few players to help determine usability or gameplay issues. Approximately 57,1% of the testers said it was hard to hit opposing players as it was difficult to determine the distance of the target. All of the inquired players commented that they had no problems with knowing the direction of the enemies and had no difficulties in aiming and shooting. Regarding the issue of lag, as the game doesn't occur in real time, only 71,4% noticed no delays at all.



## 4. Conclusions

This work here presented consisted of a framework for the development of location-based augmented reality games and a prototype based on said framework, wARms. The game has already all of its features implemented and has been tested with several players with very good feedback. This result provides useful feedback for the framework as it helps show its suitability for this type of games. The only current downside is the inability to have real-time communications in the game, due to a framework limitation. This and other identified issues will be looked into and addressed in the future.

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