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Emergency Light with Dark Switch and Motion Sensor

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Abstract

The general objective of this research was to make an alternative means of producing light by the use of some simple materials at home. The specific objective of the study was to construct lighting system for emergency purposes which can use at schools, offices, hotels, hospitals and even in our homes. This study also aims to develop more suitable and efficient lighting system which uses motion sensor and dark sensor for switching devices. In this study, there are some advantages considered: (1) equipped with dark sensor which only activates standby light when the light in the surrounding is not sufficient during power outage; (2) equipped with motion sensors for switching device which will activate it brightness if there's a presence of motion within an angle of 120 degrees and a maximum distance of 7 meters; (3) can give high frequency of emergency lighting during power outage. As the result of the study, this gadget only operates in dark surroundings and can give higher brightness if motion is sensed in a given angle and distance. To this end, this initial study formulated theories which stated that this gadget consumes less amount of energy and can operates automatically without directly controlled by a person.

Keywords: *Construction, Sensors, Emergency Lighting, Automatic*

1. Introduction

The quest for alternative means of producing light, particularly in emergency situations, has driven innovation at the intersection of technology, resourcefulness, and sustainability. In this context, the primary objective of this research was to explore the creation of a lighting system utilizing readily available materials that can be assembled in the comfort of one's home. With a specific focus on emergency scenarios, our study aimed to develop a lighting solution suitable for a variety of settings, including schools, offices, hotels, hospitals, and households.

One of the key innovations the researchers pursued was the integration of motion and dark sensors into the lighting system. The central idea was to design a system that operates efficiently, activating illumination only when necessary, and conserving energy. The dark sensor was engineered to activate standby lighting during power outages, responding to insufficient ambient light. Additionally, motion sensors were employed to switch on the lighting system when a presence was detected within a 120-degree angle and up to a maximum distance of 7 meters. This feature was implemented to ensure that the lighting system responds swiftly and effectively in emergency situations, such as sudden power failures.

Through our study, we sought to realize several advantages. First, researchers aimed to create a lighting system that operates exclusively in dark environments, ensuring energy conservation and extending the lifespan of the components. Second, the incorporation of motion sensors was envisioned to enhance the system's responsiveness, automatically increasing brightness when motion is detected within the specified parameters. Finally, the research aimed to achieve a high-frequency emergency lighting system capable of providing reliable illumination during power outages.

As a result of our study, researchers discovered that this innovative gadget not only operates in dark surroundings but also delivers increased brightness when motion is sensed within the predefined angle and distance limits. This not only enhances the system's utility in emergency scenarios but also contributes to energy efficiency.

In summary, the initial research has laid the foundation for the development of a novel lighting system that can operate autonomously, responding to environmental conditions and human presence. This project embodies the spirit of resourcefulness and sustainability, offering a practical solution to enhance lighting options in diverse settings while minimizing energy consumption. The theories formulated in this study support the notion that this gadget holds the potential to revolutionize the way the researchers approach emergency lighting solutions, making them more efficient and responsive to real-world needs.

2. Materials And Methods

This chapter presents the criteria of the study, description of the study, evaluation of the study, list of tools and equipment, list of materials, procedures for constructing fully automatic emergency light, picture documentation in constructing fully automatic emergency light, procedures using fully automatic emergency light for light substitution, and picture documentation in the utilization of fully automatic emergency light as light substitution during power outage.

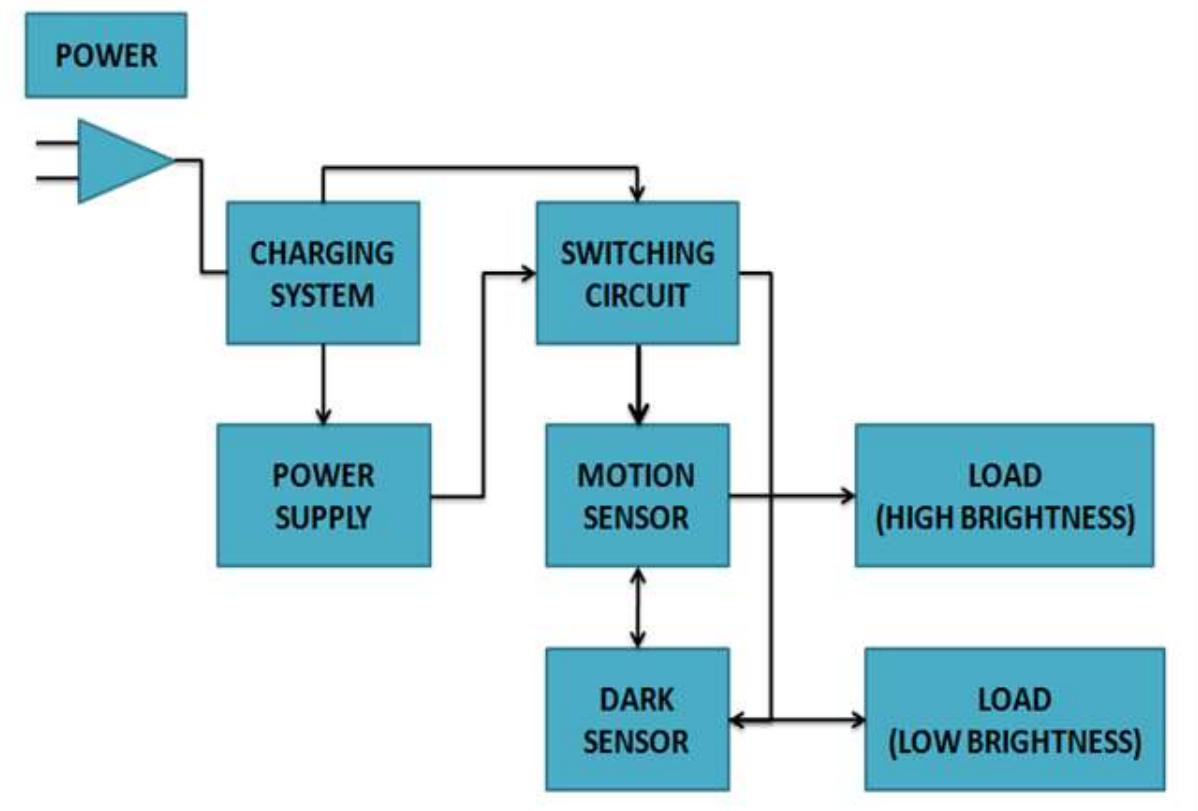
Design Criteria

A conceptual design of fully automatic emergency light was prepared based on the operational and technical information using available and common materials gathered. Materials needed and calculations for the study of materials were determined.

During the design of the fully automatic emergency light the following criteria were considered:

1. Availability of the materials and resources for construction.
2. Overall view of the project
3. Circuitry, design and placement

Conceptual Block Diagram of Fully Automatic Emergency Light



Description of the Gadget

The research project employs a 6-volt, 4.5 ampere-hour (Ah) battery as the gadget's power source. This battery is connected to a nearby outlet for recharging. The gadget is outfitted with both a light sensor and a motion sensor, which function to automatically control its operation. The light sensor serves as the primary switch, while the motion sensor regulates the gadget's brightness.

Design Plan and Preparation

Testing of the materials and parts for the construction of fully automatic emergency light was based on designed criteria of the device using computer stimulation, actual component test and circuit assembly.

Availability and quality of the materials was also considered to come up with good workmanship and durability of the device assembly.

Evaluation of the Study

Evaluation of the study used measuring instruments to measure the angle and distance:

1. The distance and angle which will activate its bright light when there's a presence of motion.
2. Operational efficiency of the system

List of Tools and Equipment

1. Soldering Iron
2. Soldering Led
3. Side Cutter
4. Multi Tester
5. Screw Driver
6. Pliers
7. Electric Drill

List of Materials

1. 6v battery
2. LED/automobile bulb
3. Light Sensor
4. Motion Sensor
5. Copper Board
6. Resistor
7. Transistor
8. Diode
9. Wires
10. 6v Transformer
11. Ferric chloride
12. Switch
13. Spaghetti tube
14. Shrink tube
15. Relays

Procedures:

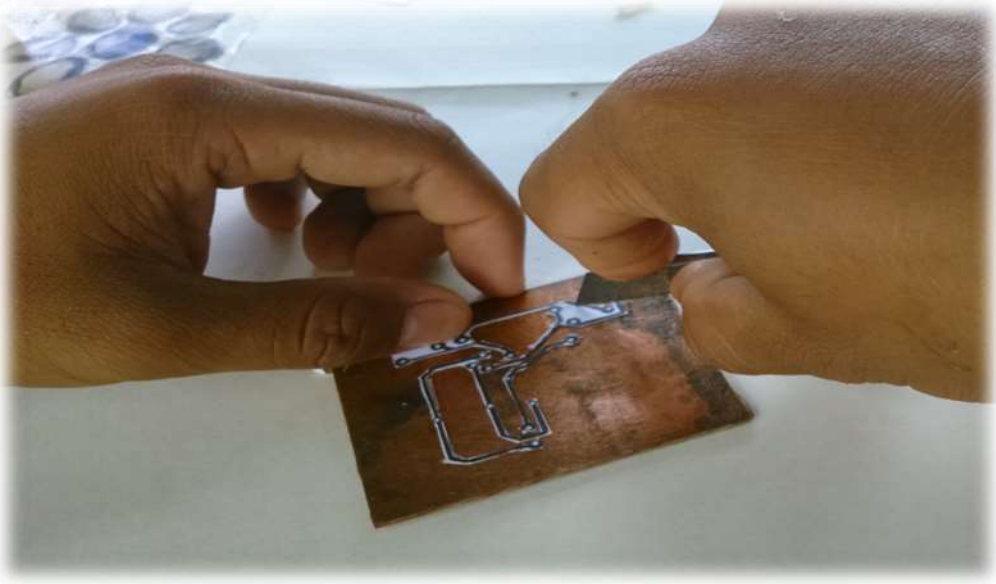
1. Prepared all the materials needed
2. Lay-out the PCB based on the schematic diagram
3. Etched the PCB board using etching solution
4. Make hole to the PCB based to the circuit diagram
5. Put the required components into the PCB and soldered to their place
6. Assembled all the parts
7. Preliminary testing of the operation of the gadget
8. Evaluated the activations of light in 90 degrees
9. Evaluated the activations of light in 60 degrees right
10. Evaluated the activations of light in 60 degrees left.

3. Results and Discussion

Figure 5. Picture of the Tools and Materials Needed in Constructing Fully Automatic Emergency Light.

Step 1. Preparation of all the tools and materials needed.

Figure 6. Pictures of Procedures in Making of the Fully Automatic Emergency Light.



Step 2. PCB making. Cutting lay out of the circuit using cutter blade.

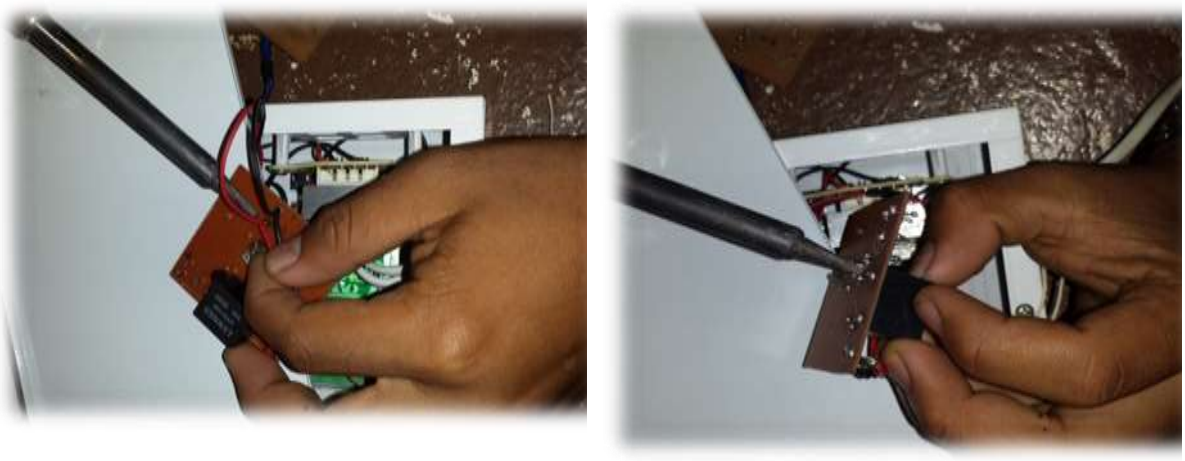
Figure 7. PCB Etching

Step 3. Etching the copper clad board using the etching solution.

Figure 8. Boring holes for the placement of components

Step 4. Boring holes to the PCB based to the circuit diagram

Figure 9. Assembling and Soldering the Components



Step 5. Assembling and soldering components onto the PCB board

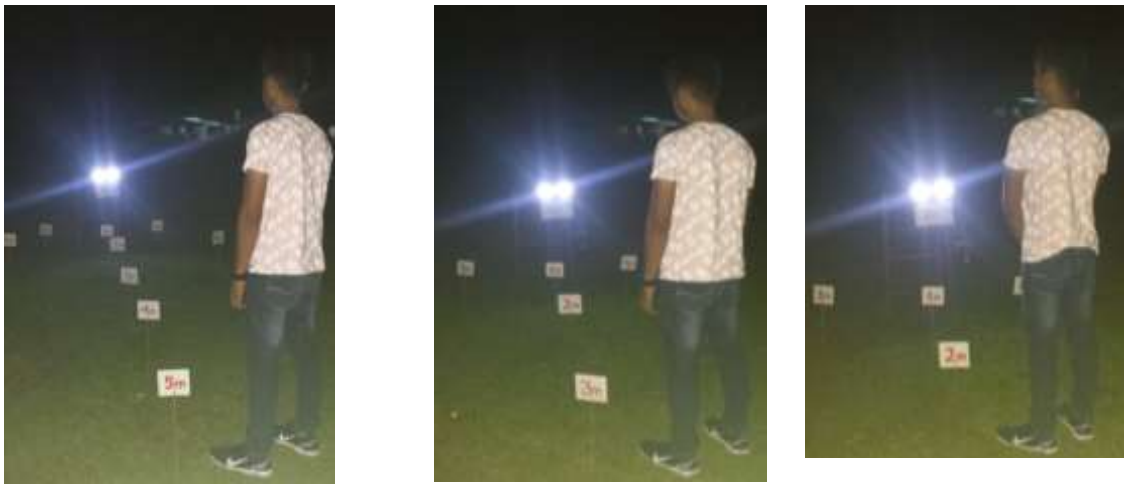
Figure 10. Finalized the Parts

Step 6. Assembling and finalize all the circuits.

Figure 11. Preliminary Testing of the Gadget

Step 7. Pre testing of the gadget light activation at dark surrounding sand when motion is sensed.

Figure 12. Gadget Evaluation as to its 90 degrees



Step 8. Evaluation of lights activation from 1 meter to 7 meters within an angle of 90 degrees

Figure 13. Gadget Evaluation as to its 60 degrees right

Step 9. Evaluation of lights activation from 1 meter to 7 meters within an angle of 60 degrees right

Figure 14. Gadget Evaluation as to its 60 degrees left

Step 10. Evaluation of lights activation from 1 meter to 7 meters within an angle of 60 degrees left.

Figure 15. Finished product. The gadget's structural view

Based on the collected data, the study's outcomes are as follows:

The Fully Automatic Emergency Light was created following the subsequent steps:

a. Gathering all necessary materials
b. Creating the PCB layout based on the schematic diagram
c. Etching the PCB board using an etching solution
d. Drilling holes in the PCB according to the schematic diagram
e. Placing the required components onto the PCB and soldering them in place
f. Verifying and testing the circuit
g. Assembling all the components

h. Connecting the gadget to an outlet for battery charging
i. Disconnecting the gadget to assess its initial system operation
j. Evaluating the performance of the gadget

The gadget underwent various trials to determine the required measurements for activating the bright light based on angle and distance. The results are as follows:

a. At a 90-degree angle in Trial 1, the light activated between 1 meter and 7 meters. The same activation range was observed in Trial 2 and Trial 3.

b. At a 60-degree right angle in Trial 1, the light activated between 1 meter and 7 meters. The same activation range was observed in Trial 2 and Trial 3.

c. At a 60-degree left angle in Trial 1, the light activated between 1 meter and 7 meters. The same activation range was observed in Trial 2 and Trial 3.

The gadget underwent different trials to determine its operational duration at both low and high brightness settings. The results are as follows:

a. In Trial 1, the evaluation revealed that the Emergency Lighting Duration at low brightness was 32 hours and 31 minutes, 32 hours and 33 minutes, and 32 hours and 36 minutes. Similar durations were observed in Trial 2 and Trial 3.

b. In Trial 1, the evaluation revealed that the Emergency Lighting Duration at high brightness was 15 hours and 11 minutes, 15 hours and 13 minutes, and 15 hours and 12 minutes. Similar durations were observed in Trial 2 and Trial 3.

4. Conclusion

In view of the findings, the following conclusions were drawn:

1. The motion sensor can detect with maximum distance of 7 meters and an angle of 120 degrees which will activates the light if motion is sensed.

2. The prototype of the gadget known as “Fully Automatic Emergency Light” is capable to use as an Emergency Lighting.

Recommendations

In the light of the findings and conclusions drawn in the study, the following recommendations were:

1. The owner should consider the place where to put the gadget because the motion sensor will not trigger if it is covered.

2. Use higher amperage of battery to increase battery life.

3. Future researchers should know what other ideas could be formulated related to this study to have emergency lightings when long power outage occurs. Try using of quality materials to get better results.

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