UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN & DEVELOPMENT OF MULTIPLE SPIN TYPE IN TABLE TENNIS TRAINER CONTROLLED VIA ANDROID APPLICATION

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Automotive) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Automotive) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Sejak kurun ke 21st, sukan telah menjadi salah satu bentuk hiburan yang terbesar. Bilangan orang yang melibatkan diri dalam pelbagai jenis sukan telah meningkat sekaligus menjadikan sukan ping pong adalah sukan menggunakan raket yang kedua digemari di dunia. Sehingga tahun 2003, lebih kurang 300 juta pemain diseluruh dunia dan sukan ping pong mempunyai 226 badan pertubuhan berdaftar di bawah Federasi Tenis Meja Antarabangsa (ITTF). Hal ini sekaligus membuktikan sukan ping pong merupakan sukan kegemaran orang ramai. Oleh yang demikian, adalah menjadi keperluan untuk menyediakan beberapa pelancar ping pong untuk meningkatkan mutu latihan pemain. Walau bagaimanapun, pelancar ping pong pada masa kini mempunyai harga pasaran yang mahal dan tidak mesra dengan pemain. Permintaan yang tinggi dari pemain untuk menyediakan pelancar ping pong yang berpatutan dari segi harga dan mesra pengguna. Pelancar ping pong ini dijangka akan meningkatkan mutu latihan para pemain agar lebih berkesan dari segi pelancaran bola dalam pelbagai putaran dan mewujudkan urutan berorientasi pemain untuk melancarkan bola. Aplikasi android dibina sebagai komunikasi bagi pelancar dengan papan Arduino Uno bertindak sebagai pengawal utama kepada sistem yang berfungsi untuk mengawal semua komponen elektrik di pelancar. Dengan cara mengawal kelajuan motor DC dan sudut pemutar, pelbagai jenis putaran dan urutan boleh dipilih oleh pengguna menggunakan aplikasi Android. Secara keseluruhannya, “Table Tennis Trainer” menjadi mesra pengguna kepada pemain dan meningkatkan kemahiran para pemain dengan menyediakan variasi jenis pelancaran bola.

ABSTRACT

Sports become one of the largest entertainments in this 21st century. Number of people involved in the any kind of sports keep on increasing daily and table tennis or ping pong become second most popular racket participating sports in the world. Until the year 2003, there are around 300 million players around the world and total of 226 table tennis association from around the world registered under International Table Tennis Federation (ITTF). This shows the popularity behind table tennis and it is required to have a table tennis trainer to enhance the player practicing method. Due to the fact that currently available trainer come with hefty price tag and not user friendly to player, there is a need or demand for an affordable and user friendly table tennis launcher. This table tennis launcher is targeted to improve the table tennis practice method to be more effective by launching the ball in multiple spin type and creating player orientated sequence for the ball launching. Android application is developed as a controller for the launcher with Arduino UNO board serves main controller of the system to control electrical components in the launcher. By controlling the speed of the DC motor and angle of the spinner, multiple types of spins and sequence can be selected by the user using the Android application. Conclusively, Table Tennis Trainer become user friendly for the player and increase the player skills by providing varies type of ball launching.

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DEDICATION

I dedicate my treatise work to my family and friends. A special recognition to my loving parents, Mr Batumalay a/l Samidevan and Mrs Puspavali a/p Danislas for their help towards me for finishing this.

I also dedicate this treatise to my friends and societies who have supported me throughout the process. I will always appreciate the help they done for me especially Karthik Manikam, Sugan Muthusamy, and Murali Ramalingam.

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LIST OF ABBREVIATIONS

MTTA	-	Malayan Table Tennis Association
ITTF	-	International Table Tennis Federation
cm	-	Centimetre
DC	-	Direct Current
AC	-	Alternating Current
RPM	-	Rotation Per Minute
RM	-	Ringgit Malaysia
PWM	-	Pulse Width Modulation

CHAPTER 1

INTRODUCTION

1.1 Project Background

Table tennis is second most popular racket sports in the world. In United States alone table tennis has over 20 million active participants and in the year 1988 table tennis become an Olympic sport[1]. In the year 1952, Malayan Table Tennis Association (MTTA) was formed to act as the coordinating body in all matters connected with the sports within the country.

Malaysia has been participating in the international table tennis tournaments since the year 1965 and has been winning number of medals. Malaysia table tennis team have been competing with other advanced countries such as China and South Korea whose been dominating the table tennis tournaments worldwide and could not shine well in international stage.

Since the late 1980s, table tennis robots have been commercially available to the athletes for training purposes. Table tennis robot is a mechanism that can be placed on the one side of the table and launch ball to the players side. Commercially available robots for table tennis comes with complicated construction and does not have the ability to launch the ball in variety of spin which makes the play more realistic[2].

In this project, a table tennis trainer is developed that can be controlled using an Android application. The types of shots and spins can be controlled by user during the training sessions by customizing the setting of the trainer.

1.2 Problem Statement

Table tennis coaching organization must set goal to get player perform well and maintain the consistent level in the tournaments. An athlete ability to adapt the method of opponents way of playing and win the matches can be improved by simulated training method and simulated method is an easier way to apply specific techniques and tactics[3].

In order to become professional athletes in table tennis, players need to have high discipline level in terms following coaching provided by trainer. The trainers have inconsistency in producing one type of stroke multiple times for the athletes is a main reason to have much more competitive and challenging method are needed for training[4].

Table tennis trainer face with a challenge to produce one type of stroke multiple time become main reason for much more competitive and challenging training for the athletes[4]. In table tennis, technique and skills plays important roles for an athlete to become an elite player in the competition [5].

In order to improve the table tennis training system, automated table tennis system which able to serve ball in variety of spin type and direction required. The system which allows user to control the launcher using an Android Application is required to ensure more effective training system.

1.3 Objective

Based on the problem statement above, it is cleared that the objectives of the projects are:

I. To develop an Android application that able to control the table tennis launcher.

I. To develop a launcher that able to shoot the balls in different spins types from a fixed position.

II. To analysis the performance of the table tennis trainer.

1.4 Scope of Work

The scopes of work for the project include the following areas:

I. Launch the table tennis balls in four different types of spin which is right spin, left spin, top spin and bottom spin.

II. An Android application is developed by using MIT Application Inventor 2.0 Android developer.

II. Code the microcontroller to communicate with the Android Application using Bluetooth module

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The idea behind this chapter is to offer present knowledge and important findings as well concept and outcome related to same field of table tennis trainer project. Furthermore, theoretical and methodological improvement to the previous research in the table tennis trainer is analysed. Based on the project, ball launching system and trainer controlling system are related to this chapter.

2.2 Table Tennis Background

Table tennis was invented in the late 1880s to imitate lawn tennis by developing indoor version that can be played during the winter season. The rackets with velum stretched over an extended casing attached with handle was used to hit balls made of cork or rubber. Poor quality of balls lead to quick death of the game and with advancement of the celluloid ball in the later years made the game to revive again.

Major sports institutes such as J. Jacques, Son, England and Parker Brothers, United Stated are the earliest organization that held table tennis tournaments successfully in the early days. Representative of the Table Tennis Association of Austria, England, German and Hungry held meeting and International Table Tennis Federation (ITTF) was formed. Tournament held in London, England in December 1926 was also labelled as the first World Championship.

Basic rules of the table are similar to both amateurs and professionals players. One table tennis game was played up to 21 points until the year 2001 but to make the game more thrilling the rules of the table tennis has been updated and the game is played up to 11 points. The winner is decided based on the player or the pair who first scores 11 points. In case both players or pair score 10 points then its called deuce and the game is won by side who gain two point lead over the opponent team. These rules are analysed yearly by the ITTF.

Table tennis took a leap forward with the invention of the rubber racket in the 1930s. This type of racket has a layer of rubber with short, hard pimples that cover the wood blade and players could apply moderate amount of spin to the ball, and spin strokes refined[5].

2.2.1 Basic Equipment

2.2.1.1 Ball

International rules have been established that game is played with spherical shape with the radius of 2cm and the average mass of ball is 2.7 gram. The rules also clarify that the ball should have a restitution coefficient of 0.89 to 0.92 which shows when a ball drop onto a standard steel surface from height of 30.5cm , the ball need to bounce up to an height of 24-26 cm. From the year 2015, celluloid plastic was chosen as material for the ball and coated white or orange with matte finish. The ball colour used for a game is decided based on the table color and its environment to make the ball visible for players. Number of stars printed in ball determines the quality of ball which means the higher the number stars the higher the quality. Since this is not a standardized across the manufactures, the balls utilized in the official competition are depends on

ITTF approval which can be seen printed on the ball[1]. Example of table tennis ball with 3 star rating is shown in Figure 2.1.

Figure 2.1: Table tennis Ball with 3 star rating [6]

2.2.2.2 Table and Net

The length of the table is 274cm and width is 152.5cm with the 76cm from the floor surface. Table tops are made from highly compressed particle board and finished with a number of coats of special paint. If a ball is dropped from the height of 30cm the table must yield uniform bounce of 23cm[7]. The tables have a line representing the side and end lines as well as the center line.