

Autonomous Pool Playing Robot

Requirements Specification

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Date	Revision #	Comments	Authors
27/02/2017	0	- Initial document creation	Eric Le Fort

Table 1: Revision History

1 Introduction

This document will provide a specification of a test plan for an automated pool playing robot and report on the results of that plan.

1.1 Overview

This document breaks down the required testing for each domain of the system. It begins with the hardware aspect, then moves to the electrical side and then finishes with software. Each section will provide a traceability matrix to map the requirements to tests that check their completion and then go into further detail to describe each test case. Lastly, a summary of the results of testing will be provided to conclude the document.

1.2 Purpose

The aim of this document is to illuminate any design flaws, software bugs, or other issues in the system. Once these issues are discovered, the engineering team will be able to work on eliminating them or minimizing their frequency and consequences.

1.3 Naming Conventions & Definitions

This section outlines the various definitions, acronyms and abbreviations that will be used throughout this document in order to familiarize the reader prior to reading.

1.3.1 Definitions

Table 2 lists the definitions used in this document. The definitions given below are specific to this document and may not be identical to definitions of these terms in common use. The purpose of this section is to assist the user in understanding the requirements for the system.

Table 2: Definitions

Term	Meaning
X-axis	Distance along the length of the pool table
Y-axis	Distance across the width of the pool table
Z-axis	Height above the pool table
End-effector	The end of the arm that will strike the cue ball
θ	Rotational angle of end-effector
Cue	End-effector
Personal Computer	A laptop that will be used to run the more involved computational tasks such as visual recognition and the shot selection algorithm
Camera	Some form of image capture device (e.g. a digital camera, smartphone with a camera, etc.)
Table State	The current positions of all the balls on the table
Entity	Classes that have a state, behaviour and identity (e.g. Book, Car, Person, etc.)
Boundary	Classes that interact with users or external systems
Double	Double-precision floating point numbers

1.3.2 Acronyms & Abbreviations

Table 3 lists the acronyms and abbreviations used in this document.

Table 3: Acronyms and Abbreviations

Acronym/Abbreviation	Meaning
VR	Visual Recognition
PC	Personal Computer
μC	Micro-Controller
CRC	Class Responsibility Collaboration

2 Mechanical Components

3 Electrical System

4 Software System

The software system is comprised of four main components: a control system running on an Arduino microcontroller, an automated image capture application running on an Android smartphone, as well a visual recognition program and smart shot selection program running on a PC. On top of the typical suite of unit tests to verify correctness of methods, rigorous system testing will also be crucial to adequately test this system.

The following traceability matrix will demonstrate that the tests to be performed prove that specified requirements have been met.

4.1 Unit Tests

4.1.1 PC Controller Program

4.1.2 PC VR Program

4.1.3 μ C Program

4.1.4 Android Program

4.2 System Tests

5 Summary of Results