IOT Mini Project Report on Automatic Room Light ystem Using Arduino

Submitted in partial fulfillment of the requirements of the degree of

Final Year of Engineering in Information Technology.

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DEPARTMENT OF INFORMATION TECHNOLOGY

UNIVERSITY OF MUMBAI 2021-22



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<u>CERTIFICATE</u>

Date.		

This is to certify that, the mini project work embodied in this report entitled, "Automatic Room Light System" submitted by "Smit Shah bearing Roll No. 861", "Aneri Vasani bearing Roll No. 871", "Naisargi Shah bearing Roll No. 860" for the award of Fourth year in Bachelor of Engineering (B.E.) degree in the subject of Information Technology, is a work carried out by them under my guidance and supervision within the institute. The work described in this mini project report is carried out by the concerned students and has not been submitted for the award of any other degree of the University of Mumbai.

Further, it is certifying that the students were regular during the academic year 2021-22 and have worked under the guidance of concerned faculty until the submission of this mini project work at *Rajiv Gandhi Institute of Technology*, *Mumbai*.

Mr. Swapnil Gharat **Mini Project Guide**

Dr. Sunil B. Wankhade **Head of Department**

Dr. Sanjay U. Bokade **Principal**

CERTIFICATE OF APPROVAL

This mini project report entitled

Automatic Room Light system

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In partial fulfillment of the requirements of the degree of **Fourth year in Bachelor of Engineering** in **Information Technology** is approved.

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Acknowledgement

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ABSTRACT

As we all know that, there are some places where we need light only when we are present in there. For ex, Garage Lights, Bathroom lights, Security lights etc. and there are many people who keep this lights 'ON' unnecessarily and waste electricity. So, to overcome this we have come up with a project called 'Automatic Room Light using arduino and PIR sensor'. This project will be based on concept i.e. if one enters the room the lights should be switched "on" automatically without anyone's intervention else it should be turned "off" automatically without anyone's intervention. Out of all the components, PIR sensor is one of the important component as it detects human presence.

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CHAPTER 1

INTRODUCTION

In this project, we will see the Automatic Room Lights using Arduino and PIR Sensor, where the lights in the room will automatically turn ON and OFF by detecting the presence of a human. Such Automatic Room Lights can be implemented in our garages, staircases, bathrooms, etc. where we do not need continuous light but only when we are present.

Automatic Room Lights System using Arduino is a very useful project as you need not worry about electricity and turning on and off the switches every time you want to turn on the lights. The main components of the Automatic Room Lights project are

- 1. Arduino,
- 2. PIR Sensor
- 3. Relay Module.

Out of the three components, the PIR Sensor is the one in focus as it is the main device that helps in detecting humans and human motion. In fact, the Automatic Room Lights project can be considered as one major application of the PIR Sensor. A similar concept is being already implemented in automatic toilet flush valves, hand dryers, etc.

So, in this project, we have implemented Automatic Room Lights using Arduino and PIR Sensor.

CHAPTER 2 AIMS AND OBJECTIVES

AIM: To design an Automatic Room Light system using Arduino and PIR Sensor, where the lights in the room will automatically turn ON and OFF by detecting the presence of a human.

OBJECTIVES: The objectives of our project are as follows-

- Learn about PIR sensor and how it helps in detecting humans and human motions.
- Learn about Arduino UNO.
- Designing a simple Automatic Light room system
- To control the system using Arduino UNO.
- Controlling the switches by sensor.
- And finally, getting the project work done as projected.

CHAPTER 3

LITERATURE SURVEYED

Literature Survey is the study of already established systems and collection of information which helps in doing new tasks. Vibhuti proposed a system which operates with control of relays and with the use of WAGO PLC (Programmable Logic Controller) and Arduino UNO. Switching operation of devices such as tube light, fan, AC, etc. can be operated simultaneously by using PIR sensor and on the basis of environmental conditions. In realtime implementation, automatic control is done by sensor data and manual control is done by android application. But, difficulty in this paper is the controlling and monitoring of the devices done by WAGO PLC and Arduino UNO both. These operations can be done only by Arduino UNO. Automatic lighting and control system for classroom in which electrical light is controlled by Bluetooth, PIR sensor and relay. To switch ON or OFF the light, Bluetooth module is connected to Arduino UNO when sends voice command from Arduino UNO by using mobile android application. The experimental results have shown that 50% energy is conserved. But, this paper can be implemented by removing the Bluetooth module as well. Depending upon the human presence, the room lights ON or OFF. There is no need of manual operation for switching. The PIR sensor is used to the human presence which is the entrance of the room. As visitor counter is used, the increment in the counter when the person enters in the room and this leads to turn ON the room light which is controlled by microcontroller program. If person exists the room, the counter decremented and this leads to turn OFF the lights. When all persons left the room then only the lights in the room is switched OFF. The difficulty in this system is that the door of room should not allow more than one person at a time. Vahid proposed a system whose control is depend on Arduino microcontroller, network communications and Modbus industrial protocol. The specific Android application is used to load the Modbus program into mobile or Windows software named 'mypro' and on Arduino board, Arduino code loaded through USB (Universal Shield Bus) cable. There is interconnection between Arduino Ethernet Shield and mobile through Ethernet cable and router. By connecting to router, user can control and monitor the applications easily.

CHAPTER 4 PROPOSED SYSTEM

The proposed system is an Automatic room light system which automatically turns the lights on and off based on human detection. Arduino, PIR sensor and relay module are some of its main components. Among these three components, PIR sensor plays a very important role because it detects the human presence based on which the lights can be turned on or off. In the present day world, environmental effects and day-by-day depleting energy resources warn us to save energy so we have proposed an Energy efficient lighting system which will avoid wastage of electricity. As PIR sensors are cheap so it also cost- efficient. The system also involves simple coding and is more affordable.

CHAPTER 5 IMPLEMENTATION

The system is composed of 6 main components-

- Arduino UNO
- PIR Sensor
- 5V Relay Module (Relay Board)
- LED
- 100Ω Resistor (1/4 Watt)
- Connecting Wires
- Breadboard
- Power Supply

If you do not have a Relay Module, use the following components:

- 5V Relay
- 2N2222 (or BC547) NPN Transistor
- 1N4007 PN Junction Diode
- 1KΩ Resistor (1/4 Watt)

Circuit Diagram:

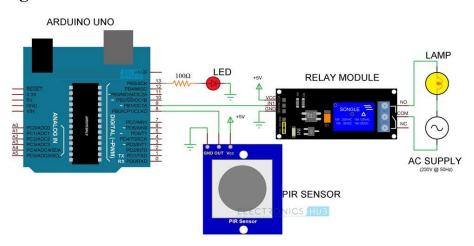


Fig 4.1 Circuit Diagram

Circuit Design:

- i. PIR Sensor's Data OUT Pin is connected to Arduino's Digital I/O Pin 8. An LED is connected to pin 13 of Arduino to indicate whether the light is turned ON or OFF.
- ii. The IN1 pin of the Relay Module is connected to Pin 9 of Arduino. A bulb is connected to mains supply through relay. One terminal of the bulb is connected to one wire of the mains supply. The other terminal of the bulb is connected to the NO (Normally Open) contact of the Relay Module.
- iii. COM (Common) contact of the Relay is connected to the other wire of the mains supply.

Working:

- i. Initially, when there is no human movement, the PIR Sensor doesn't detect any person and its OUT pin stays LOW. As the person enters the room, the change in infrared radiation in the room is detected by the PIR Sensor.
- ii. As a result, the output of the PIR Sensor becomes HIGH. Since the Data OUT of the PIR Sensor is connected to Digital Pin 8 of Arduino, whenever it becomes HIGH, Arduino will activate the relay by making the relay pin LOW (as the relay module is an active LOW module).
- iii. This will turn the Light ON. The light stays turned ON as long as there is movement in front of the sensor.
- iv. If the person takes a nap or leaves the room, the IR Radiation will become stable (there will be no change) and hence, the Data OUT of the PIR Sensor will become LOW. This in turn will make the Arduino to turn OFF the relay (make the relay pin HIGH) and the room light will be turned OFF.

CHAPTER 6

HARDWARE and SOFTWARE

Software:

Arduino IDE

Arduino IDE where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment. A range of Arduino modules available including Arduino Uno, Arduino Mega Arduino IDE- Arduino Leonardo, Arduino Micro and many more. Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.

Hardware:

1) Arduino UNO

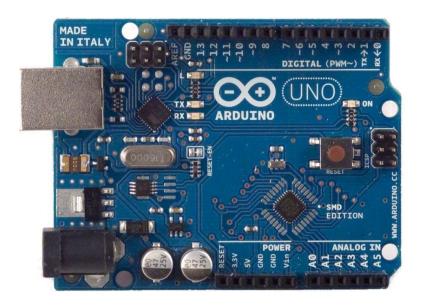


Fig 5.1 Arduino UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins, 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

2) PIR SENSOR

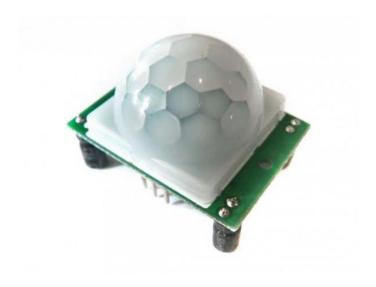


Fig 5.2 PIR Sensor

PIR sensors are Passive Infrared Sensors. Passive infrared sensors detect body heat (infrared energy) by looking for changes in temperatures. They are the most-widely-used motion sensor in home security systems.

They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications.

PIR sensors detect general movement, but do not give information on who or what moved. For that purpose, an imaging IR sensor is required.

PIR sensors are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector". The term *passive* refers to the fact that PIR devices do not radiate energy for detection purposes. They work entirely by detecting infrared radiation (radiant heat) emitted by or reflected from objects.

3) 5V Relay Module (Relay Board):



Fig 5.3 5V Relay Module

A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When the relay is de-energized, the sets of contacts that were closed, open and breaks the connection and vice versa if the contacts were open.

It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energizes the electromagnetic field which produces the temporary magnetic field. This magnetic field moves the relay armature for opening or closing the connections.

Relay boards are used in many different applications. Some products are used to control lights, motors, and other electronic devices in industrial and commercial applications. Others are also used to control heater temperatures, or are used in power switching applications Relay boards that are designed for specific types of industrial equipment are also available.

4) Laser Diode



Fig 5.4 Laser Diode

A laser diode is a semiconductor laser device that is very similar, in both form and operation, to a light-emitting diode (LED). The term laser originated as an acronym: Light Amplification by Stimulated Emission of Radiation. Hence, a laser is a device that emits light through a process of optical amplification based on the stimulated emissions of electromagnetic radiation.

5) Jumper cables



Fig 5.5 Jumper Cables

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with

breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

6) Breadboard

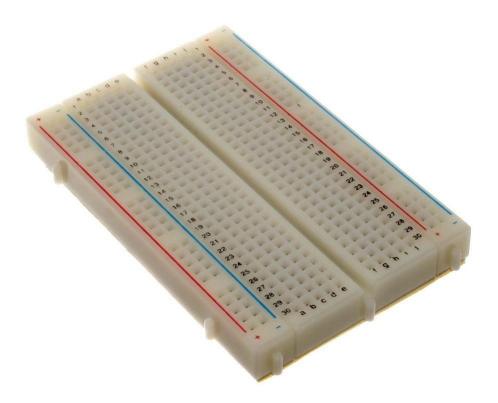


Fig 5.6 Breadboard

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an early version of) an electronic circuit. The connections are not permanent, so it is easy to remove a component if you make a mistake, or just start over and do a new project. This makes breadboards great for beginners who are new to electronics. You can use breadboards to make all sorts of electronics projects, from different types of robots or an electronic drum set, to an electronic rain detector.

CHAPTER 7

CONCLUSION

In this project an approach is taken to control automatic light with the help of various devices and the user was informed about the entry of the person through a PIR SENSOR at the receiver. This model can be efficiently utilized in houses, schools, offices etc. Since an effort has been made to reduce the consumption of (electrical) energy with this model, thus it is proven to be energy efficient. Hence this type of innovation will put a step forward towards the notion of conserving electricity which was being neglected until now mostly among the younger generations.

CHAPTER 8 REFERENCES

- www.circuit.io
- www.electronicshub.org www.ijcstjournal.org