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Development of IoT Mini Studio for Photography Course MPU24021

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Abstract

Photography course referred as course code MPU24021 is a course offered for co-curriculum in Politeknik Ibrahim Sultan. MPU24021 were offered to semester 2 students who choose club for their co-curriculum. Students who take this course as their co-curriculum will learn on photography techniques and equipment used in photography. In this course, student from various background will be exposed to many types of photoshoot techniques including product shooting in a photography studio. Thus, the IoT Mini Studio is proposed as a portable mini photography studio use for teaching and learning purposes in Photography Course (MPU24021). This IoT Mini Studio uses mobile apps that work as the interface to control lighting brightness, lighting color and platform rotations. The RGB LED strip is used as the lighting source in the IoT Mini Studio which can vary the lighting brightness and colors to intensify the mood of the photographs with minimal editing effort. On the other hand, the platform uses a stepper motor that can rotate 360 degrees rotation with clockwise (CW) and counter-clockwise (CCW) direction. Furthermore, the products shooting from this IoT Mini Studio has proven to be able to produce photographs that are professional looking with suitable lighting colours and brightness as well as in producing a smooth 360 degrees angle of video shooting.

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Key-word: - Internet of Things, Mini Studio, Photography, RGB LED, Product Shooting

1. Introduction

Photography course referred as course code MPU24021 is a course offered for co-curriculum in Politeknik Ibrahim Sultan. MPU24021 were offered to semester 2 students who choose clubs for their co-curriculum. This course is open to all semester 2 students in Politeknik Ibrahim Sultan from all departments. Students who take this course as their co-curriculum will learn on photography techniques and equipment used in photography. In this course, student from various background will be exposed to many types of photoshoot techniques including product shooting in a photography studio.

A photography studio is a workspace for capturing and developing images. It can also accommodate photography training and ready-made photo displays. Studio photography is performed indoors, in a managed setting where the photographer has complete control over all the elements that go into creating a photograph. In studio photography, both placement and colour of the lighting are critical to achieve the desired look. Lighting needs can vary greatly, depending on the type of camera, the size and the type of subjects.

Photography in a studio offers you the useful feature you need for product shooting, video shooting and more. In a studio, users will have full control of the environment whereas outdoor photography are subjected to unpredictable weather and changing lighting. In order for the shooting session to be smooth and smart, the Internet of Things (IoT) is applied in the studio.

Internet of Things (IoT) is a system to connect one to another devices, mechanical and digital machines, objects or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human- to-computer interaction. In the face of this modern trend, the revolution in technology as developments in the information system have led to large and comprehensive changes in our daily lives such as learning and employment.

2. Problem Statement

The problem statement of this project are:

- i. Difficulties in finding suitable location with sufficient lighting for teaching and learning of Photography Course (MPU24021).
- ii. Product shooting often needs major editing to intensify the mood of the subject.
- iii. Product shooting by using manually rotating platform or manually panning camera is not practical and often result in unsmooth video.

3. Objective

The main objectives of this project are:

- i. To design a mini studio using Internet of Things (IoT) with automatically rotating platform and variable lighting brightness and colors for Photography Course MPU24021.
- ii. To develop a mobile Apps as the interface for controlling the platform rotation and the lighting brightness and color of IoT Mini Studio.

4. Methodology

This product development focuses on the hardware and user interface parts as depicted in the block diagram in Figure 1. The hardware output will follow the command by users in the application to trigger any adjustment needed for lighting and platform rotations. The project is design with platform which rotate using stepper motor and lighting source using RGB LED strip. The stepper motor and other component are place inside the platform to protect the component. For the lighting, RGB LED strip are used because it can provide more than 15 colors while the brightness of the lighting can be adjusted. Input voltage supply to IoT Mini Studio is 12V in direct current (DC). On the other hand, the IoT Mini Studio can be connected to the mobile apps via Bluetooth and all setting in the studio are controlled using IoT Mini Studio Mobile App.

In addition to the LEDs, one or more current limiting resistors is also necessary to ensure that the RGB LED strip does not go into overcurrent mode. The resistor is also placed in series with the LEDs, and its resistance value is calculated such that it will draw approximately 3 volts as well. So, 3 LEDs in series requires 9 volts for the LEDs and 3 volts for the resistor, bringing to 12 volts. Besides, component that used for platform rotation is bipolar stepper motor. The bipolar stepper motor with 1.8° step angle (200 steps/revolution). Each phase draws current 1A at 5V. By using bipolar stepper motor, the platform can be rotated in two direction which is clockwise and counter clockwise. For the interface part, the mobile app is designed by using MIT App Inventor web application. Users can adjust the lighting brightness, lighting colors and platform rotations using the IoT Mini Studio Mobile App during product shootings.

Hardware	Interface
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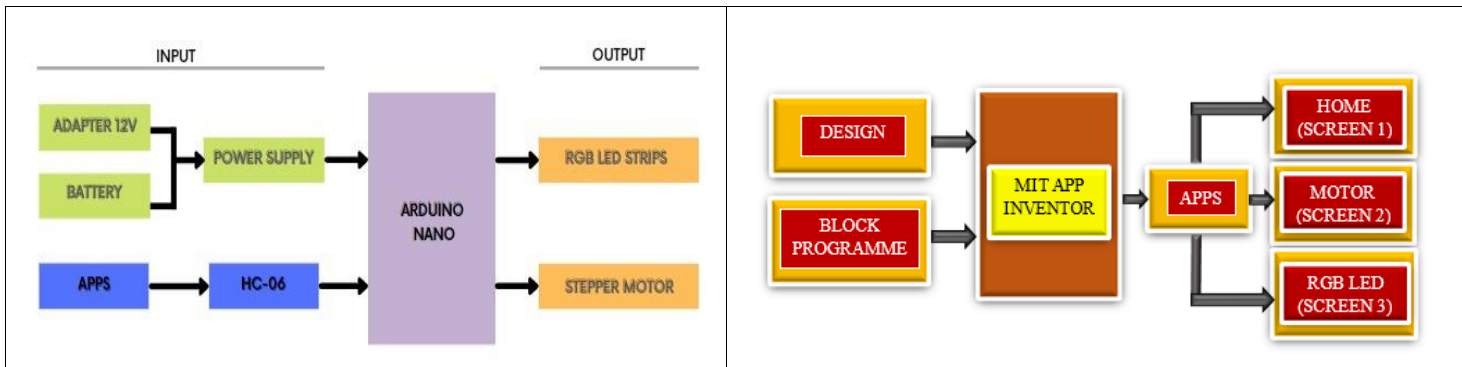


Figure 1 Block diagram of hardware and interface

Based on the flowchart in Figure 2, the lot Mini Studio begin with connect the IoT Mini Studio with mobile phone by using Bluetooth connection. Users can choose either motor rotation or lighting to get setup first. Open IoT Mini Studio Mobile App and begin the setting of platform rotation by choosing platform settings. Next, select the rotation angle from the rotation slider depends on situation in shooting session. After set the rotation angle, user can adjust the rotation speed and the rotation direction either in clockwise or counter clockwise. The platform starts the rotation.

For the lighting of IoT Mini Studio, process start by choosing the lighting color. IoT Mini Studio provide more than 15 colors of RGB LED strip. It can be changed depends on the creativity of users. On the next step, user can adjust the lighting brightness and the RGB LED strip will emit light. The lighting brightness can be in dim, medium and bright output.

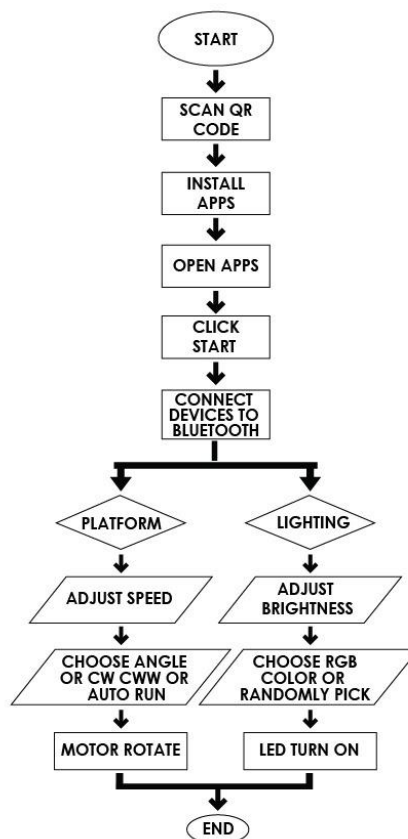


Figure 2 Flowchart of product

5. Result

The final product of IoT Mini Studio is shown in Figure 3. This mini studio was developed in dimension of 32cm x 32cm x 32cm. Experiment were carried out to check if the mobile apps were successfully integrated with the hardware when devices were connected via Bluetooth by the user. During the experiment, both the lighting and platform parts were tested. The result for 3 main screens in the user interface which are for home page, lighting and platform are shown in Figure 4.



Figure 3 Final product

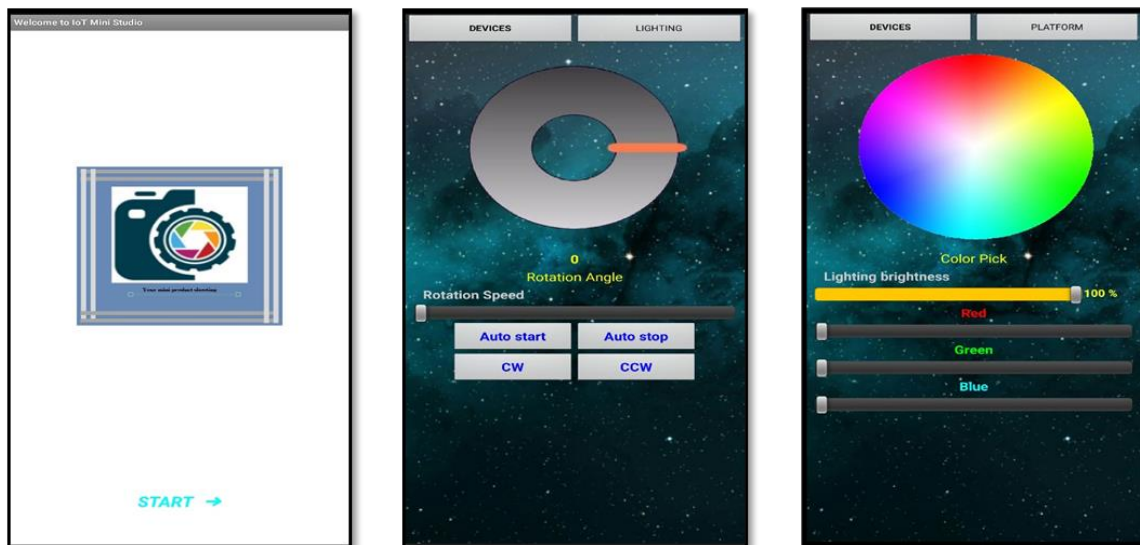


Figure 4 User interface for IoT Mini Studio mobile apps

Table 1 Platform rotation

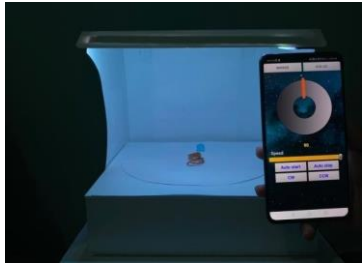
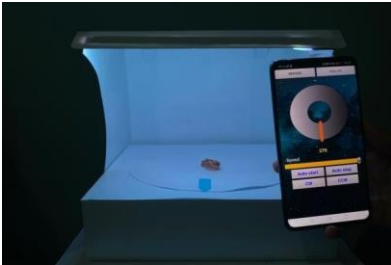
Angle	Platform rotation	Angle	Platform rotation
0°		180°	
90°		270°	

Table 2 Platform rotation speed

Input	Rotation Speed
0	Stop
25%	Slow
50%	Medium
100%	Fast

The platform has been tested to rotate in clockwise and counter clockwise direction with variable rotation speed. Table 1 shows result of 4 rotation angles selected which are 0°, 90°, 180°, and 270°. The platform rotate while the rotation speed can be adjusted resulting in different speed as shown in Table 2.

Table 3 Quick selection of lighting colour

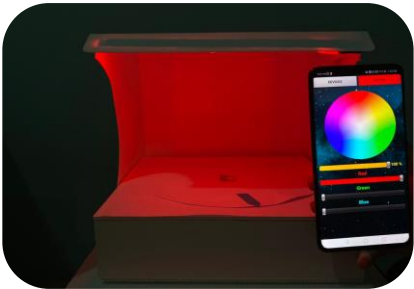
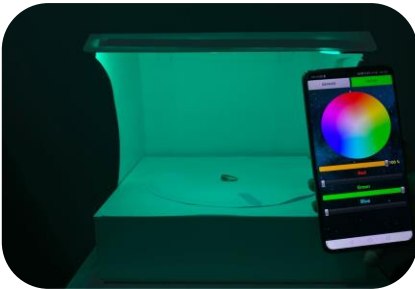
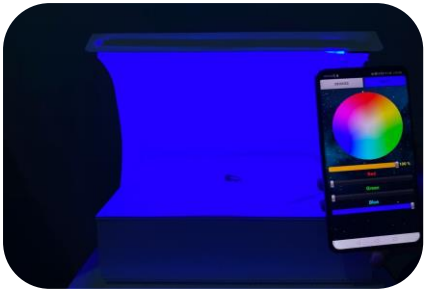
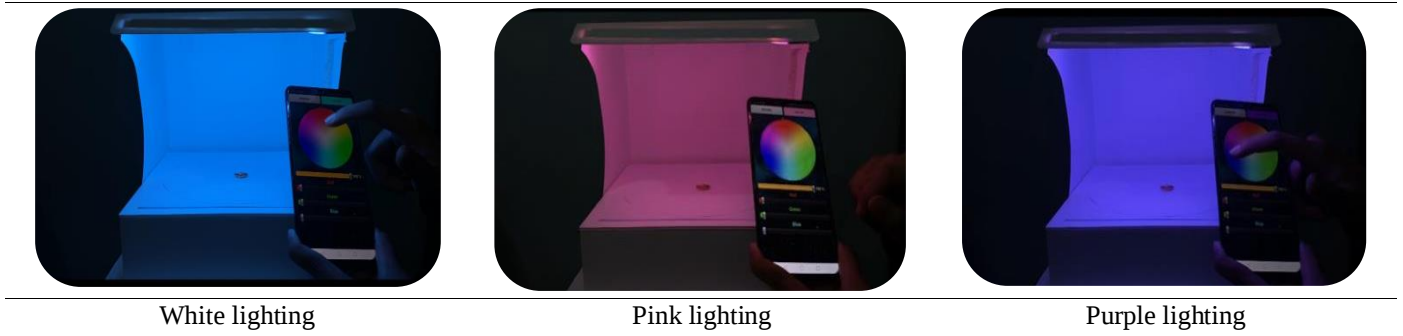
		
Red lighting	Green lighting	Blue lighting

Table 4 Random selection of lighting colour

**Table 5** Lighting brightness

Brightness level	RGB LED brightness
0%	Dim
50%	Medium
100%	Bright

The lighting in IoT Mini Studio has been tested for various colours and brightness. User can choose the lighting colours from quick selection provided which consist of three basic RGB LED colours as shown in Table 3. Meanwhile in Table 4, it shows the random colours selection which white, pink and purple lighting are chosen for the testing. Table 5 depict the lighting brightness that can be adjusted in IoT Mini Studio. Figure 5 shows the result of several product shooting that have been done by using all the functions available.

**Figure 5** Photoshoot outcomes using IoT Mini Studio

6. Conclusion

IoT Mini Studio have been successfully developed which are portable, easy to set up and can be fully controlled by a mobile application. Two main elements which are lightings and platform rotations will start working when received the command from user. This product perhaps will ease the teaching and learning process for Photography Course MPU24021. Furthermore, it can help students to have the experience of product photo shooting in a photography studio, hence improve their shooting outcomes. Indirectly, the IoT Mini Studio can minimize the editing process of a photograph since the lighting brightness and colors been adjusted during the photo shoot session.

References

- W. Staff, "LED Strip Light Internal Schematic and Voltage Information," Waveform Lighting, 16-Jan-2018. [Online]. Available: <https://www.waveformlighting.com/pcb-designs/led-strip-light-schematic-and-voltage-information>. [Accessed: 06-Apr-2020].
- Sarinastiti, Widi & Sukaridhoto, Sritrusta. (2015). The Development of Portable Mini- PhotoBot ver.02 for Small Medium Business.
- D. I. Y. Oracle, "360° Photography Turntable Controlled Via WiFi," Hackster.io, 01-Apr-2018.[Online].Available: <https://www.hackster.io/diy-oracle/360-photography-turntable-controlled-via-wifi-4665fe>. [Accessed: 08-Apr-2020].

Team, C. (2018. March 4). Automatic 360° Photography Turntable. Retrieved from <https://www.hackster.io/circuito-io-team/automatic-360-photography-turntable-586ble>