UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SHUTTLECOCK LAUNCHER WITH DUAL MODE TRAJECTORY SYSTEM FOR BADMINTON TRAINING PURPOSE

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

by

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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:

Signature: …….

Supervisor : MOHAMMAD HANIFF BIN HARUN

ABSTRAK

Pembangunan pelancar bulu tangkis dengan sistem dwi cara trajektori untuk latihan badminton direka untuk membantu pemain dan jurulatih bagi sesi latihan mereka. Pelancar bulu tangkis dengan sistem dwi cara ini terbahagi kepada tiga bahagian penting iaitu pelancar, penyuap, dan sistem pengawal. Dengan pelancar bulu tangkis ini, terdapat beberapa jenis pukulan yang boleh dilakukan oleh pelancar seperti pukulan lob, pukulan jarak dekat, dan pukulan jarak jauh. Manakala, penyuap pula direka untuk menyimpan ataupun menampung 10 bulu tangkis dan boleh mengagihkan satu persatu kepada pelancar. Bagi sistem kawalan pula, kawalan mikro Arduino Uno digunakan untuk kawalan pada motor A.T dan kawalan motor servo. Pengawal mikro Arduino Uno boleh diprogramkan dengan menggunakan pengisian Arduino. Akhir sekali, bahagian mekanikal dan bahagian pengisian program akan digabungkan sekali untuk membentuk pelancar bulu tangkis dengan dwi cara trajektori. Pelancar bulu tangkis ini akan diuji terlebih dahulu trajektorinya untuk mengetahui tahap keberkesanan dan kecekapannya.

ABSTRACT

The development of the shuttlecock launcher with dual mode trajectory system are designed for helping badminton's players and coach to their session training. The shuttlecock launcher with dual mode trajectory system have three main part which is the launcher, the feeder and the controller. With this the shuttlecock launcher, there have several type of shot that can be make such as lob shot, short shot and long shot. Meanwhile, the feeder is designed to store or hold 10 shuttlecock in a time and can separate the shuttlecock to the launcher one by one with sequence. For the controller system, the Arduino Uno is being used to control the DC motor and the servo motor. The microcontroller Arduino Uno can be programmed by using Arduino software. Lastly, the mechanical part and the software will be combined together to develop the shuttlecock launcher dual mode trajectory system. The trajectory of the shuttlecock launcher need to be test first to investigate the reliability and performance of the shuttlecock launcher.

DEDICATION

To my beloved parents, Ispar Bin Baronawi and to my mother Fuziah Binti Sairan, I acknowledge my sincere gratitude to them for their love, support value and the sacrifice throughout my life. Their sacrifice had inspired me since when I was born until I have become now. I never dream that I would go as this far in my life, but their spirit and determination has inspired me to do so. I cannot find the appropriate words to describe my truly appreciation for their devotion, support and faith in my ability to archive my own dreams.

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LIST OF ABBREVIATIONS

DC - Direct Current
PWM - Pulse Width Modulation
CPU - Central Processing Unit
RAM - Random Access Memory
ROM - Read Only Memory
PIC - Peripheral Integrated Circuit
SPI - Serial Protocols Interface
LED - Light Emitting Diode
USB - Personal Computer
ICSP - In-Circuit Serial Programming
AC - Alternate Current
RISC - Reduced Instruction Set Computing

CHAPTER 1

INTRODUCTION

1.1 Introduction

In 18 centuries, Republic of India has a game that was competed at which period and it was called “Poona”. When the British Army come to India in 1860s, they adopted this game and took the game back to their country, England. In Gloucestershire, the Duke of Beaufort at his estate, Badminton make this game success and after that the name was change to Badminton.

Now, badminton is the one of the top famous sport in the world and has been dominated especially in Asia although this game initiated in England. There have governs international badminton called Badminton World Federation (BWF) joined by many countries around the world including Malaysia and the top athlete in Malaysia, Datuk Lee Chong Wei has been holding the first-place ranking in WBF also make our country one of the lists of the winner of badminton history.

In this era of the technology, we can see that all the player of badminton will train by their coach. It is good to get the knowledge and the good practices that will give from their coach. For example, the coach need to throw the shuttlecock again and again at which spot is the weakness of the athlete. This repetitive work should be replaced to the technology like a robot to make the coach easier to train their athlete. So, we need to have or create machine or robot to help athlete training without using coach energy and also can make athlete practice or training by their self. This problem can be counter by

my project which is focused on player self-training and also assist the coach during train their athlete.

The machine or robot that needs to replace with the coach activity is a shuttlecock launcher. The projection system of the shuttlecock launcher will have two modes. The first mode is automatic projection system that will set a few direction and angles of the shuttlecock to be launch to the air. There are several shots that would be project by the shuttlecock launcher such as short shot and lob shot. For the second mode is the manual mode that the user needs to calibrate or adjust by their self which direction and angle they want to launch the shuttlecock. This dual mode shuttlecock launcher will assist the couch or help the users from use energy of other human during training and make the athlete can train by their self.

1.2 Background

The human ability is limited. Human cannot do repetitive work for a long time. Such a coach as a trainer of the badminton's athlete, it can be a problem to throw the shuttlecock with consistent, accurate and efficient during training session because it takes a long time to end the training. For the other hand, the shuttlecock launcher in the market is high cost and limited so that the potential of the beginner to buy this machine is lesser.

Moreover, the size is big and not mobility so that because it is hard to user brings the launcher by using vehicle such as car or motorcycle. The user needs to dissemble the shuttlecock launcher and it will cost some time to do it. The other hand, the coach not free all the time. So, the athletes need to train by their self without the coach. To get the same way as the coach train, the shuttlecock launcher is the solution. The athlete can do the training without any curious as what he has be done.

In this era of the technology, we need to implement the technology to something that will help us and make it easier than before. For example, baseball sport is the one of the immerse game that the athlete need to hit the ball to the air as far as the athlete can. The technology that implement to this sport is a pitcher was replaced by the ball launcher. This is because the hitter needs to get the ball throw with consistent. This situation same as the athlete badminton, which is they need to get the shuttlecock to be throw with consistent. Since the badminton sport have no technology that be apply, the shuttlecock launcher is the suitable to replace the coach from throw the shuttlecock repeatedly.

1.3 Description of Prototype

- Shuttlecock Launcher

There have two rollers with some gap in the middle that are attach to the servo motor with high speed rotation for trajectory purpose.

- Control Circuit

The used of this control circuit is to control the degree of rotation and elevation of the body and to control the speed of the roller for trajectory. The cause for control is to make sure the shuttlecock launcher can be launch same as the lob shot, short shot and long shot

- Shuttlecock Feeder

Can store 6 or more of shuttlecock in a cylinder container for feeding process to go to the next system.

1.4 Objective

The shuttlecock launcher machine is kind of technology that can be categorize in new technology. All the company such as Siboasi trainer, Baddy, and knight trainer produce the shuttlecock launcher and market it with the high cost that can reach about thousand dollars per unit. It very expensive to buy it especially for the beginners that wants to train by their self. Other than that, many of the shuttlecock design in spec of size is bigger and not mobility. It will be a hard to assemble and dissemble the shuttlecock launcher to bring it anywhere and cost a time to resemble. Moreover, our country is the country that only imports the technology from the outside. Since the shuttlecock launcher is new, it can be one of the technologies that can be a role model to our country to produce our own brand and compete all the other country. By developing this project, the functionality of the product should be increase and the cost of the product can be reduced. For this project, there are four objectives that need to be achieved. The objective of this project is:

- To design a portable shuttlecock launcher that can lift it and move it with ease by a person.
- To design a shuttlecock launcher that can be launch the shuttlecock with the variance area.
- To design a programming for the automatic trajectory system and reduce the maintenance and also the cost of material use.

1.5 Scope

There have several guidelines that are propose to make sure the project will reach the objectives. These are the scopes for this project:

- Design a control circuit for the rotation, levitation and launcher motor by using PWM circuit and ARDUINO UNO circuit to control the speed of the motor with each purpose.

- Design a programming language for automatic mode by using ARDUINO software to control the speed of the motor.

- Build the body or platform with trajectory angle by using stepper motor or servo motor to make sure all the variance angle can be achieved.

- Build a shuttlecock holder and feeder that can store six shuttlecocks or more and launch it with the sequence.

1.6 Project Outline

The layout and structure of the project:

Chapter 1 - Introduction: This chapter briefly describes about the introduction which covers the objectives, scopes of the project and the problem statements.

Chapter 2 - Literature Review: This chapter wills explains what research have been and also the result of the previous researchers about the shuttlecock launcher with dual mode trajectory system. It is also containing many information which a guideline for developing this project.

Chapter 3 - Methodology: This chapter describes about the method that will be used for developing for this project and explains the details about it.

Chapter 4 - Expectation Result: This chapter will give expectation result of the movement of the shuttlecock launcher with dual mode trajectory system.

Chapter 5 - Conclusion and Recommendation: This chapter will conclude the entire project and future recommendation that can be used for future project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The previous article, journal and all the information or ideas that can be related to build the shuttlecock launcher with or without dual mode trajectory system will be discuss on this chapter. There have some importance things for making this project such as the study or research about the feeder of the shuttlecock, the launcher, the controller, the workspace and the flight trajectory of the shuttlecock. From this chapter, the knowledge about all the previous journal and article is the main objective to obtain as much as possible the ideas and give some overview to the reader of the source that have been discovered.

2.2 Badminton Theory

Badminton is the one of the sport in the world that are famous and popular games until now. The popularity of the sport is so huge that over 160 countries have joined the Badminton World Federation. (Nakagawa, Kenichi; Hasegawa, Hiroaki; Murakami, Masahide; Obayashi, Shigeru; 2012). Badminton have two catogeries which are single games and double games. For single game, it will be played by two player fight each other while for double games, there are two type which are the same gender or mix that will played with four players. This sport very popular because of the way of the player play the game such as tectical, skills and psycological. 10% of normal heart rate will climb up easyly while playing the badminton and it is the one of the cause of why the badminton