**RoboWars**

**Progress Report**

**SYSC 4907  
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Project #34  
  
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# 1 – Introduction

The following document is a progress report for the RoboWars fourth year engineering project. The RoboWars project is under development by a team consisting of Alexander Craig, Alexander Dinardo, Steve Legere, and Mike Wright. The report covers the development period from September to December 2010. Included in this report is a summary of the project objectives, an overview of the work completed thus far, comments on further development, and an overall assessment of the project’s progress.

# 2 – Project Review

The RoboWars project has two primary objectives:

* The first project objective is to develop a robotics control system which is both intuitive to use and is implemented on a mobile platform that is widely available and used by the public.
* The second project objective is to experiment with the combination of live video and virtually generated, overlaid imagery to enhance the ease of use and feature set of a robotics control system. This technology is commonly referred to as augmented reality.

To combine these objectives, the project aims to create a system which allows two remotely controlled robots to share and interact with a simple virtual world which will be rendered on to a live video feed and displayed to remote clients using Android smart phones. Development of the RoboWars project began in September 2010, and is scheduled to be completed by March 2011.

# 2 – Progress Summary

## 2.1 – Completed Development

The period covered by this report includes the entirety of phase one of development and the beginning of phase two of development as defined in the original project schedule (see Appendix A). At this point, all phase one development is complete, as well as several components scheduled to be implemented in phase two.

The first two weeks of development were spent on formal design work and preparing funding proposals. RoboWars successfully secured $975.07 of funding from the CUESEF equipment fund. A number of design documents were prepared, and a well documented base design has been a significant factor in keeping the project on the originally determined schedule.

A Lego Mindstorm NXT 2.0 robot kit has been purchased and used to construct a custom built RoboWars robot. This robot uses a 3-point wheelbase, and runs a custom firmware provided by the open source LeJOS project. LeJOS provides a Java virtual machine which runs on a Lego NXT Intelligent Brick, as well as libraries for dead reckoning position tracking. The use of Java on the NXT robot has greatly eased communication with the Java server code, although custom IO code was required as LeJOS provides limited implementations of the standard Java input and output streams. The LeJOS dead reckoning code was also customized to account for the geared wheel configuration used by the RoboWars robot.

Communication between the game server and NXT robot has been established through both USB and Bluetooth connections. Mechanisms have been successfully established for the game server to transmit commands to the NXT robot, and for the NXT robot to send position data to the game server. This accounts for all scheduled phase one robot development, as well as much of the work scheduled for phase two.

All phase one objectives for game server development have been met. A server lobby has been implemented to manage active connections with users and robots. This lobby allows users to exchange chat messages, adjust game settings and launch virtual gameplay. This server lobby can be monitored through a Swing GUI provided on the server machine. The pairing procedure between users and remote robots has been implemented, which was originally scheduled for phase two.

The implementation of basic virtual gameplay is largely complete. The game server is currently capable of storing game state and running a game to completion. Two game modes implemented thus far: “LightCycles” and “FreeTest”. “FreeTest” is a game mode whose purpose is merely to test all functionality of the virtual world and robot movement. Both the user and the virtual world can generate and transmit commands to the remote robots in real time.

Development of the Android client has begun, despite this work being scheduled for phase two. A basic GUI has been implemented and moderately tested, the MVC design architecture has been implemented, and the TCP communication framework is complete. The application layout has been implemented in XML in order to maximize modifiability, to keep the layout organized, and to provide ease-of-access to future developers. The client has only been tested over a virtual network implemented by the Android emulator.

## 2.2 – Further Development

In the upcoming work period all development scheduled for phase two will continue as originally planned. This entails developing a 2D server side display of the current game state, integration of the game server and camera feed, and implementation of game controls using tilt functionality (through artificially generated tilt events as the Android simulator does not support gyroscope emulation). In addition to these goals it is hoped that streaming of the live video feed to remote clients can be completed during phase two to allow for additional developer time to be spent on graphics rendering during phase three.

In the upcoming work period a greater emphasis will be placed on testing the existing implementation. Testing versions of the user/robot proxies have been developed which disable network communication and record all transmitted data locally for testing purposes. These proxies will be extended to emulate basic user/robot functionality to facilitate unit testing. Unit tests have been written, but currently only a small percentage of the implementation is exhaustively tested. In the next work period the project will test the Android client on actual smart phone hardware, as well as expand unit tests to cover the majority of the implementation

# 3 – Assessment

The RoboWars project is successfully meeting the goals outlined in the original project schedule. All phase one development has been completed as scheduled, and many aspects of phase two development have already been completed ahead of schedule. The greatest weakness of the project is currently a lack of exhaustive testing, which the team hopes to address in the current development phase. Further development will be performed according to the original project schedule, and at the current rate of implementation the project will be completed within the originally proposed time frame.

Appendix A  
Updated Development Schedule

