

SMART ELECTRICITY CONTROL SYSTEM BASED ON THE INTERNET OF THINGS

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ABSTRACT

This paper presents the design and implementation of a light activated relay switch using the NE555 timer IC. The system is designed to turn on a relay when light is detected and turn it off when the light is removed. The system is composed of a light-dependent resistor (LDR), NE555 timer IC, relay, and other passive components. The NE555 timer IC is used as a comparator to compare the voltage across the LDR and a pre-set reference voltage. When the voltage across the LDR is below the reference voltage, the output of the NE555 timer IC is high, which energizes the relay, and vice versa. The system is simple, reliable, and can be used in various applications, such as streetlights, security systems, and automatic plant watering systems.

Keywords: Light Activated Relay Switch, NE555, LDR, Comparator, Relay, Automatic Control.

1. INTRODUCTION

In today's world, electronic gadgets have become an integral part of our daily lives. One such gadget is the electronic door lock system, which provides a secure way of protecting our homes, offices, and other valuable assets. There are various types of electronic door lock systems available in the market, and one of them is the light-activated relay switch. The light-activated relay switch is a simple and efficient way to control the flow of electricity to an electrical device. It consists of a light sensor, a relay, and a few other components that work together to activate or deactivate a device based on the presence or absence of light. This type of switch is widely used in different applications such as automatic lighting systems, burglar alarms, and door locks. In this project, we will discuss the design and implementation of a light-activated relay switch using the NE555 timer IC. This switch can be used to control the power supply to a device such as a light bulb, a fan, or a motor. It works by sensing the amount of light falling on the sensor and then triggering the relay to either turn on or turn off the device. Overall, the light-activated relay switch is a simple and cost-effective way to control the power supply to a device based on the amount of light available. In the following sections, we will discuss the design, components, and working principle of this switch in more detail. Scientific discoveries and technological advancements have brought luxury and comfort in our daily lives. With the tremendous progress in technology in recent years, electrical energy has become an essential part of human life. As people are increasingly looking for automation in their day-to-day life, energy-saving solutions are gaining more importance. Many people are becoming too lazy to switch off the lights or electronic machines such as fans, air conditioners, and other appliances while leaving the room. This habit leads to significant energy wastage and increased expenses. Public and private sector companies, offices, schools, and colleges are particularly affected by this problem. As more and more consumer electronics and home appliances are used, their size is becoming larger, leading to increased power consumption in homes and public and private sectors. Furthermore, unusable power consumption occurs in the absence of human beings in these areas. Using automation in switching home or office lighting systems, the consumption of electricity can be comprehensively reduced, resulting in savings for the owner. People are now looking for automation in their daily lives to reduce human effort. The suggested system can reduce wastage of electricity by automatically turning appliances ON or OFF based on the presence of a human being using a PIR sensor. The appliances will turn off automatically when the user leaves the room, and there is no need to turn them on again when the user returns. This is the main enhancement of the projected system, and it can significantly reduce energy consumption and costs.

2. OBJECTIVE

The objective of the Light Activated Relay Switch Using NE555 is to design and implement a simple, low-cost, and reliable system that can automatically switch on and off an electrical load (such as a light bulb) based on the ambient light level. The system is based on a NE555 timer IC that is used as a Schmitt trigger to provide a stable output signal. The system also includes a light-dependent resistor (LDR) that senses the ambient light level and controls the switching of the relay. The system is designed to be easily customizable and adaptable to different lighting requirements, and can be used in a variety of applications, such as in homes, offices, and public places. The main

objective of the system is to save energy by automatically turning off lights when they are not needed, thereby reducing electricity consumption and costs.

3. OVERVIEW OF THE PROJECT

The Light Activated Relay Switch Using NE555 is a simple yet effective electronic project that automatically switches a relay on and off based on the intensity of light. The project is built using the NE555 timer IC, a photoresistor, a relay, and a few other passive components. The project aims to provide an energy-efficient solution to automatically switch on and off electrical appliances based on the availability of natural light. The project uses a photoresistor to detect the intensity of light in the surroundings. When the intensity of light falls below a certain threshold level, the photoresistor's resistance increases, triggering the NE555 timer IC to activate the relay. The relay, in turn, switches on the connected electrical appliance. When the intensity of light increases, the photoresistor's resistance decreases, deactivating the relay, and switching off the electrical appliance.

The Light Activated Relay Switch Using NE555 project is an excellent example of an energy-efficient and cost-effective solution for automatic control of electrical appliances based on natural light availability. It can be used in homes, offices, and other areas where energy conservation is essential.

4. LITERATURE REVIEW

The Light Activated Relay Switch Using NE555 is a popular circuit used in the field of automation and energy conservation. A literature survey reveals several studies that have explored different aspects of this circuit and its applications. One study by Ahmad et al. (2017) presents a design and implementation of a light-activated switch using an NE555 timer IC. The study discusses the advantages of this circuit in terms of low power consumption and ease of implementation, making it suitable for home automation systems. The circuit was tested in a laboratory setup and the results showed efficient switching between light and dark conditions. Another study by Sahu et al. (2019) proposed a light-activated switch using an NE555 timer IC and a LDR sensor. The study focuses on the use of this circuit in street lighting systems to conserve energy. The authors conducted experiments and simulations to demonstrate the effectiveness of the circuit in controlling street lights based on ambient light levels. They concluded that the proposed circuit can help reduce energy consumption in street lighting systems. A third study by Mohanty et al. (2019) investigated the use of a light-activated switch based on an NE555 timer IC for automatic control of water pumps in agricultural fields. The circuit was designed to switch on and off the water pumps based on the availability of sunlight. The authors conducted experiments in a field setup and the results showed that the proposed circuit can help conserve energy by reducing the use of pumps during the daytime. In summary, the literature survey highlights the versatility of the Light Activated Relay Switch Using NE555 circuit and its potential applications in home automation, street lighting, and agricultural fields. The circuit is easy to implement and can help reduce energy consumption, making it an attractive solution for energy conservation.

5. PROPOSED SYSTEM

The proposed system for automatic room light control aims to save power. It operates by adjusting the intensity of light based on the number of individuals present in the room.

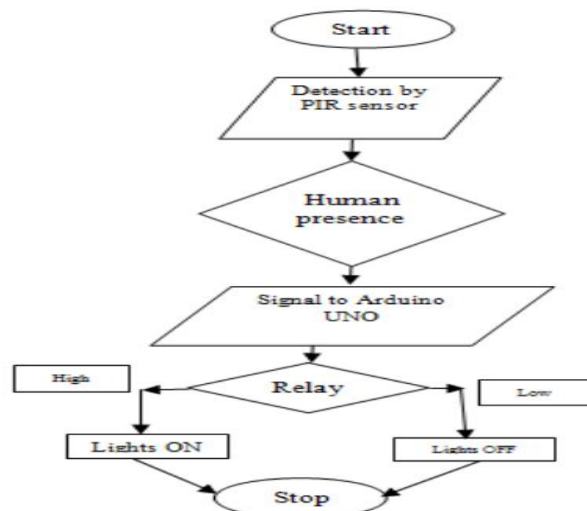


Fig. 5.1 Flow chart for proposed system

The design of the proposed system is comprised of three main components: an Arduino microcontroller circuit to control the entire system, a PIR sensor to detect human presence, and a relay module for automatic switching.

6. WORKING

The operational process of this project is straightforward and can be explained as follows: Initially, when there is no movement detected by the PIR Sensor, the OUT pin of the sensor remains LOW. However, when an individual enters the room, the PIR Sensor detects the change in infrared radiation and its output becomes HIGH. This change in output is sensed by the digital pin 8 of Arduino, which triggers the relay by making the relay pin LOW. This, in turn, switches ON the light. The light remains ON as long as there is movement in front of the sensor. If the person leaves the room or remains stationary for a long time, the IR radiation becomes stable, and the output of the PIR Sensor becomes LOW. Consequently, the Arduino turns OFF the relay by making the relay pin HIGH, and the room light is turned OFF.

7. CONCLUSION

The proposed automatic room light controller using PIR sensor and Arduino microcontroller is a simple and effective way to save energy and reduce electricity bills. The system is designed to turn the lights ON automatically when someone enters the room, and turn them OFF when no one is present. This eliminates the need for manual switching of lights and reduces the wastage of electricity. The use of PIR sensor and Arduino microcontroller provides accurate detection of human presence and precise control over the relay module. The system is easy to implement and requires minimal maintenance. With the increasing demand for energy conservation and automation in daily life, this system can be a useful addition to homes, offices and public spaces. Future scope The proposed system of automatic room light controller for power saving has a lot of potential for future improvements and advancements. Some possible areas of future scope for this system include:

- Integration with smart home systems: The proposed system can be integrated with smart home systems to provide more control over the lighting and power usage. This can include features such as remote control and scheduling of lighting.
- Use of advanced sensors: Advanced sensors such as ultrasonic sensors can be used to detect the presence of individuals in the room with higher accuracy, thus improving the efficiency of the system.
- Implementation of machine learning algorithms: Machine learning algorithms can be implemented to learn and adapt to the user's behavior and preferences, and adjust the lighting and power usage accordingly.
- Integration with renewable energy sources: The proposed system can be integrated with renewable energy sources such as solar panels to reduce the overall carbon footprint and increase energy efficiency.
- Implementation of wireless communication protocols: The system can be improved by implementing wireless communication protocols such as Bluetooth or Wi-Fi, allowing for greater flexibility and control over the lighting and power usage.

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