

Autonomous Pool Playing Robot

High-Level Architectural Design

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Date	Revision #	Comments	Authors
6/12/2016	0	- First draft completion	Guy Meyer Ernest Selman Derek Savery Andrew Danha Eric Le Fort

Table 1: Revision History

1 Introduction

This document will describe the hardware architecture of the Autonomous Pool Playing Robot as a high level design.

1.1 System Description

This system will consist of the mechanical, electromechanical, and electrical components which in combination will form the physical makeup of an autonomous pool playing robot.

The mechanical components will form the structure of the robot in order to allow the end effector to move in the X, Y and Z axis as well as rotate about the Z axis. The electromechanical components will facilitate motion of the robot including actuating the end-effector. The electrical components will power the entire system as well as deliver cpu signals to the electromechanical devices, thus driving the motion of the robot.

1.2 Overview

This document has three sections not including this one. The first section is dedicated to the mechanical components, the second section is dedicated to the electromechanical components, and the third section is dedicated to the electrical components.

For each mechanical component there is a subsection containing a diagram of that component, a subsection dedicated to purpose and behaviour of that component, and a subsection dedicated to requirements for that component.

For each electro-mechanical component there is a subsection dedicated to purpose and behaviour of that component, and a subsection dedicated to requirements of that component.

For the electrical section there is a subsection containing a context diagram of all components. For each electrical component there is a subsection dedicated to I/O of that component.

These subsections are intended to prepare the hardware team for implementation of each component.

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.

1.3.2 Acronyms & Abbreviations

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

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 the 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

Table 3: Acronyms and Abbreviations

Acronym/Abbreviation	Meaning
VR	Visual Recognition
PC	Personal Computer
μC	Micro-Controller
EE	End-Effector
EEB	End-Effector Base
EEA	End-Effector Arm
PWM	Pulse Width Modulation

2 Mechanical System

2.1 X-Rails

2.2 Y-Rails

2.3 Arm Base

2.4 Arm

2.5 Bridge

2.6 End-Effector

2.7 End-Effector Arm

2.8 End-Effector Base

3 Electromechanical System

3.1 X-Rail Motors

3.2 Y-Rail Motor