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Automatic Room Lights Controller Using Arduino and PIR Sensor

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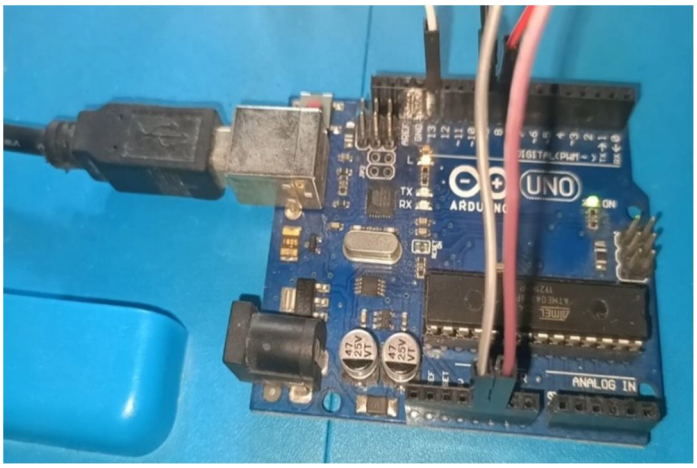
Abstract: ***Automatic room lights controller can be installed in which the room lights will turn on automatically upon detection of human motion and will stay tuned until the motion stops or the person has left the room. Such type of system can be implemented where we don't require continuous light supply but only when a person is present. The common places where we can install the system are washrooms, bathrooms, office rooms, classrooms in schools and colleges, garages, etc. Also, using this controller system, we don't need to worry about electricity as the room lights will switch off on their own when no person is present. A huge amount of energy and economy will also be saved . The main components of the Automatic Room Lights project are Arduino Uno, PIR Sensor and the Relay Module.***
Keywords: Arduino Uno, Lights, PIR sensor, Relay Module

I. INTRODUCTION

In recent years, we common people are interested to interact with technology and thus make our day to day tasks easier by creating automation. Even we are really feeling the seriousness to save energy for ours and future generations. People are getting lazy to even do simple tasks like switching off the lights while going outdoors, which results in large amount of energy wastage. Such kind of carelessness is generally seen in public and private buildings, industries, schools, colleges and most of us are disinterested to switch off electronic appliances such as fans and lights when not in use. This has resulted in increased power consumption in home area on a large scale. Moreover, unusable power consumption occurs in the absence of human being in public and private sectors.
The proposed system can resolve above mentioned problems . So, using automatic room lights controller system ,user can reduce electricity usage and save some amount of money thereby. When there is no human presence or motion the room lights will get switched off on their own. It is an efficient way to save energy and human efforts.

II. COMPONENTS DESCRIPTION

1) *Arduino UNO:* It is a microcontroller board based on the ATmega328P. It has a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack and a ICSP header and a reset button.



Microcontroller : ATmega328P
It consists of total 14 digital input /output pins of which 6 can be used as PWM outputs.
It has 6 analog input pins
Its input voltage limit ranges from 6 to 20 volts.

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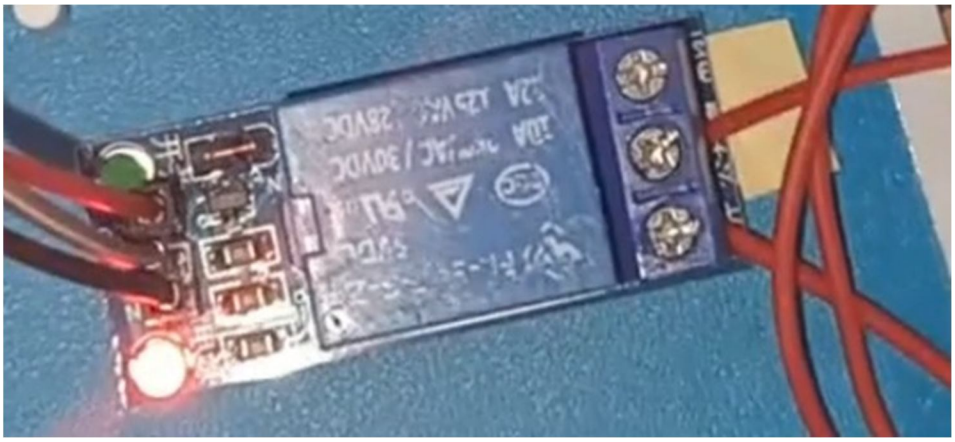
2) *Relay Module:* A power relay module is an electrical switch that is operated by an electromagnet. A Relay Module is a very useful component as it allows Arduino, Raspberry Pi or other Microcontrollers to control big electrical loads. . We have used a active high relay module.



a) On-board EL817 photoelectric coupler with photoelectric isolating anti interference ability strong
b) On-board 5V, 10A / 250VAC, 10A / 30VDC relays
c) Relay long life can absorb 100000 times in a row
d) Module can be directly and MCU I/O link, with the output signal indicator
e) Module with diode current protection, short response time.

3) *PIR Sensor:* A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. It works entirely by sensing infrared radiation (radiant heat) emitted or reflected from objects.

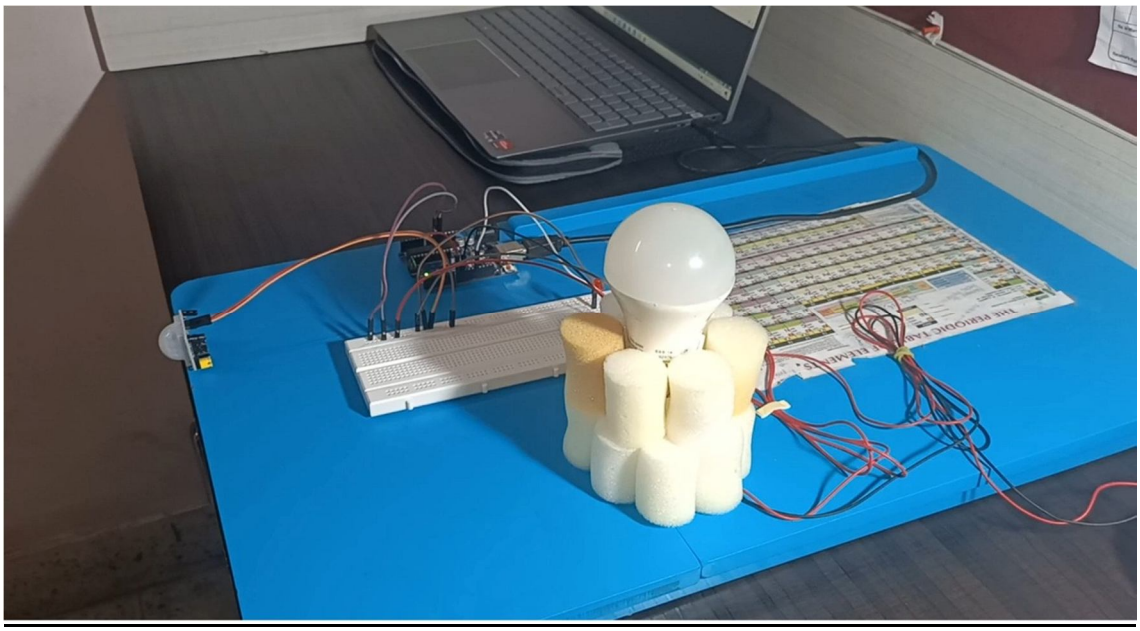
III. LITERATURE SURVEY

In [1] , system proposes that switch control operations of devices like lights ,fans, air conditioners, etc. can be handled using PIR Sensor depending on environmental conditions.The system uses of arduino uno and WAGO PLC (Programmable Logic Controller) to make it happen. Practically sensor data does the automatic control and manual control is done by android apps. But the drawback of this " Implementation of Smart classrooms using arduino and WAGO PLC " system is that it uses both arduino and WAGO PLC for control whereas the operations can be performed by only using Arduino Uno.
"Smart Lighting system using raspberry pi " by Maslekar et al [2] suggests the monitoring of fans and lights simultaneously using Raspberry pi. About 50 % of energy can be conserved using this system. The room lights and fan will go off on their own. The drawback of this paper is that the system becomes expensive as raspberry is costlier. Instead we can use Arduino uno which is cheaper comparatively.

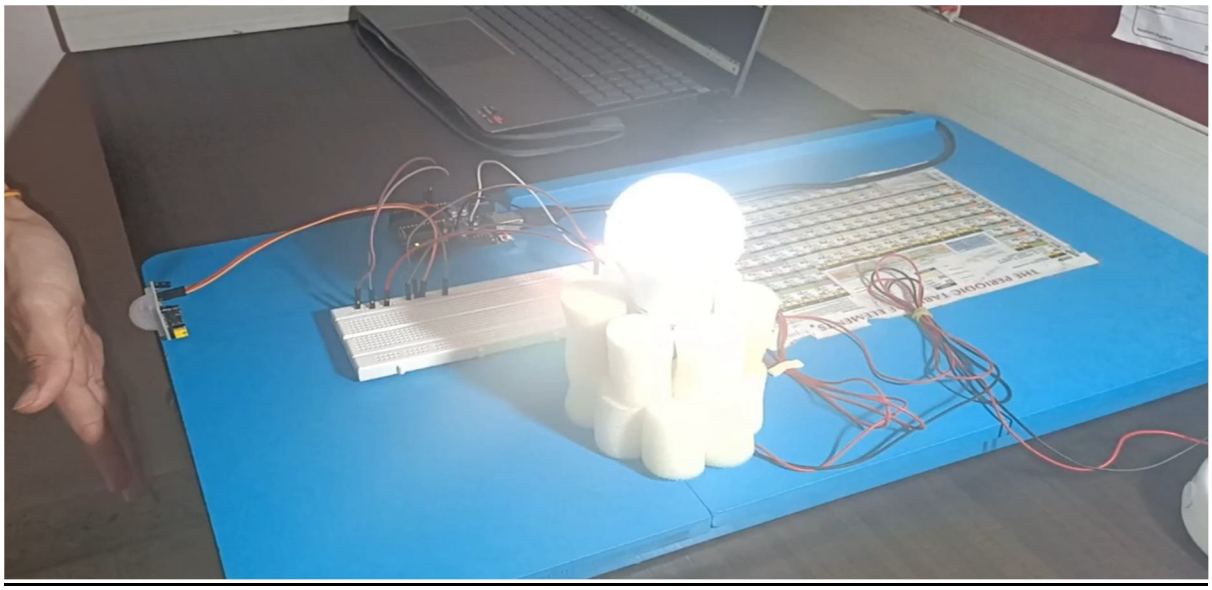
Suresh et al [3], has proposed Automatic lighting and control system for Classroom wherein classroom lights are operated using PIR sensor, Bluetooth and Relay. Bluetooth module sends voice commands from arduino uno by using android application. The Bluetooth module is connected to Arduino uno.This system can also be implemented without Bluetooth.

In [4], system uses visitor counter and PIR sensor to detect human presence and operate room lights. Using this system manual operation for switching is eliminated. Human presence is detected using PIR sensor at the entrance. When a person enters room there is increment in visitor counter which leads to turn on action of lights controlled by a microcontroller program. And when the person leaves room lights goes off following decrement in counter. Drawback of the system is that only single person can enter the room through the door at a time.

IV. WORKING MODELS

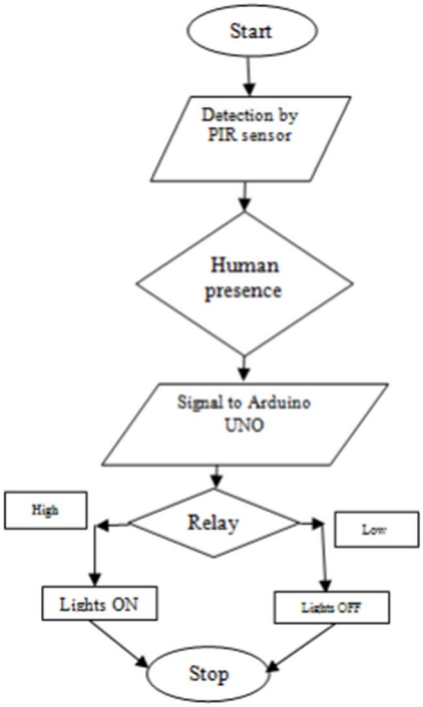


Before human motion in front of PIR sensor we can see the light is OFF and continues in this state till a motion is sensed.



AS soon as human motion is detected the light turns ON.

V. SYSTEM FLOWCHART

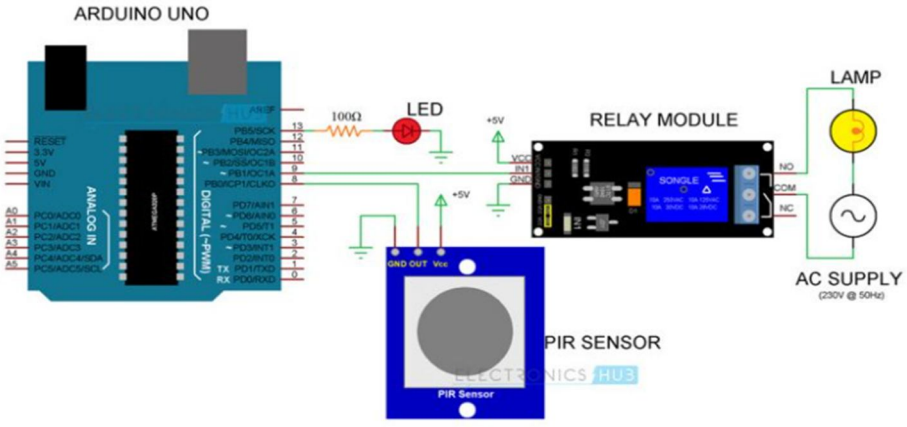


The system operates as shown in the flowchart in the following sense :-

1) At first PIR sensor detects whether there is human presence or not.
2) Then it gives signal to Arduino Uno. The arduino controls the relay module.
3) This is further processed by relay module. If the input to relay module is high then it does the switching action and thus turns on the light. And if input signal is low the lights are switched off.

VI. WORKING

A. In absence of human motion, the OUT pin of PIR sensor remains low.
B. As soon as a person enters the room PIR sensor detects a change in IR radiations level. This results OUT pin to become high.
C. Now the data OUT pin of PIR is connected to Arduino's pin no. 8.
D. When pin 8 of Arduino recieves HIGH , it will control the realy module to turn on the lights.
E. The lights will continue to remain on till IR radiations becomes stable by stop of human motion.
F. If the IR radiations level gets stabilized by no human movement or if he takes a sleep, the OUT pin of PIR gets low and thereby Arduino controls the relay by ordering it to switch off the lights.



The above figure shows the connection diagram of system discussed in this paper.

VII. CONCLUSION

We can conclude that room lights can be controlled automatically using this system. Nowadays a large amount of electricity is wasted by us unknowingly. Using this system a huge energy and power can be conserved. This project can lead to automation in every individuals day to day life. The total cost of system is very less and hence can be implemented by everyone. This system can be coupled with various technologies and thus giving vast applications.

VIII. FUTURE SCOPE

This system can be improved and made more accurate by implementing following technological changes :-

A. Using GSM we can receive notifications of the current state of system.
B. A pressure sensor can be used to calculate occupancy outside the house thus helping in control and security purpose.
C. Instead of PIR sensor a digital camera can be used to detect a person's presence using image processing technique.
D. Along with PIR sensor a LDR can also be used for better working of the system.

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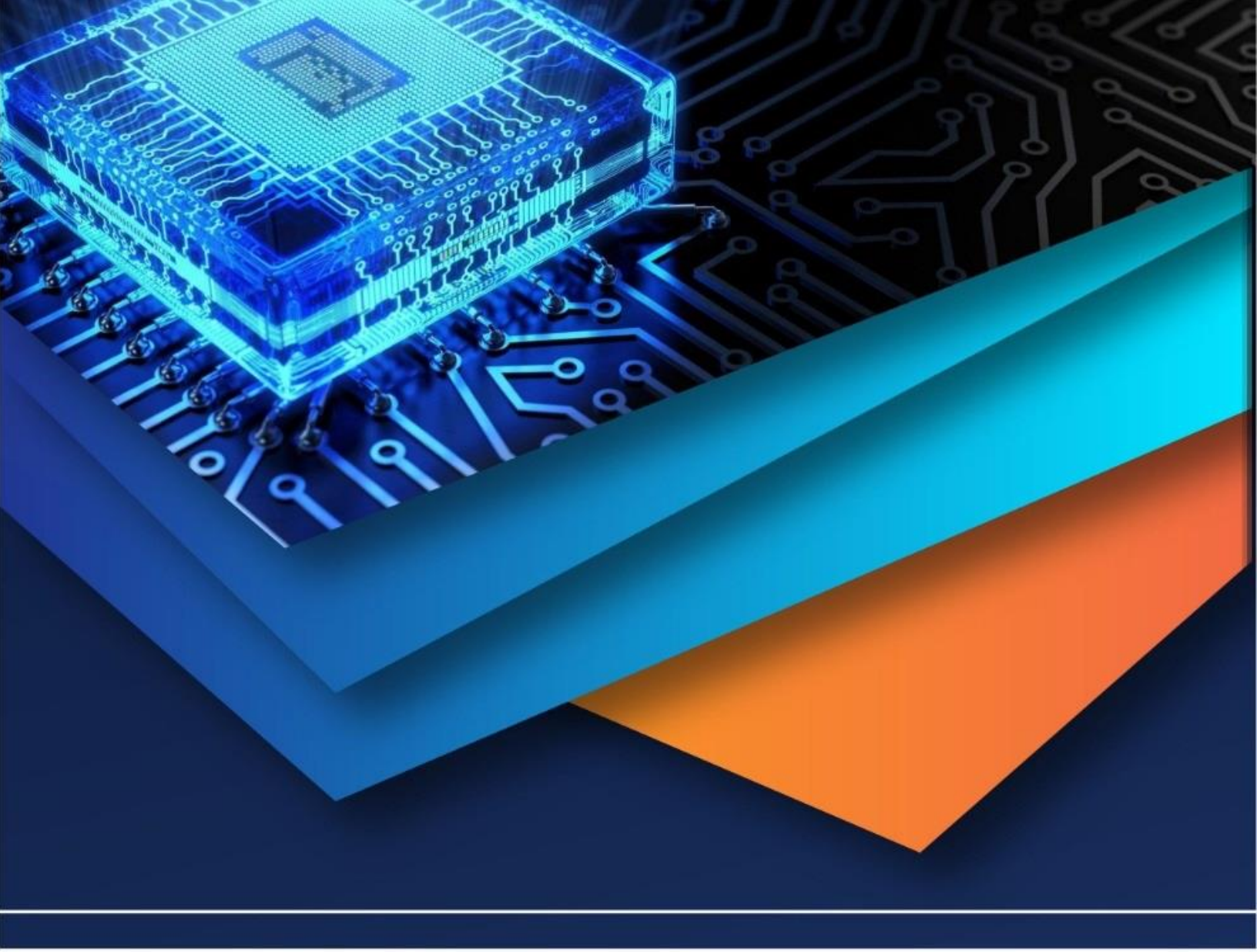

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