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Edutainment Drone

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Abstract : Edutainment drone is a project where learning can be entertaining, especially for the beginner. The basic understanding of physics concepts of momentum, work, kinetic and potential energy, power, and Newton's principles of motion all help understand how drones' function. This project has few objectives to be achieved. The first is to ensure that students better understand the concept of learning and the fun of drones. Also, students can learn how the drone gets to fly at a certain height and fly as want without any problem. The drone movement can be controlled by adjusting the variable resistor. It can move up, down or tilt right or left, but there is a limit. The drone movement will move based on the pole. Students can measure how fast each motor can rotate based on LCD to make drone positions such as hover, move or down and tilt right or left.

Keywords: Edutainment tool, Basic drone flight, Drone as a learning tool

1. Introduction

Transportation has become extremely vital in our life [1]. People use transportation to go to other places whether the distance of the places is near or far away. In 1903, the Wright Brothers plane at Kitty Hawk had sparked the rise of air transportation. After a decade, the world's first scheduled passenger flight flew across the water between Tampa and St. Petersburg, Florida. Nowadays, Air transportation has primarily dominated Transcontinental and intercontinental travel. The drone is also one of the air transportations. Drones are unmanned aircraft or ships that can be controlled from a distance. A drone is increasingly used around the world. Drones can be small-scale to fit in a palm or huge enough to transport vast amounts of freight or people, and they can be powered by batteries, solar panels, or gas.

Drones have many uses, such as photographic, commercial, and military. Despite that, there has only been a small amount of understanding of the concept of the drone by users. The true potential of a drone is not fully utilized by users [2]. The movement is based on basic's physics. One can fly a drone with little understanding of physics such as momentum, work, kinetic and potential energy. Drone movement can be described as hovering, climbing and forward motion [3]. These movements have a physics concept that can be learn to utilize drones fully. Edutainment drone projects that aim to ensure

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students understand these concepts. According to new research (Feist, 2021), beginners face few difficulties when flying a drone for the first time [4]. This mistake can be prevented by using Edutainment Drones. This will give early information before flying the drones.

The use of drones in education will benefit the education system itself [5]. The drone is an interactive device that gives deep understanding and can motivate Students in learning sciences, technology, engineering, and mathematics STEM concepts. The student also can build their drones by understanding the concept.

2. Materials and Methods

2.1 Materials

a) Arduino Uno
- Arduino Uno is an open-source microcontroller board that is equipped with output and input pins. Arduino Uno is responsible for the brain of our project that is connected to some other components such as motor drivers, LCD, potentiometer and breadboard.

b) Arduino (IDE)
- The actual writing in the system module uses the coding that had been constructed. Arduino IDE as a programming platform using a C++ language. The code is constructed thoroughly and is optimized for best execution for an excellent result outcome. Arduino will functional and send a signal to the LCD, and the LCD will show the results.

c) Motor driver (MDD3A)
- Two motor drivers, 3 Ampere, are used for this drone. Each motor driver able to support 3 Ampere per channel continuously. Each motor driver gets supply from a 3.7 Volt battery and will control 2 DC motors to move the fans.

d) 820 Coreless Motor
- The drone needs four motors for every four wings of drone. The motors that are used are lightweight, small, and robust motors. This motor can rotate clockwise or anti-clockwise. Since the motor is light and powerful, it is suitable for our drone since Styrofoam's body is made. Each motors speed will be controlled and adjusted by a potentiometer.

2.2 Methods

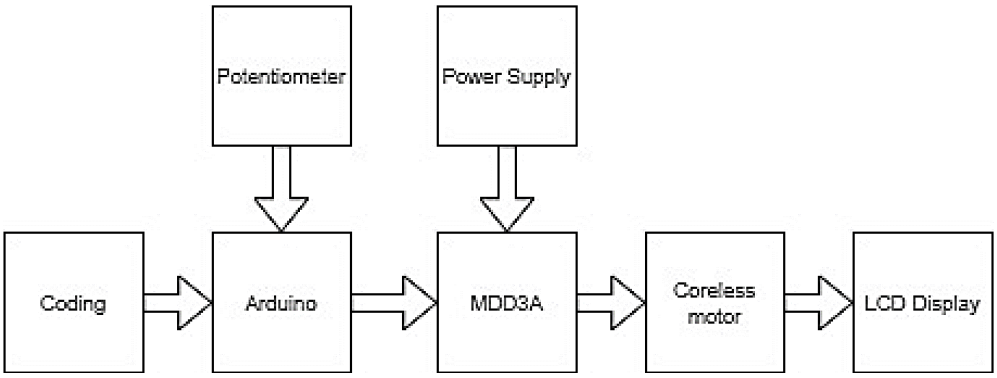

Figure 1: Block diagram of edutainment drone

Figure 1 is a block diagram of the proposed system used in this project. Based on the block diagram, the Arduino Uno functions as a microcontroller to control the entire circuit. In this system, the battery works as a power supply as an input to activate the system. There is a coreless motor, and LCD works as an output in the system.

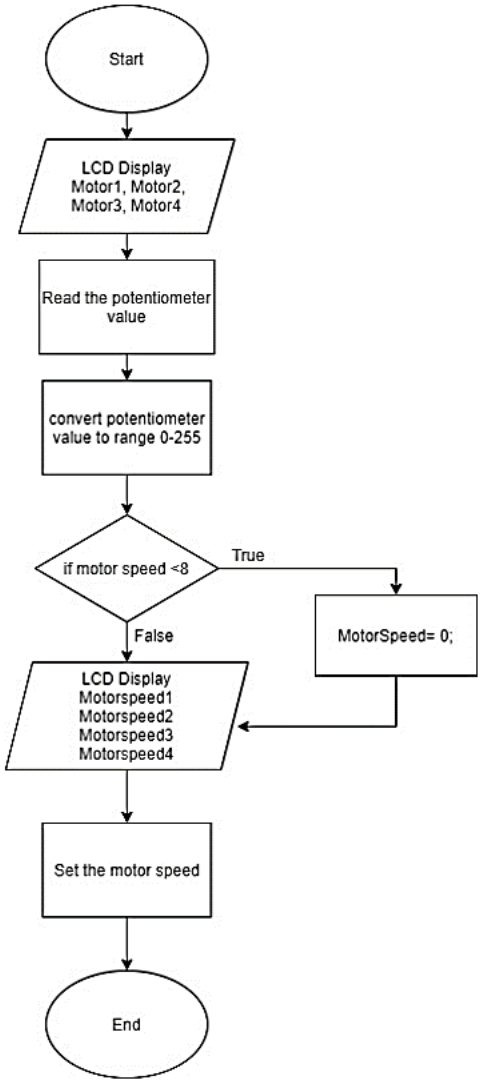

Figure 2: Flowchart of edutainment drone

The flowchart in **Figure 2** is presenting the flow of the process. First, the LCD will display the number of available motors. The range of the potentiometer will be read and adjusted to range 0-255, the Arduino will read the speed of the motor, and the LCD will work as an output to show the speed motor for each of their percentage. The potentiometer can adjust the motor speed, and the motor speed can check the LCD.

3. Results and Discussion

Table 1 shows that the testing has been taken one by one using a different percentage of power supply. For the column that drone achieve 50-centimeter height it has been taken when all 4-potential meter with a 100% of power supply. Then when the drone achieves 30 centimeter all the potential meter set with a 90 % of power supply. Lastly the drone with height 20centimeter has been taken when all potential meter at 80% of power supply. The height has been recorded using measuring tape from the blue base of drone until the height of drone achieve. So, we can conclude that 50 centimeter is a maximum of drone height. Then the drone height will decrease when the potentiometer was adjusted, which controls the power supply capacity. In conclusion, the basic concept to build a drone using angular momentum. Angular momentum in drones depends on how fast the rotors spin. The drones

build from 2 anti-clockwise motors and two clockwise motors— the example of motor location with this diagram.

Table 1: Motor speed (%) vs drone height

PERCENTAGE OF MOTOR	HIGH OF DRONE
100%	50cm
90%	30cm
80%	20cm

Table 2: Drone movement at 50 cm

PERCENTAGE %				POSITION
1	2	3	4	
85	100	85	100	Forward
100	85	100	85	Backwards
100	85	85	100	Right
85	100	100	85	Left

Table 3: Drone movement at 30 cm

PERCENTAGE %				POSITION
1	2	3	4	
78	90	78	90	Forward
90	78	90	78	Backwards
90	78	78	90	Right
78	90	90	78	Left

Table 4: Drone movement at 20 cm

PERCENTAGE %				POSITION
1	2	3	4	
71	80	71	80	Forward
80	71	80	71	Backwards
80	71	71	80	Right
71	80	80	71	Left

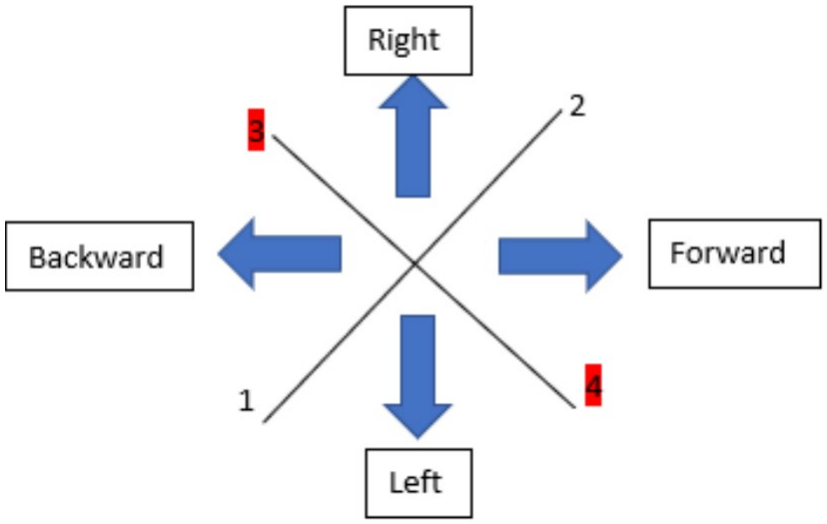

Figure 3: Drone direction

Based on the diagram as shown in **Figure 3**, the red motor Anti-clockwise labelled with numbers 3 and 4. While Black motor clockwise labelled with numbers 1 and 2. Based on angular momentum, the two opposite rotations balance out and keep the drone balanced. This can be proved with **Figure 4** and **5**.

Figure 4: Hovering position

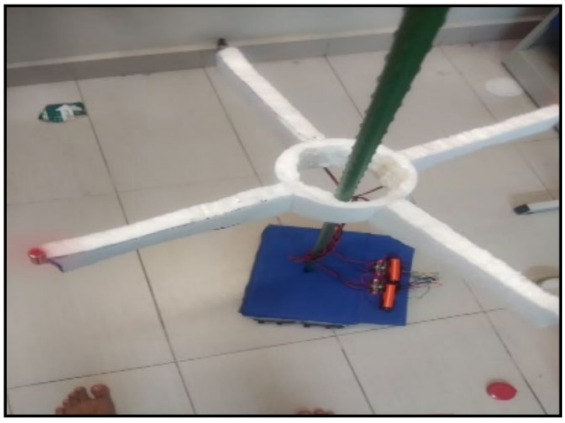

Figure 5: Top view of drone

If all motors with the same direction, either anti-clockwise or clockwise, the drone will completely keep rotating. The drone can be fly when the rotor of the motor spin together. It will push down the air and push back up the rotor. When the motor's rotor is slow down, the drone will slowly be landed on the ground. **Tables 2**, **3** and **4** obtained some drone movement, which is it can fly forward, backward, right, and left. To make some movement in the drone, slow down two motors on the other side and speed up another two motors on another side. It will slowly move in the specific direction and it can be proved in **Figure 6**.

Figure 6: Drone movement

The achieve analytical results:

- The drone can be fly using angular momentum to create stability. When using two different directions of the motor.
- Slower and faster, the rotor side can do any movement of the drone. It happens because of the motion principle.

4. Conclusion

Edutainment drone can visually prove to students the theory of physics learned in school. In a nutshell, edutainment drone is supposed to be interactive devices in learning at the school level. The school can use this to make a learning session more fun. This project is for essential learning of how the drone is functional, and this can be proved from the results. Speed of each fan can be control to get the desired fan speed, and this is to show whether the speed of each fan affects the movement and position of the drone to fly.

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