

Automatic Room Light Controller using Microcontroller

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Abstract: Aiming the working process of Microcontroller and PIR sensor, the project first deals with the sensitivity detector of people inside a room using PIR sensor, then the paper optimizes the state of Microcontroller, its circuit diagram, coding principle and working procedure. Then the Relay driver section consist a BC547 transistor and a 5 volt relay for controlling the light bulb. Transistor is used to drive the relay. The digital World we are living in allows us to use different technologies to automatically perform certain tasks. Such automation is very useful in certain areas like energy consumption, reducing human efforts, improving standard of living etc. understand the application of PIR sensor, Microcontroller, relay module in this digital world, its future developments and applications in different fields.

Keywords: Microcontroller, PIR sensor, relay module, Room Light Controller.

I. INTRODUCTION

In this project, we will see the Automatic Room Lights using Microcontroller 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 your garages, staircases, bathrooms, etc. where we do not need continuous light but only when we are present. Also, with the help of an automatic room light control system, you need not worry about electricity as the lights get automatically off when there is no person. often, we see visitor counters at stadium, mall, offices, class rooms etc. How they count the people and turn ON or OFF the light when nobody is inside? Today we are here with automatic room light controller project by using Microcontroller. Automatic Room Lights System is a very useful project as you need not worry about 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 Microcontroller, PIR Sensor and the 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.

II. BRIEF DESCRIPTION ABOUT THE PROJECT

In this project we use different componants,they are-

- Microcontroller
- Relay (5v)
- Resistors
- PIR Sensor module
- 16x2 LCD display
- Bread Board
- Connecting Wires
- Led
- BC547 Transistor

PIR sensor section: The project of “Digital visitor counter” is based on the interfacing of some components such as sensors, motors etc. with arduino microcontroller. This counter can count people in both directions. This circuit can be used to count the number of persons entering a hall/mall/home/office in the entrance gate and it can count the number of persons leaving

the hall by decrementing the count at same gate or exit gate and it depends upon sensor placement in mall/hall. It can also be used at gates of parking areas and other public places.

This project is divided in four parts: sensors, controller, counter display and gate. The sensor would observe an interruption and provide an input to the controller which would run the counter increment or decrement depending on entering or exiting of the person. And counting is displayed on a 16x2 LCD through the controller.

When any one enters in the room, PIR sensor will get interrupted by the object then other sensor will not work because we have added a delay for a while.

Control Section: The 8051 Microcontroller is one of the basic type of microcontroller, designed by Intel in 1980's. This microcontroller was based on Harvard Architecture and developed primarily for use in [embedded systems technology](#). Normally, this microcontroller was developed using NMOS technology, which requires more power to operate. Therefore, Intel redesigned Microcontroller 8051 using CMOS technology and their updated versions came with a letter C in their name, for instance an 80C51 it is an 8 bit microcontroller. These latest Microcontrollers requires less power to operate as compared to their previous versions. The 8051 Microcontroller has two buses and two memory spaces of 64K X 8 size for program and data units. It has an 8 bit processing unit and 8 bit accumulator units.

Display section: Display section contains a 16x2 LCD. This section will display the counted number of people and light status when no one will in the room.

Relay Driver section: Relay driver section consist a BC547 transistor and a 5 volt relay for controlling the light bulb. Transistor is used to drive the relay because arduino does not supply enough voltage and current to drive relay. So we added a relay driver circuit to get enough voltage and current for relay. Arduino sends commands to this relay driver transistor and then light bulb will turn on/off accordingly.

➤ Circuit Diagram with Connections:

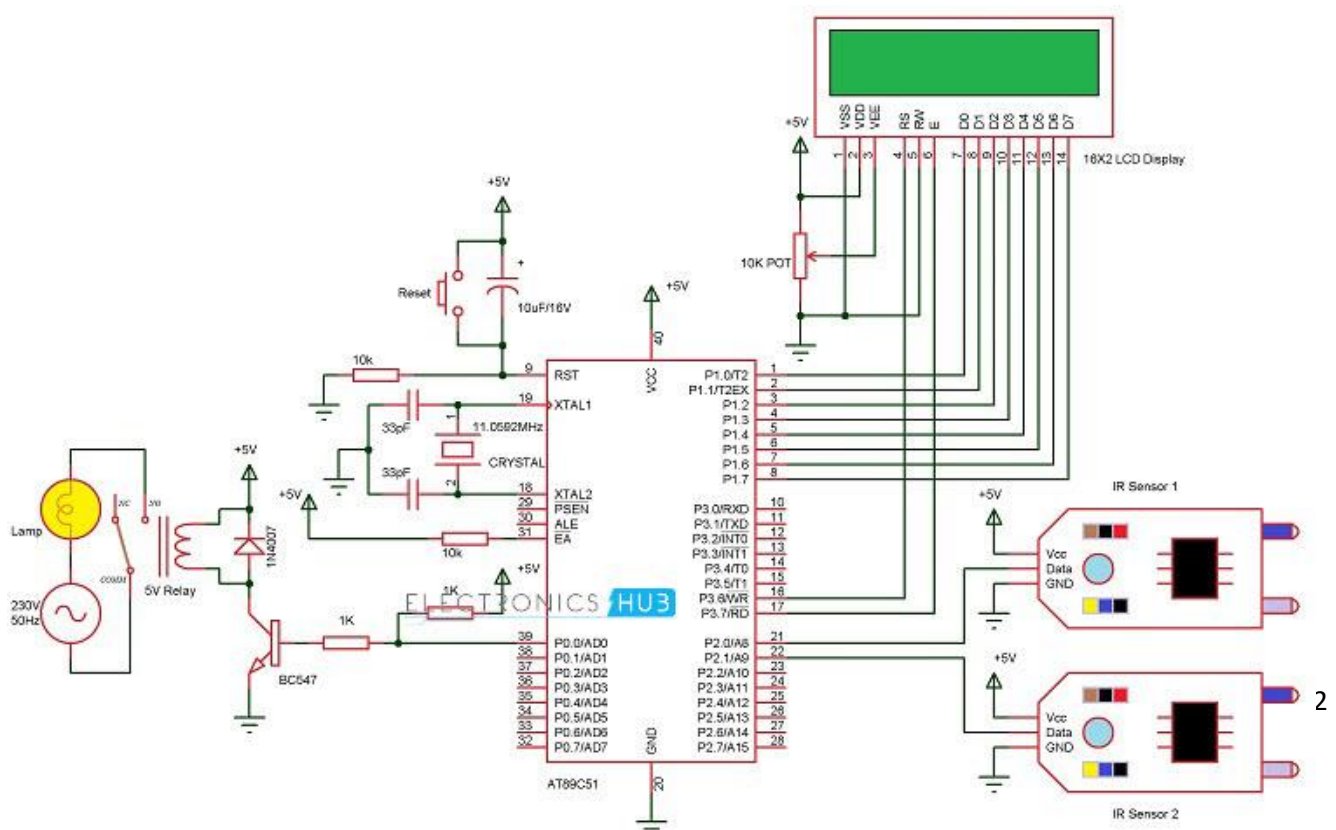
Let us see the design of the circuit for automatic room lighting project. The circuit diagram shows all the connections with respect to microcontroller. If you are doing this project on a development board, some of the connections mentioned in the circuit diagram might not be necessary. Also, we have used modules for Relay and IR Sensor and hence, the connections are shown with respect to those modules only. Corresponding circuit diagrams are also provided.

Coming to the circuit design, a 16 x 2 LCD Display, two IR Sensors and a 5V Relay Module must be connected to the 8051 Microcontroller. First, connect the 8 data pins of the LCD to PORT1 pins i.e. P1.0 to P1.7.

The 3 control pins of LCD i.e. RS, RW and E are connected to P3.6, GND and P3.7 pins respectively. A 10 KΩ Potentiometer is connected to contrast adjust pin of LCD i.e. its pin 3.

Two Reflective type IR Sensors are connected to PORT2 pins i.e. P2.0 and P2.1. Detailed circuit of the IR Sensor is mentioned in the Component Description.

The input of the 5V Relay is connected to PORT0 pin P0.0. The detailed circuit of the 5V Relay module used in the project is explained in the component description section. Alternatively, you can construct the circuit as per the circuit diagram (which consists of 5V Relay, Transistor, Diode and a Resistor).



III. Working of the project

In this project, an automatic room lighting system is developed using 8051 microcontroller.

The main component of the project is IR Sensor and we have used two of them. The placement of the sensors is important as it will determine the functioning of the project.

Practically speaking, both the sensors must be placed on the either side of the door or entrance of the room. The sensor placed on the outside of the room is named as Sensor 1 and the sensor, which is placed on the inside is named Sensor 2.

When a person tries to enter the room, Sensor 1 detects the person first and then Sensor 2. This action will indicate the 8051 Microcontroller that the person is entering the room.

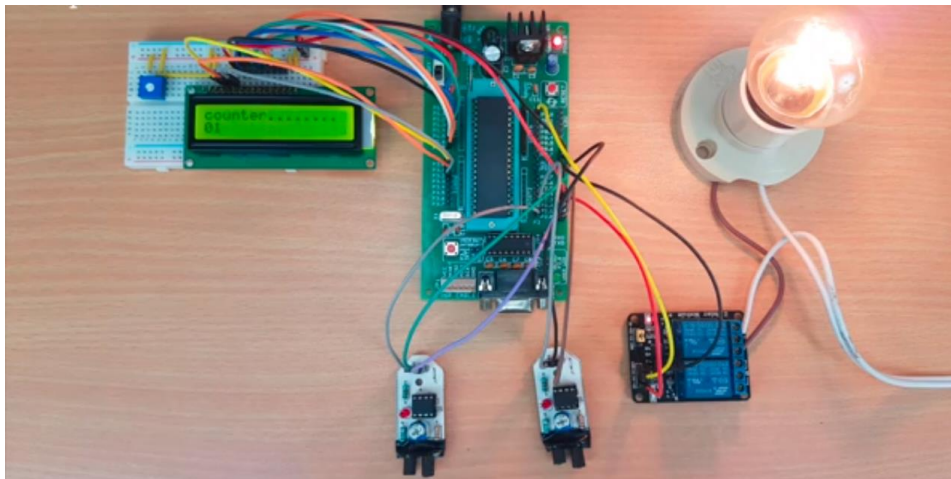
Hence, the microcontroller will turn on the light and also increments the visitor counter to 1. If there are more visitor, the microcontroller will keep the light turned on and increments the visitor counter accordingly.

When a person tries to leave the room, Sensor 2 detects the person first and then Sensor 1. This process will make the microcontroller to understand that a person is trying to leave the room and hence, it will decrement the count of visitors. The microcontroller will not turn off the light until the last person has left the room.

As the visitors start leaving the room, the visitor count will be decremented and when the last person leaves the room, the count becomes 0. During this point, the microcontroller understands that there is nobody in the room and turns OFF the light.

Caution: Be extremely cautious when using 230V mains supply.

IV. UNIQUENESS OF THE PROJECT



The Automatic Room Lights using Arduino and PIR Sensor is a simple project, where the lights in the room will automatically turn on upon detecting a human motion and stay turned on until the person has left or there is no motion. Working of this project is very simple and is explained here. 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. As a result, the output of the PIR Sensor becomes HIGH. Since the Data OUT of the PIR Sensor is connected to Digital Pin of 8051, whenever it becomes HIGH, 8051 will activate the relay by making the relay pin LOW (as the relay module is an active LOW module). This will turn the Light ON. The light stays turned ON as long as there is movement in front of the sensor. 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 8051 to turn OFF the relay (make the relay pin HIGH) and the room light will be turned OFF. This project can create a great impact on the society as it consumes power and help us to overcome our fault while leaving the room without turning off the lights. This is a unique project as it reduces power consumption and also we can store these powers for the beneficial of mankind in future.

V. BENEFITS AND PROBLEM-SOLVING AREAS OF THIS PROJECT

Automatic Room Lights System using 8051 microcontroller is a very useful project as you need not worry about turning on and off the switches every time you want to turn on the lights. So it consumes power and the efficiency can be increased respectively.

- Automatic Room Lighting with Bidirectional Visitor Counter can be used to automatically turn on the light in a room when a person enters the room and turn it off when the person leaves the room.
- The project can also be dubbed as a Bidirectional Visitor Counter it is an integral part of the Automatic Room Lighting circuit.
- The project can be modified with LEDs and as the number of persons in the room increases, the number of LEDs turning ON also increases

Further more,this model can be used in –

1. Automatic toilet flush valves.
2. Hand dryers.
3. Bathroom light controller.
4. Garage Lights
5. Security Lights
6. Traffic controller in highways
7. Power consumptions in different places like classrooms,office,Shopping malls,cinema halls,etc.

V. CONCLUSION

This automatic room light controller can be used in different places to decrease the power consumptions as well as to utilize the consumed power in different fields.The project consists of different electronic gadgets which are very cheap and maintain the sustainability throughout the project .This project can be a great movement towards the electric power generation as we all know that the power sources are decreasing day by day. Using further technologies we can utilize the consumed power in different sectors and also we can use this project as security alarm inspite using the led in the circuit diagram.The project can solve some daily life problems which we face while forgetting to turn off the room lights.This controller can sense the incoming persons in the room and automatically lit the led and also turn off the light when no one is present in the room.In this way power consumption can be optimized and store it for further usage.Our society will get various benefits in the fulfilment of this project.