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**Unleashing Potentials
Shaping the Future**

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IoT Based-AUTOMATIC ROOM LIGHTING SYSTEM (ARoLS)

INTRODUCTION

Sustainable development includes using electricity efficiently as per UN SDG goal 7 target; ensure access to affordable, reliable, sustainable, and modern energy for all. This research presents the development of an Automatic room light controller system via the Internet of Things (IoT). The purpose of this research is to detect the person entering the room and to save the power wasted when the light is left ON, even in the absence of human. This research uses NodeMCU as the main microcontroller with built-in a WiFi module. Ultrasonic sensor detects person entering and exiting the room while LDR (light detector resistor) senses the lightness of surroundings.

ISSUES/ PROBLEM STATEMENT

Most of the people often forget to turn OFF the light when leaving a room. This action is causing waste of electricity. This problem gets worse especially the room that people do not go in often. It will cause electric waste and certainly the electricity bills higher. One other thing is that people who have trouble reaching the switches. Parents no longer have to worry about their kids climbing something, which can be dangerous just to switch the light ON. This project also could provide safety at home. The use of automated control also would further aid in the use of those who are sick, handicapped or elderly. For example, someone unable to reach the light switch because of their disability. If they forced themselves to reach the switch, accidents might occur. Another example is when someone's hand is wet, this system will aid them, so there is zero chance of the person being electrocuted.

OBJECTIVES

- automatically turn on or off the lights in a room by detecting the human movement
- to provide a safety switch or non-contact switch for lights
- to add the ability to control the lights through a smartphone application

FINDINGS

Table 1 shows the result finding from the switching, for the light to be turned ON, the room should be in dark condition, and there should be one or more people inside the room. If the room is bright, the light will not be turned ON automatically even when a person enters the room. If there is no one inside the room, the light also will not be turned ON.

Person	Room Condition	
	Dark	Bright
= 0	OFF	OFF
> 1	ON	OFF

Table 1. The working of the system

From the simulation part for this ARoLS research. The simulation consists of Arduino Uno, which acts as the NodeMCU controller, two PIR motion sensors (replaced by ultrasonic sensors for a real design), an LDR, relay, and a light bulb. Figure 4, 5, 6 and 7 shows the result form simulation.

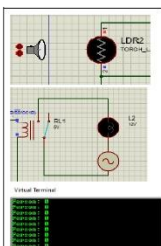


Figure 4. Simulation (When the room is dark, person = 0)

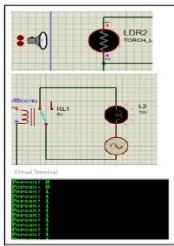


Figure 5. Simulation (When the room is dark, person >= 1)

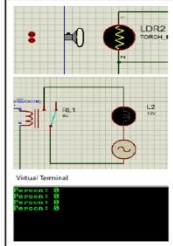


Figure 6. Simulation (When the room is bright, person = 0)

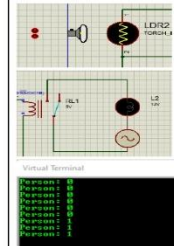


Figure 7. Simulation (When the room is bright, person >= 1)

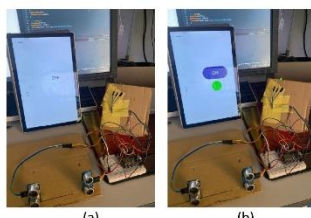


Figure 8. System Prototype with Blynk apps.

Figure 8 (a) shows the light can be turned off by the apps, while figure 8(b) depicts the light can be turned on via the apps regardless of any lightness of surroundings. The app also displays the number of humans in the room. This can be one of the smart home features including safety. The reset button on the apps can be used to reset the counter if a mistaken number happens. The green circle on the app shows the status of the light; either on or off.

METHODOLOGY

Figure 1 shows a block diagram of ARoLS. This system consists of two inputs and three outputs. Two ultrasonic sensors and an LDR were used as input, while the relay and light were used as outputs. Another feature is the WiFi module inside the NodeMCU microcontroller. Figure 2 shows a flow chart of ARoLS. There are two types of room conditions, whether the room is dark or bright. This room condition will justify whether the light will be automatically turned ON or OFF. It will indicate, the number of people inside the room. If a person enters the room, the value will increase by 1. When a person leaves the room, the value will decrease by 1. For the light to be turned ON, the room should be in dark condition, and there should be one or more people inside the room. If the room is bright, the light will not be turned ON automatically even when a person enters the room. If there is no one inside the room, the light also will not be turned ON. Person Room Conditions. Figure 3 shows a schematic diagram for ARoLS, the circuit was implemented using simulator software, Proteus.

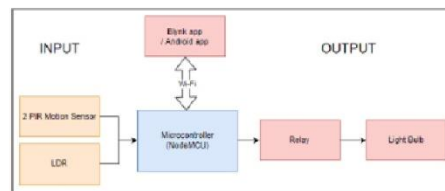


Figure 1. Block diagram of the ARoLS.

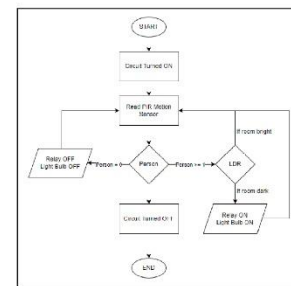


Figure 2. Flow chart of the ARoLS.

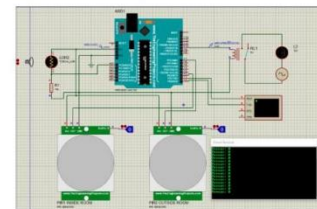


Figure 3. Schematic diagram of the ARoLS.

NOVELTY

The system is a simple microcontroller system which is a low-cost system. This system provides automatically turns on/off light depending on the human presence and surrounding lightness factor. At the same time, this gives efficiency to the use of electricity.

CONCLUSION

The development of Automatic Room Lighting system via the Internet of Things (IoT) is successfully developed. This research has fulfilled the main objective is to detect people entering and exiting the room with the use of ultrasonic sensor and automatically turn on/off the switch by the relay module, and thus the electricity usage is more efficient. In addition, this research also successfully provides a safety switch or non-contact switch for lights. Lastly, this research successfully connect a WiFi module included in the NodeMCU microcontroller, which is to add an ability to control the light through a smartphone application.

COMMERCIALIZATION

Nowadays, people used mobile as their main gadget. With the aid of IoT in this research, IoT based- Automated Room Lighting can be commercialized with enhanced the power source to be renewable energy and used a back-up power for the system.

RECOGNITIONS

We, the authors would like to thank University Technology MARA (UTM), Campus Dungun for the chances to enable the author to join any IID competition. It was a great learning opportunity. Thank you.