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An Improved Portable Shuttlecock Launcher for Training Purposes

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ABSTRACT
In this paper a wireless shuttlecock launcher system is designed and fabricated to help badminton athlete and coach improve their training session. The shuttlecock launcher system have three main parts which are the automated shuttlecock launcher, switching from short shot and long shot type of training can be made effortlessly. The feeder is designed to store a minimum of 10 shuttlecocks at a time, and it can feed individual shuttlecock into the launcher in sequence. The wireless controller system consists of an Arduino Uno and an ESP32 module that controls the shuttlecock launcher wirelessly. The Uno's main task is to control the servo motors, while the ESP32 module is used to communicate wirelessly with the Blynk smartphone app. The Blynk app will generate a trigger signal for the shuttlecock launcher. Both microcontrollers the Arduino Uno and the ESP32 module is programmed using Arduino IDE. The hardware actuators combined with the software instructions help realize the shuttlecock launcher with wireless control system. Note that the trajectory of the shuttlecock launcher needs to be calibrated first in order to guarantee a high level of reliability and performance of the shuttlecock launcher.

Key words : Shuttlecock launcher, Shuttlecock trajectory, Wireless control system.

1. INTRODUCTION

Nowadays badminton players will usually train with professional coaches in order to improve themselves as a coach's knowledge and practice are very crucial in helping the player be better at the game. A shuttlecock being thrown again and again at an athlete's weak spot is one of the more usual type of training. There is a problem with this approach, as the shuttlecock is usually thrown manually by the coach, hence the coach have to concentrate his energy on throwing shuttlecocks and this means less time is spent analysing the athlete's gameplay.

A badminton trainer robot should be invented so that coaches can concentrate on training their athlete and away from focusing their energy on this kind of repetitive motion. Athletes can then do self-training with the help of this robot and coaches can focus on more important parts of the training. A shuttlecock launcher prototype can also help replicate the coach's repetitive training activity. Shuttlecock drop coordinate selection shall be made available to the shuttlecock launcher's projection system. A badminton court zones can be displayed and this will allow the coach to select the coordinate and direction of the shuttlecock to be launched to. Wireless communication system ensures smooth exchange of data between coordinate selection trajectory software and the remote shuttlecock launcher prototype. Start delay mode can be an added feature so that the prototype can be operated by the player without the coach's presence. This battery-operated and wireless-controlled shuttlecock launcher will be capable of assisting players during training session and will be a perfect stand-alone badminton buddy. A badminton coach will need a high level of consistency, accuracy and efficiency in throwing the shuttlecocks during training, hence training manually means so much time will be wasted when initiating each shuttlecock throw, and this can possibly lengthen the training duration more than it needs to. The proposed solution is a wireless controlled shuttlecock launcher which is capable of duplicating the coach's repetitive training effectively.

2. LITERATURE REVIEW

At the moment Badminton is considered as one of the utmost popular games in the World. Contemporary Technology can be employed for developing a shuttlecock throwing machine with varied speed, swing, and spin for the advantage of the practicing. The Shuttlecock Launcher affords consistent and accurate badminton training for players of all levels without the necessity of a trainer [1]. It will be very useful at school, club, and junior level where the standards of badminton training are less consistent. From the observation of the badminton team players, it was established that they were struggling at the practice sessions and consequently at their main matches, all because of lack of practice with consistent badminton training style. Regarding to badminton training robot, there are other researchers who focus on other sports such as bowling [2], volleyball [3], baseball [4], table tennis [5] and soccer [6]. All of these focus on developing new training method for sports in order to improve players using standard training. Not only that, there are many types of autonomous robot being developed and all of it being accessed thoroughly to make it a better robot. There are some of the researchers focused on autonomous robot other than using it in sports such as cleaning robot [7], rescue robot [8], underwater robot [9], vacuum robot [10] and many more. Related past articles regarding the birdie launcher for shuttlecock, racquet swing launcher, impact launcher mechanism, and roller type launcher was further elaborated and explored in this segment.

2.1 Birdie Launcher

A prototype birdie launcher was made by [11], utilizing a leaf blower to power up its launcher. The leaf blower uses compressed air to launch the shuttlecock through the guiding tube and into the air. The birdie launcher is also equipped with opening and closing plates to separate the launcher from the shuttle feeder.

The researchers discovered that their design had one major flaw, a lot of airflow is wasted as it escaped between the plates during the air compression. As a result, the shuttlecock's launch distance did not reach an adequate target goal as the air speed is very low. By using a leaf blower, another flaw of this design is that the birdie launcher is very noisy and it can affect players’ concentration during training. Figure 1 (a) shows the discussed birdie launcher prototype.

2.2Racquet Swing Launcher

The racket swing launcher [12] is very different from the birdie launcher. The racquet swing launcher will start throwing the shuttlecock to the player by using a racquet swing movement. As soon as the feeder drops a shuttlecock, a racket attached to a high-speed DC motor will swing with full power and hit the shuttlecock, launching it into the air. Result show that this shuttlecock launcher can only make one type of shot which is the lob shot utilizing the high speed of the DC motor and the full power of the swing racquet.

Some flaws were discovered by using this type of mechanism. The consistency of dropping the shuttlecock is found to be very low. The racquet swing launcher also takes time to return to its initial position and is not suitable for training as it gives long delays before initiating another shuttlecock drop. The minimum distance recorded for the launched shuttlecock is 664 cm while the maximum distance is 750 cm. Figure 1 (b) shows the racquet swing launcher.

2.3The Dual Roller

Researchers [13] found that professional badminton players can hit a shuttlecock until reaching a top speed of up to 300 km/h. To replicate this speed, the dual roller launcher type is introduced, using an AC motor to turn the rollers into the outer diameter within the rubber. The rubber roller's function is to grip the shuttlecock and reduce the damage done by the roller to the shuttlecock's cork, and with this gripper the shuttlecock will be in a slippery launch to the air. As the dual roller is attached to the AC motor, the shuttlecock's velocity can be adjusted by controlling the AC motor speed via the Arduino Uno circuit, thus affecting the shuttlecock's trajectory. Figure 1 (c) shows the dual roller launcher.

2.4The Feeder

The feeder ensures each individual shuttlecock drops sequentially to the launcher. The feeder mechanism is very popular in other sports feeder machines to launch the ball towards the player such as tennis ball feeder, baseball feeder, lacrosse ball feeder, and sepaktakraw feeder. These feeders will only launch spherical balls, so it will be a challenge to imitate this mechanism to launch shuttlecocks because of the cone shape as well as the feathers. Some different mechanisms of feeders are examined and summarized below.

A. Tennis Ball Feeder

Tennis ball launcher operation is very simple, the balls are placed in a cage that can hold around 150 tennis balls at a time, and by using gravitational force the feeder will dispense one ball and it will fall to the feeder tube, causing the ball to move towards the launch mechanism [14]. The Hooper's top view is shown in Figure 1 (d).

B. Rotational Feeder

Rotational feeders are also simple mechanisms and may not be suitable for badminton training application. According to researchers [15], only a maximum of 6 shuttlecocks can be placed in the feeder at any given time. The heptagon shape has only 6 sections to put shuttlecocks in due to its design. Under the feeder, there will be a hole to drop the shuttlecock bringing it directly into the launcher. Because of this quantity limit, this is deemed unsuitable for training as players will waste time to refill the shuttlecocks back into the feeder after 6 shots and this will ultimately disturb the player's concentration. The rotational feeder shape is shown in Figure 1 (e).

2.5Summary

The proposed prototype of a shuttlecock launcher wireless system will use the dual roller type after referring to past researches as this can launch shuttlecocks consistently as compared to other methods. To control the operation of the hardware actuators, a wireless control method will be implemented. The shuttlecock trajectory launch angle must be accurately set so that the shuttlecock will shoot to the desired destination by adjusting the motor's rotation. A microcontroller is needed to manipulate the angle of variance to adjust the motor speed. Since Arduino is cheap and readily available, it will be used as the controller since the Arduino offers fast deployment and has better features than the traditional PIC. All hardware trigger operation is controlled by a wireless method via smartphone communication.

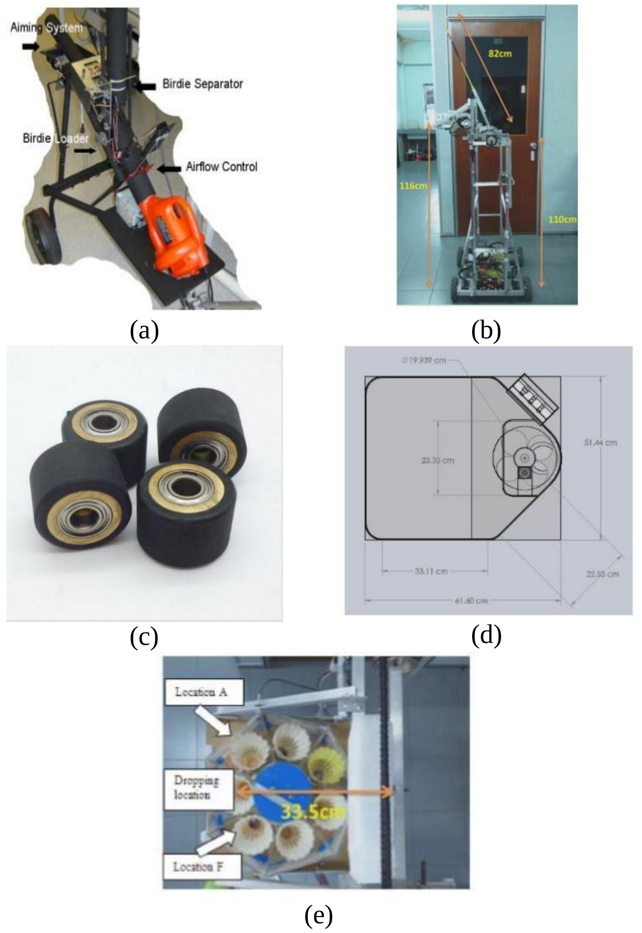


Figure 1: (a) The Birdie Launcher; (b) Racquet Swing Launcher; (c) The roller of the launcher; (d) The top view of the hopper; (e) The rotational feeder

3. METHODOLOGY

There are two important things that will be combined to develop the wireless-controlled shuttlecock launcher which are hardware mechanics and software. The hardware mechanics consists of the feeder, the launcher, the wireless-controlled microcontroller, and the prototype base. The software part consists of codes that will control movements such as the launcher elevation, the launcher rotation, and the launcher rotation speed. The code is developed by using Arduino IDE because Arduino is the microcontroller of choice.

3.1Mechanical Hardware Development

The component's functionality and specification will be discussed in this subtopic. For mechanical hardware development, there are four main components divided into two parts. DC brush motor, servo motor, Arduino microcontroller, and BTS 7960 module are listed for the component. For the launcher part, there is the shuttlecock launcher and feeder.

A. DC Brush Motor

To launch a shuttlecock to a great distance, it requires a motor with fast speed. Thus, the 24 Volts and 3.4 Amperes rated current DC brush motor is proposed to be used. With a specification of 0.125Nm torque, 52-watt output power and a maximum speed of about 5000 RPM without load, this is a good motor to be used for the launcher since the shuttlecock weight is about 5.2 grams. The respective DC brushless motor model is as shown in Figure 2 (a).

B. Servo Motor

The MG995 servo motor shall be used as the feeder separator movement as it uses 5V and 0.3A which is the same source for the Arduino. The specification for this servo motor is 0.32 Nm torque with a power output of 133 watts and this motor is about 95 mm long, weight 650 grams. Figure 2 (b) shows the DC servo motor.

C. Microcontroller Module

NodeMCU ESP32 is a low-cost Wi-Fi chip with a full stack TCP/IP capable microcontroller. Some of its characteristics are open-source, interactive, reprogrammable, low-cost, Wi-Fi enabled, and simple plug & play. Arduino Uno has 14 configurable digital input/output pins, 6 of which can be used as PWM output. This microcontroller is also equipped with a 16 MHz crystal oscillator, ISP header, power jack, USB connection and reset button to reset the entire circuit and programming. The input voltage recommendation is between 5V–7V and about 40mA DC current per I/O pin. Example diagram of the microcontrollers are shown in Figure 2 (c) and (d).

D. BTS 7960 Module

This module is a half-bridge motor controller that can determine clockwise or anti-clockwise motor rotation. The operating voltage is up to 24 volts and for maximum usage it can operate at a continuous current of 43 amps as shown in Figure 2 (e).

E. Development of Feeder

The feeder is an important part for sequentially launching the shuttlecocks. The feeder needs to release the shuttlecock one by one without interruption. A cylinder or tubular shaped case shall be used to store or hold the shuttlecocks. The shuttlecocks will be held horizontally, and this uses gravity to release the shuttlecock to the launcher as shown in Figure 2 (f).

F. Development of Trajectory Launcher

The launcher shall use the dual roller because of the low cost and the high efficiency rate. This dual roller is mounted on the 12V DC brush motor. The roller size is approximately 45 mm in radius and 7 mm thick. There is a 20 mm distance gap between two rollers to make the shuttlecock pass by frictional force between two rollers and the shuttlecock as shown in Figure 2 (f). The roller speed will be controlled by the programmed PWM circuit and Arduino microcontrollers.

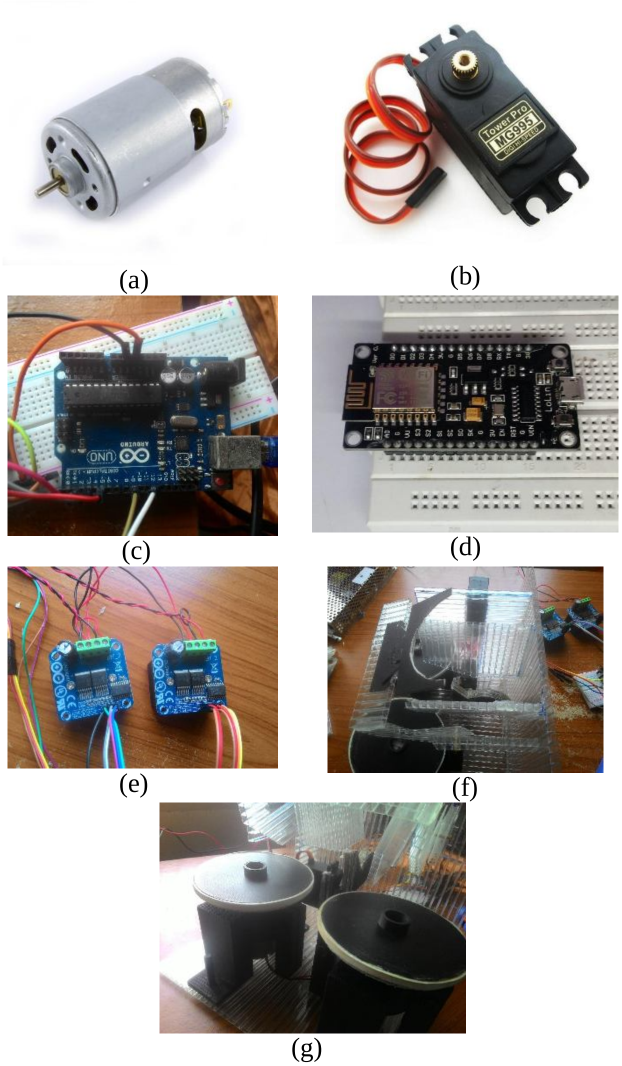


Figure 2: (a) DC brush motor; (b) DC servo motor; (c) Arduino Uno; (d) NodeMCU ESP32; (e) BTS 7960 module; (f) The Feeder; (g) The Launcher

3.2Software Development

The initial idea is then simulated using software, and once simulation is successful, the electrical circuit design is finalized. This is important to ensure that all the connection goes in the right direction. The following section describes the software used in this stage.

A. Arduino IDE Software

The C and C++ programming language is used by the Arduino based microcontrollers. The Arduino IDE is used in development as it is very easy to use and has a vast library of open source coding. Arduino IDE is downloaded from their website free of charge as shown in Figure 3.

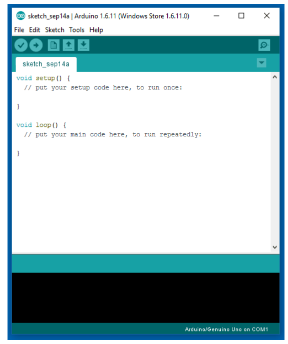


Figure 3: The Arduino IDE Software interface

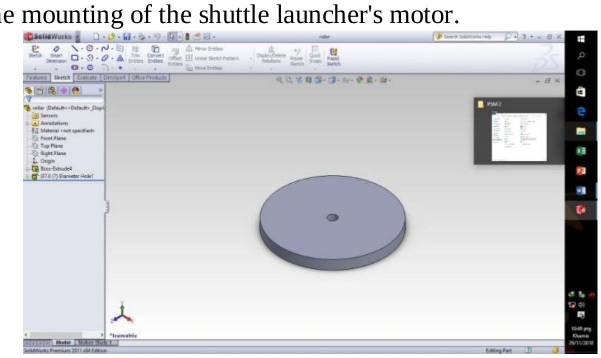
B. Smartphone App Development

One of the key criteria in this project is the smartphone app that will help control all hardware prototype operation. The app will communicate with the prototype wirelessly using Bluetooth and radio frequency. The benefit of using wireless communication is the device becomes truly portable and untethered to long wires. Since user can operate the prototype from a distance, the user will also not be harmed by any unwanted incident near the prototype during operation. App development will use the Blynk IOT Platform as illustrated in Figure 4 below.

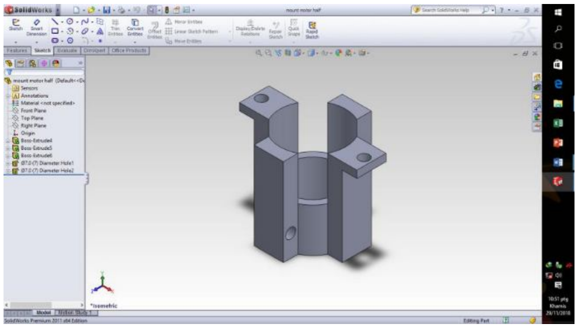
Figure 4: Example of Open Source Wireless Platform

C. Solidworks Software

Solidworks is a three-dimensional (3D) drawing software used to create prototype drawings and simulate the operations. Universities and industries alike have adopted this software as the main design software. Some parts of the project will be 3D-printed in which Solidworks software is used to create the design. Figures 5 (a) and (b) show the roller's 3D design and the mounting of the shuttle launcher's motor.



(a)



(b)

Figure 5: (a) The roller of the shuttlecock launcher; (b) The mount of the DC motor

3.3Final Prototype

The shuttlecock launcher with wireless control is completed by combining three major parts, which are the automatic shuttlecock feeder part, the dual roller disc trajectory launcher part and the wireless control circuit system part.

A. Automatic Shuttlecock Launcher

For the shuttlecock launcher system to act as a standalone badminton trainer, the automated feed plays an important role since the user will not have to always waste time reloading the shuttlecocks. A certain number of shuttlecocks can be readily stored at the designated shuttlecock feeder area. Two servo motor are used for the basic automatic feeder system to operate. The first servo motor will act as individual shuttlecock feed. The main function is to make sure that every time the system operates, only one shuttlecock will be fed into the main prototype. The second servo motor functions as the shuttlecock's temporary holder before sending the shuttlecock to the dual roller disc trajectory system as shown in Figure 6.

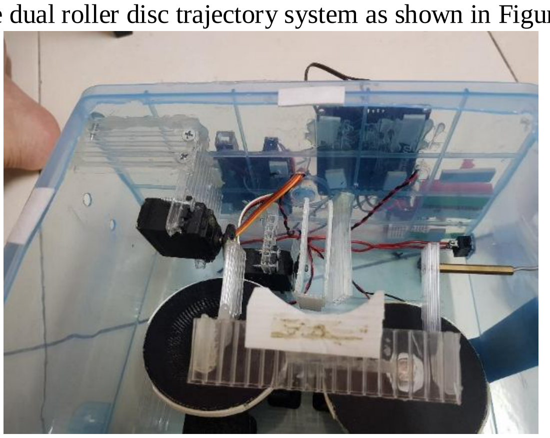


Figure 6: Automatic Feeder with Two Servo Motor

B. Dual Roller Disc Trajectory Launcher

The dual roller disc trajectory will accept the shuttlecock from the automatic feeder and launch the shuttlecock based on the preconfigured speed of both roller discs. Two DC motor is used to drive the roller disc in both clockwise and anti-clockwise direction. The speed and direction of DC motor will be controlled by a motor driver module that accepts PWM input value from the main controller board. By varying the speed of the DC motor, the depth of shuttlecock travel can be controlled; higher speed simply means that the shuttlecock will travel farther. By manipulating the difference of speed for each motor, the shuttlecock tends to travel in a certain angle offset from its origin straight line. This is due to the difference in force that is applied on the left and right side of the shuttlecock. By combining both the control of depth and manipulation of offset angle, a variety of shuttlecock trajectory destination is achieved as shown in Figure 7.

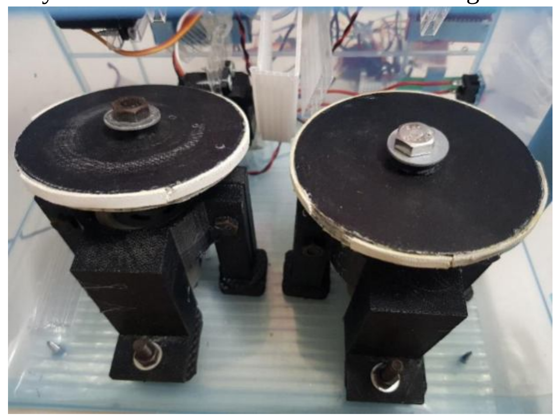


Figure 7: Dual Roller Disc Trajectory part

C. Dual Roller Disc Trajectory Launcher

The wireless control circuit and system is the most important part for the prototype as it will act as the main control component for the prototype, hence the circuit and system reliability must be prioritized. Bluetooth communication will be used by the system to communicate with the smartphone app. Two main controller boards were implemented for this prototype in order to achieve load balancing. The first board is an Arduino microcontroller which supports wireless communication for the purpose of communicating between the smartphones app and the prototype. The smartphone app will send whatever user-defined variable to the wireless microcontroller. The remaining boards will function as the prototype controller board where it will control the operation of servo motor at feeder part and the speed of DC motor for the launcher part. The second microcontroller will receive input signal from the first wireless capable microcontroller before it carries out required operation based on the given input signal as shown in Figure 8.

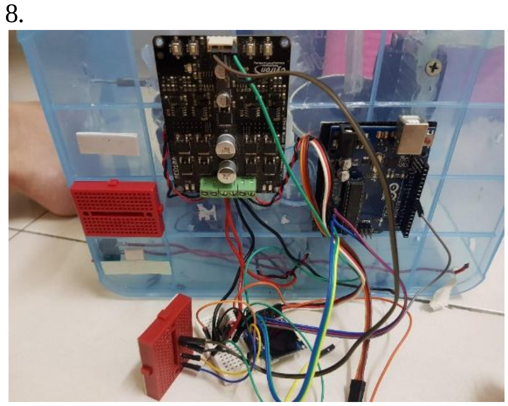


Figure 8: Part of Wireless Control Circuit and System

3.4Testing the Project

A flowchart is presented to illustrate processes involved in the execution of the prototype. Analysing the respective data involved can also enrich knowledge for improving the prototype in a future project study. Variances of the shots sequence will be tested during the project testing. Stability of the prototype hardware will also be observed. Figure 9 illustrates the project test flowchart.

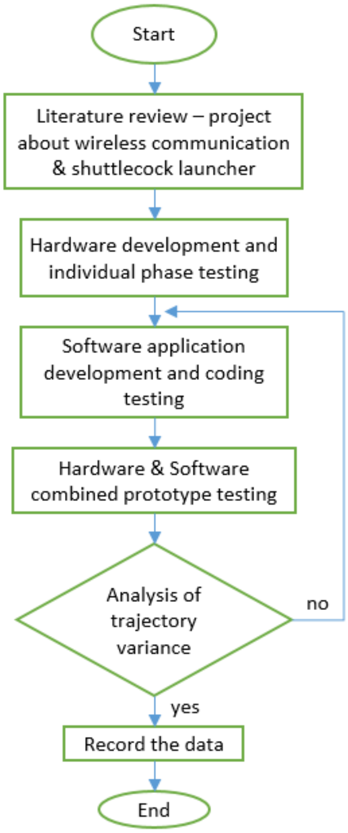


Figure 9: The flowchart of step to test the project

4. RESULT & DISCUSSION

Three experiments are conducted to analyse the performance of the developed wireless system and shuttlecock launcher. The first experiment is to test the distance of shuttlecock travel in regard of the dual roller speed to identify the speed of motor required to achieve different variance of shot such as long shot and short shot. The second experiment is to analyse the variance angle of the shuttlecock launched, so that the shuttlecock can land at different area of the court. Finally, the third experiment is to test the full operation of the wireless system integrated into the shuttlecock launcher.

4.1Shuttlecock Travelled Distance versus Dual Roller Speed

The speed of the dual roller discs is controlled by the motor driver module through the attached DC motor. Its main purpose is to launch the shuttlecock to the user's determined destination. By adjusting the speed of the DC motor, the distance travel of the launched shuttlecock can be controlled. The controller controls the speed of DC motor via PWM. The range of the PWM value generated by the controller is found to be between 0 to 255.

Table 1: Distance of shuttlecock travel vs dual roller speed

No. of Shuttlecock Trial	Voltage (V) / Duty cycle (%) / Speed (RPM)	Distance (m)
1	0.47V / 3.92% / 196rpm	2
2		3
3		2.7
	Average	2.57
4	0.71V / 5.88% / 294rpm	5.9
5		6.8
6		5.3
	Average	6
7	0.94V / 7.84% / 392rpm	7.2
8		6.7
9		7.5
	Average	7.13
10	1.18V / 9.8% / 490rpm	8.4
11		9.1
12		8.6
	Average	8.7

From the result recorded, it can be concluded that the relationship of distance travelled by the shuttlecock and the speed of dual roller discs is directly proportional. The higher the speed of the dual roller discs, the farther the travelled distance of the launched shuttlecock will be. Figure 10 illustrates this result.

Figure 10: The distance of the shuttlecock versus the speed of the motor

There are three trials for one speed as far as the chart is concerned. The difference between these three trends increases over time. The range of the shuttlecock that was projected is about two meters for the first shot with a speed of 196 rpm. After that, the second shot made 3 meters at the same speed and the shuttlecock landed at 2.7 meters for the last shot at the same speed. The first shot made the shuttlecock land at 5.9 meters for the next rate, which is 294 rpm, and the range for the second shot rises to 6.7 meters but for the last shot, which is the third shot, the distance falls to 5.3 meters. Next, the motor speed is changed to 392 rpm and the first shot makes the shuttlecock land at 7.2 meters which a distance increase of about 1.3 meters from the previous shot. For the second shot, the shuttlecock's range to land decreases marginally to 6.8 meters and for the third shot thus increases up to 7.5 meters. The last motor speed measured was 490 rpm and the shuttlecock could hit around 8.4 meters for the first shot. But the second shot will raise the range to 9.1 meters which is the farthest that the shuttlecock that can land for this speed and the third shot, the shuttlecock's distance decreases to 8.6 meters.

4.2Angle Variance of the Launched Shuttlecock

Angle variance means that the shuttlecock launcher must project the shuttlecocks at many different angles to establish the shot pattern such as long shot, short shot, right shot and left shot. There is no major part from the model that can be moved or rotated to such an angle to make a shot like the shuttle launcher's base. The shuttlecock launcher's base uses dual roller rotation to make an angle shot in the right or left horizontal direction. For example, if this shuttlecock launcher has to project shuttlecock to the left, the left motor speed needs to decrease the rotation per minute while the right motor stays the same while the right side needs to slow down the right motor and the left motor stays the same in speed. Table 2 shows both the launcher speed and the shuttlecock angle from the launcher. After landing, the angle of the shuttlecock can be described by following the equation for Trigonometric Ratios as below.

$$Sin\ \theta = \frac{opposite}{hypothenus};\ \theta = tetha\ (angle\ in\ degree) \quad (1)$$

Table 2: The angle variance of the shuttlecocks

No. of Shuttlecock Trial		Speed (rpm)		Angle of the shuttlecock from the shuttlecock launcher (degree)
Trial	No.	Left Motor	Right Motor	
First	1	392	196	16.26
	2			15.28
	3			18.06
			Average	16.67
Second	4	196	392	-14.33
	5			-18.17
	6			-16.59
			Average	-16.36
Third	7	490	294	20.63
	8			15.62
	9			17.43
			Average	17.89
Fourth	10	294	490	-19.52
	11			-21.63
	12			-17.06
			Average	-19.40

From the above result, all the shuttlecocks' angle from the shuttlecock launcher can be fully controlled. The negative value means the shuttlecock land on the shuttlecock launcher's left side, whereas the positive value means that the shuttlecock launched will land on the shuttlecock launcher's right side. The speed difference between both motors will influence the shuttlecock's travel course. This result can be categorized as having high precision for a badminton trainer.

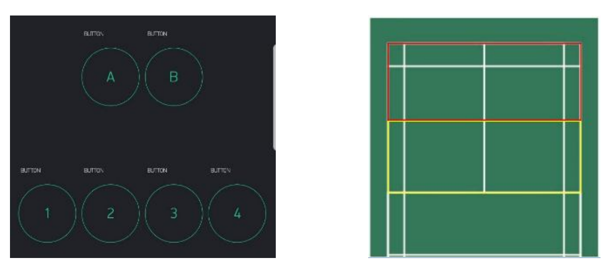
4.3Launch the Shuttlecock to the Desired Area with Wireless Control Sequence

Based on the previous experiments, by differentiating speed of both motors, different angle of shot can be made. To achieve a different training routine, the position of a launched shuttlecock with respect to Blynk trigger signal needs to be tested. By combining data recorded from experiment 2 and experiment 3, the shuttlecock travel path can be controlled. By adjusting the travelled distance and angle of projection, the shuttlecock can be launched to certain desired area of the court. The angle and travelled distance of the shuttlecock will be recorded as well as the regarding trigger signal given by the Blynk app. In order to achieve different training routines, some settings need to be adjusted in the Blynk app.

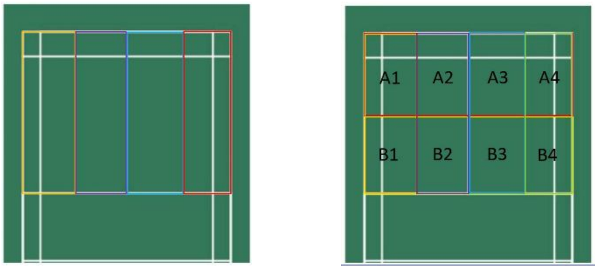
From Figure 11 (a), there are 6 buttons with two letters "A" and "B" and four numeric '1', '2', '3' and '4'. Buttons "A" and "B" is used to select mode. Mode is used to select the type of shot, either long shot or short shot. Based on the figure below, if mode "A" is selected, the type of shot will be a long shot. Which means the shuttlecock will land in the red box area. For mode "B", a short shot mode is selected as shown in Figure 11 (b). The shuttlecock will land inside the yellow box area. Both button "A" and button "B" is used to control the distance of shuttlecock travel as previously discussed in experiment 2.

For the four numeric number '1','2','3' and '4' button, these are used to control the angle variation of the shuttlecock launched as previously discussed in experiment 3. According to below figure, button '1' will result in the shuttlecock landing in the yellowish box area. For button'2', the selected angle for shuttlecock will result in the shuttlecock landing in the purple box area. Shuttlecock will land in the blue box area if button '3' is pressed. Lastly, button '4' is to launch the shuttlecock into the red box area as shown in Figure 11 (c).

For the prototype to fully operate with wireless control, both the above control method needs to be combined into one so that different training routines can be realized. After combining shuttlecock travel distance and angle variation, user can easily operate the shuttlecock launcher to project the shuttlecock into the desired area. Figure 11 (d) below shows the area of the desired shuttlecock projectile in regard with Blynk app commands sent.



(a) (b)



(c) (d)

Figure 11: (a) The user interface for Blynk Application; (b) Court display for long shot and short shot; (c) Court display for angle variation; (d) Court display for desired launching area

To test the reliability of the shuttlecock launcher in launching the shuttlecock to the desired area as selected by the user in Blynk app, 3 shuttlecock trials per each area is recorded. The results collected are as Table 3 below.

Table 3: The distance travel and projectile angle of shuttlecock using Blynk application

Mode	Angle Selection	Distance Travel (m)	Projectile Angle (Degree)
A	1	12.6	-12.2
		12.1	-11.1
		12.3	-11.7
	2	11.9	-3.1
		12.3	-4.9
		12.9	-4.2
	3	12.8	2.9
		13.0	4.8
		11.8	5.0
	4	13.1	11.5
		12.8	12.1
		11.9	11.3
B	1	10.6	-14.5
		11.1	-12.5
		9.9	-15.4
	2	9.5	-5.2
		8.9	-4.7
		10.3	-4.9
	3	9.7	3.1
		10.1	4.5
		10.5	5.4
	4	11.2	14.9
		10.7	16.0
		11.2	11.8

From the data collected, we can see that the shuttlecocks successfully landed in their determined area. We can say that the launched shuttlecock is highly accurate since all shuttlecocks landed in the set area, but the precision of the shuttlecock is low since the launcher cannot launch the shuttlecock to the same spot every time. This is due to slight motor vibrations disturbing the launch sequence when shuttlecock is pushed to the launcher. The movement that pushes the shuttlecock to the roller discs need to be improved further for the system to achieve greater precision. Nevertheless, the prototype is considered acceptable since the shuttlecocks still land in their respective area.

5. CONCLUSION

The objective of this project to develop a prototype launcher that can act as a standalone badminton trainer is achieved. The size of the shuttlecock launcher is around three meters cube and the total weight is around 1.5 kilogram as it is made of a mixture of wood, 3D printing materials, plastic materials and others. The prototype is quite light and can be moved around easily by the user. With the battery and wireless system integrated, this system is an all in one badminton trainer. The shuttlecock launcher can be controlled by using Blynk smartphone app with dual roller speed manipulation function. The system is tested in its ability in operating variation of the training routine. Experiment results show that the prototype is capable of launching shuttlecocks to different desired areas of the court. Nevertheless, there are still room for improvements for this prototype shuttlecock launcher. For example, the smartphone app can be upgraded to a more customizable platform. Platforms like the MIT App Inventor is more suitable compared to Blynk platform in its easiness to develop the app. By adding a 3d image sensor to the shuttlecock launcher can also boost up the project to another level. The sensor will enable the system to count the quantity of shuttlecocks launched and shuttlecocks returned by the player in real time. Monitoring of performance can be achieved effortlessly by using this method. The last recommendation is by adding a battery indicator so that the user can be alerted whenever the system's battery is detected to be low so that the system can be recharged.

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