

# Multiplayer Pervasive Games and Networked Interactive Installations using Ad hoc Mobile Sensor Networks\*

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## ABSTRACT

In this work, we showcase a set of implemented multiplayer games and interactive installations based on Fun in Numbers (FinN). FinN allows the quick prototyping of applications that utilize input from multiple physical sources (sensors and other means of interfacing), by offering a set of programming templates and services, such as proximity, localization and synchronization, that hide the underlying complexity.

## 1. OVERVIEW

FinN<sup>1</sup> is our software platform for developing pervasive applications for entertainment and educational purposes. The use of ad hoc networking techniques in our platform allows for a completely distributed architecture and implementation of multiplayer games and networked interactive installations. Moreover, FinN enables a more immersive and engaging experience providing non-conventional interfacing methods, multiple interactive schemes and use of actuators.

The entertainment installations and the multiplayer games presented here share a number of characteristics, emphasized to outline the benefits of our platform. First, the interactions between users and the installations are based on the sensing of *presence* (enter/start or leave/pause interaction) and of *motion* (perform entertainment related actions). Both are realized by using wireless sensor networking techniques. Also, such installations can operate with numerous participants, adding multiplayer characteristics to the installations. Moreover, a centralized control exists for the central coordination and the management of the installations. In order to develop, deploy, operate and administer such installations we created a unified, software and hardware, framework. We utilize Sun SPOT nodes as our prototype

\*This work has been partially supported by the European Union under contract numbers IST-2005-15964 (AEOLUS) and ICT-2008-215270 (FRONTS).

<sup>1</sup>For more information and additional examples using FinN, please visit our website: <http://finn.cti.gr>

implementation hardware platform, which provides, among others, wireless communication, a 3D accelerometer, as well as embedded light and thermal sensors. In order to visualize the output on each installation we use monitors/projectors.

## 2. SHOWCASE HIGHLIGHTS

**Clashing rocks:** This installation represents an ancient ship (trireme), where players have the role of oarsmen. Each player holds an oar on which a SunSPOT is mounted, capturing and recognizing the oar's motion. While stroking, players are trying to escape from being clashed. By stroking fast and synchronized, the ship gradually gains full speed. A boatswain imposes audibly the stroking tempo, which accelerates while all players maintain their synchronization. The experience is enhanced by visualizing the game's progress. In this cooperative game, the basic features of synchronization, gesture recognition and visual output are combined.

**Chromatize it!:** This edutainment installation is based on the mixture of basic colors. The basic features demonstrated here are proximity between devices, player's input as well as visual output. A chromatic mass appears as soon as the player approaches the screen. By choosing among basic colors available on his device, the player colorizes the masses' minions. By doing so, he mixes colors, in an effort to match the color of the mass. The matching combination leads to an ever increasing difficulty of levels in chromatic complexity. More than one players can simultaneously participate.

**Tug of war:** In this highly competitive multiplayer game, players enter a 3D cube on each side of which colors are floating. Each color defines territories owned by a player, the aim of which is to expand his territory as much as possible. This is achieved when the indicated gestures are performed properly and fast. Visual output as well as gesture recognition are the basic characteristics of this installation.

**Casanova:** This is a two-players-only game. One of the players is randomly selected as the "Casanova", while the other one as "Bianca". The goal of Casanova is to run away from Bianca, while Bianca must not lose Casanova from her sight, running when Casanova runs and staying still when Casanova does not move. The two players are informed for who is who and the actual game starts. Casanova tries to win Bianca, by running away from her, or by staying still suddenly. This game is based on ad-hoc networks, where the need of infrastructure is not compulsory.