

# PC Controlled Home Automation and Automatic Room Light Controller with Bidirectional Visitor Counter

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## ABSTRACT

With the rising power of technology, we are able to accomplish things at a much quicker rate. We have at the touch of a button access to large amounts of information due to the capability of computers. Not only has technology given us more information, but it also has given us the ability to communicate, organize, and manage our time. This report focuses on designing a microcontroller based home automation system which is controlled by a computer to switch On and switch Off various electrical and electronics devices and Automatic Room Light Controller with Visitor Counter which takes over the task of controlling the room lights as well as counting number of persons/visitors in the room very accurately.

**Keywords :** Arduino Controller, Methodology, Sensor Section, Hardware Implementation

## I. INTRODUCTION

A typical home automation system allows one to control house hold appliances from a centralized control unit. These appliances include lights, fans, air conditioners, television sets, security cameras, electronic doors, computer systems, audio/visual equipment, etc. These appliances usually have to be specially designed to be compatible with each other and with the control unit for most commercially available home automation systems. The project “Implementation of a Low-Cost Home Automation System”, demonstrates a system that can be integrated into a building’s electrical system and allows one to wirelessly control lights, fans, and turn on or off any appliance that is plugged into a wall outlet. The system can be controlled serially through laptop. Thus the installation cost and hardware cost is kept to a minimum as most users already own the requisite hardware such as laptop.

The system is capable of detecting when the user enters or leaves the room can accordingly turn on or off appliances such as lights and fans. The power supply for each appliance is wired through an electromechanical relay. A number of relays are used depending on the number of appliances to be 2 controlled. All the relays are controlled by a microcontroller. The microcontroller

is connected to the server via a USB interface. This makes it plug-and-play and compatible with virtually any PC. Automatic Room Light Controller with Visitor Counter using Microcontroller” is a reliable circuit that takes over the task of controlling the room lights as well as counting number of persons/visitors in the room very accurately. When somebody enters into the room then the counter is incremented by one and the light in the room will be switched ON and when any one leaves the room then the counter is decremented by one. The light will be only switched OFF until all the persons in the room go out. The total number of persons inside the room is also displayed on the seven segment displays.

## II. METHODS AND MATERIAL

### Methodology

Every Home Automation box is a stand-alone device. It is connected to the mains and controls the power outlet of the electrical device that is plugged into it. There will be a receiver (Microcontroller) and transmitter in each of the box, so they can exchange information with the master (a computer). Control of power supply of electrical devices in order to create an interactive home environment to facilitate the control without changing any home appliance. Home Automation boxes will be

put into different rooms at home, depending on the needed functionality. Various different sensors could be attached to the boxes.

### Block Diagram

The sensors are used as triggers for actions, that user can set up in the computer program. Relay driver IC ULN2003 is also used for driving relays. For instant, 5 volt SPDT 3 relays are used for controlling LIGHT, FAN and TV. Relays are connected to arduino through relay driver IC ULN2003 for controlling LIGHT, FAN and TV respectively.

Serial communication is used to control the home appliances. We send commands like LIGHT ON, LIGHT OFF, FAN ON, FAN OFF, TV ON AND TV OFF to control AC home appliances. After receiving the given commands, arduino send signal to relays which are responsible for switching on or off of the appliances. When we press ENTER after typing one of any given command on hyper terminal or serial terminal, arduino performs relative task like turning on the “fan” and likewise other tasks “Automatic Room Light Controller with Visitor Counter using Microcontroller” is a reliable circuit combined with home automation which takes over the task of controlling the room lights. When somebody enters into the room then the counter is incremented by one and the light in the room will be switched ON and when any one leaves the room then the counter is decremented by one. The light will be only switched OFF until all the persons in the room go out. The microcontroller performs the dual job by multiplexing both the tasks. It receives the signals from the sensors, and this signal is operated under the control of software which is stored in ROM. Microcontroller continuously monitor the Infrared Receivers, When any object pass through the IR Receiver's then the IR Rays falling on the receivers are obstructed this obstruction is sensed by the Microcontroller.

### A. Sensor section

In this section we have used two IR sensor modules which contain IR diodes, potentiometer, Comparator (Op-Amp) and LED's. Potentiometer is used for setting reference voltage at comparator's one terminal and IR sensors sense the object or person and provide a change in voltage at comparator's second terminal. Then

comparator compares both voltages and generates a digital signal at output. Here in this circuit we have used two comparators for two sensors. LM358 is used as comparator. LM358 has inbuilt two low noise Op-amp.

### B. Control Section

Arduino UNO is used for controlling whole the process of this visitor counter project. The outputs of comparators are connected to digital pin number 14 and 19 of arduino. Arduino read these signals and send commands to relay driver circuit to drive the relay for light bulb controlling.

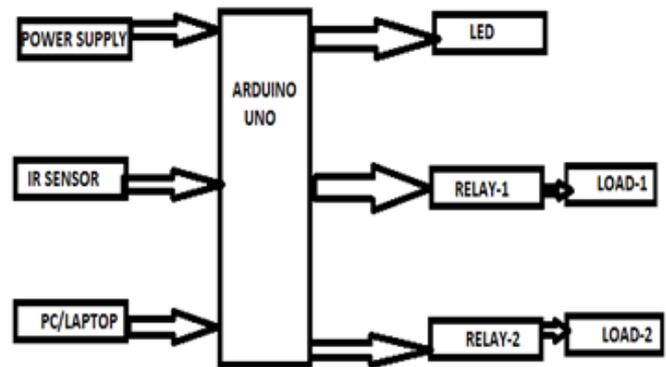


Figure 1 : Block diagram for home automation with embedded controller

### C. 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. A relay is electro mechanical switch which is used in industrial application to provide isolation between high voltage and low voltage circuits. These two circuits have different voltage rating. One might be a low voltage side and other high voltage side. A relay is electrical mechanical switch which is used for switching between 5 volt circuits and 220/ 120 Volt AC circuits. For example, in microcontrollers based circuits, relay is used to isolate microcontrollers from 220 volt AC supply.

## D. Arduino

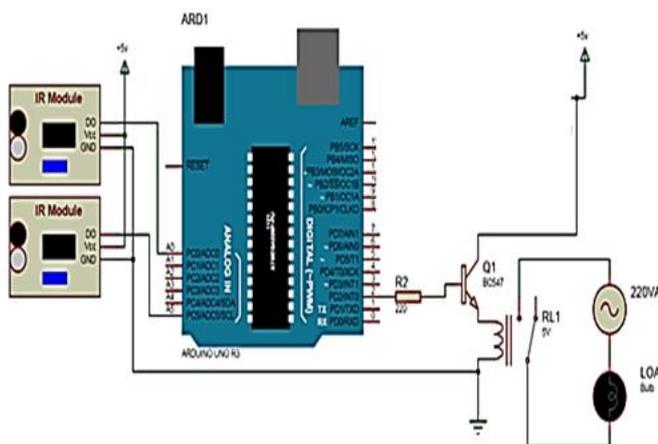
It is open source computer hardware and software company, project and user community that designs and manufactures microcontroller-based kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project is based on microcontroller board designs, manufactured by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can be interfaced to various expansion boards ("shields") and other circuits.

The boards feature serial communications interfaces, including USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino platform provides an integrated development environment (IDE) based on the Processing project, which includes support for the C, C++ and Java programming languages.

## III. RESULTS AND DISCUSSION

### Hardware Implementation

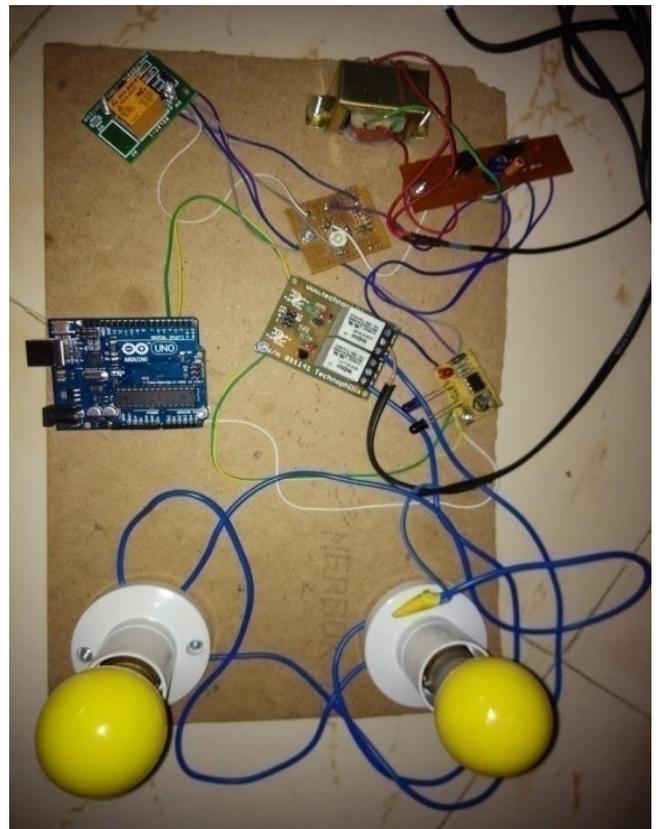
Circuit implementation of PC and automatic room light controller project with bidirectional visitor counter using arduino is shown in below Fig.,



**Figure 2 :** PC and automatic room light controller project with bidirectional visitor counters using arduino

Hardware implementation of a microcontroller based home automation system which is controlled by a computer to switch On and switch Off various electrical

and electronics devices and Automatic Room Light Controller with Visitor Counter which takes over the task of controlling the room lights as well as counting number of persons/ visitors in the room very accurately.



**Figure 3 :** Hardware implementation of PC and automatic room light controller project with bidirectional visitor counters

## IV. CONCLUSION

The proposed system is to offer a low-cost solution for a home automation system. The system provides basic control of appliances at a fraction of the cost of commercially available systems. The concept of a proprietary control device is done away with as the system can be controlled from a PC or laptop. There is no need for a specialized server system as a typical desktop PC can act as the server. Nowadays most users already own the requisites such as a laptop and a desktop PC; hence the cost of the system is considerably reduced. The system can be easily integrated into an existing electrical system of a building to its simplified design. It can also be easily installed for just a single room if one so desires. Modifications to the existing electrical system are minimal, thereby reducing installations costs.

## V. REFERENCES

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