

McMASTER UNIVERSITY

SMARTSERVE

SOFTWARE & MECHATRONICS CAPSTONE

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## Project Goals

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Date	Revision	Comments	Author(s)
10/05/17	0	First revision of document completed	Christopher McDonald & Sharon Platkin
10/06/17	1	Second revision to add more sections and text	Christopher McDonald & Nisarg Patel & Harit Patel
10/06/17	2	Third revision to strengthen the context, proof read and refine the context	Christopher McDonald & Nisarg Patel
10/06/17	3	Fourth revision of document to set realistic goals, remove extra goals to ensure the total number of goals is less than 15	Christopher McDonald & Nisarg Patel & Janak Patel & Jared Rayner & Sam Hamel

Figure 1: Revision History

# 1 Team Vision

The SmartServe team envisions to provide Table Tennis enthusiasts with an effective training solution which enables any player to improve their game with the help of modern technology and data analytics.

# 2 Project Overview

When a player wants to improve their table tennis game, a typical solution is to hire a coach. However, this does not come without its challenges. These include scheduling, focusing on particular shots and receiving in-depth statistical feedback. Our solution to solve the above problem will consist of a shooting mechanism, a way to identify successful returns and a system to recommend different shots. Throughout the training session, the system will provide the user with feedback on the quality of their game. The system will consist of a electromechanical system to shoot the ball and a computer vision system to track the ball's location during flight. A server will also be added to store data, provide diagnostics and recommend shots given the user's past performance.

# 3 Success Criteria

To judge how well the system meets the problem described above, several aspects of the system will need to be measured. The first major part is the accuracy and precision of the shooting mechanism with respect to how well it shoots the ball. The second will be how many degrees of freedom can be applied to a shot to vary its characteristics. Lastly, including features in order to better solve the problem in areas like usability, performance and quality. However, for the project to be deemed successful in solving the problem, all of the low-level goals need to be satisfied. The mid and high-level goals will be prioritized last after the low-level have all been achieved.

# 4 Goals

## 4.1 Low-Level Goals

The following items encompass the low-level goals of the system:

- The system can detect valid returns from the user with an accurately
- The system can hit 9 zones on the table, corresponding to a 3x3 grid
- The system implements reinforcement learning algorithms
- The system helps user improve their game in any way

- The system is implemented with one camera
- The shooting mechanism can pan
- The shooting mechanism can shoot with variable speeds

## 4.2 Mid-Level Goals

The following items encompass the mid-level goals of the system:

- The system can hit 16 zones on the table, corresponding to a 4x4 grid
- The system has realtime performance updates
- The system has implements the ‘single-shot’ and random shooting modes
- The system can apply various spin directions
- The system can support multiple user profiles
- The system is implemented with a stereoscopic camera

## 4.3 High-Level Goals

The following items encompass the high-level goals of the system:

- The system can hit 36 zones on the table, corresponding to a 6x6 grid
- The system can track the ball throughout the complete path travelled across the table
- The system is implemented with two synchronized cameras
- The system can shoot at variable pitch