Bidirectional Visitor Counter with security system and Automated Room Light Controller

Saikat Sarkar[1], Satyaki Nan[2], Pryanikar Ghosh[3], Moinak Adhya[4], Sandip Kumar Singh[5], Avali Ghosh[6]
Department of Electronics and Communication Engineering
Guru Nanak Institute of Technolgy
157/F Nilgunj Road, Panihati, Sodepur, Kolkata - 700114

Abstract—**This paper describes a circuit which is used for controlling the room lights according to the count of persons in the room and simultaneously works as a security system when the camera is attached. When somebody enters into the room then the counter will be incremented accordingly the LED light in the room will be switched ON and when any one leaves the room then the counter will be decremented. The light will be only switched OFF when the room is vacant. The number of the LED lights will be ON according to the total number of persons inside the room and the count will be displayed.**

Keywords— *LED, Microcontroller, Infrared, IR Sensor, Security system.*

I. INTRODUCTION

There is a necessity for automatic appliances in day today life. So developing an automatic circuits will be helpful. At present a user has to switch ON and OFF the lights according to his/her requirement. Since the user can switch on and off the lights as per their preferences so there is a chance of keeping the lights in on state even though it was not required. This may occur because of carelessness of user and so a large amount of power is wasted.

The most commonly used lighting control system used in buildings may cause wastage of valuable energy. The energy loss is occurred when a light is ON in an area which is not being used currently at that particular time or when a light is ON even though sufficient lighting is available for work.

This paper describes a microcontroller based model used to count the number of persons entering in a particular room and accordingly LEDs in the room will be ON and simultaneously send the picture of the person entering or leaving the room to the user for security purpose. Infrared sensors are used to count the number of persons. This circuit also serve as the security system by sending the picture of the person entering and leaving the room. The main purpose of our proposed system is to save energy by making the lights ON or OFF according to the presence of the person in a room, to reduce the efforts required to switch on the lights and for the security reasons.

II. CIRCUIT DESCRIPTION

The proposed system is mainly two major parts and they are hardware and software.

A. Hardware Description

1) Arduino UNO: It is a microcontroller board based onATmega328. It has 14 digital input/output pins , 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.
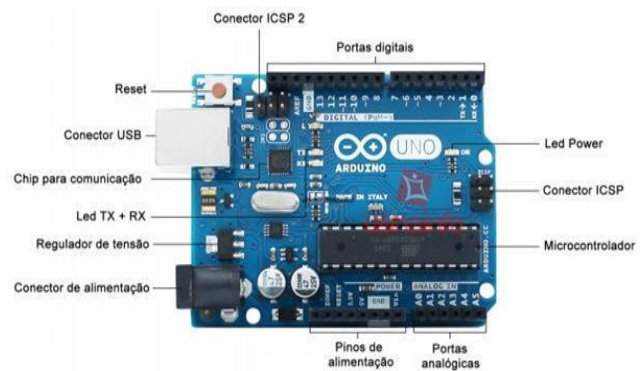

Fig. 1. Microcontroller Board

2) Relay: A relay is an electromagnetic switch operated bya relatively small electric current that can turn on or off a much larger electric current.
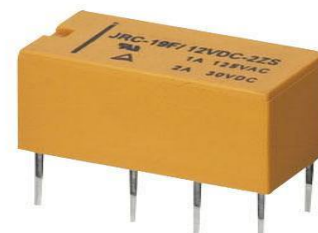

Fig. 2. Relay

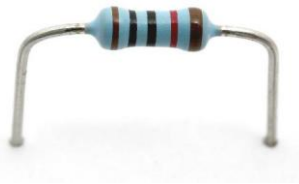*3) Resister:* It is a electronics passive device which opposethe flow of current through it.

Fig. 3. Resister

4) IR Sensor Module: It is an electronic instrument whichis used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.
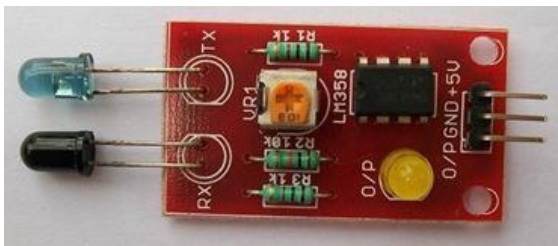

Fig. 4. IR Sensor

5) LCD Display: LCD (liquid crystal display) is thetechnology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies.
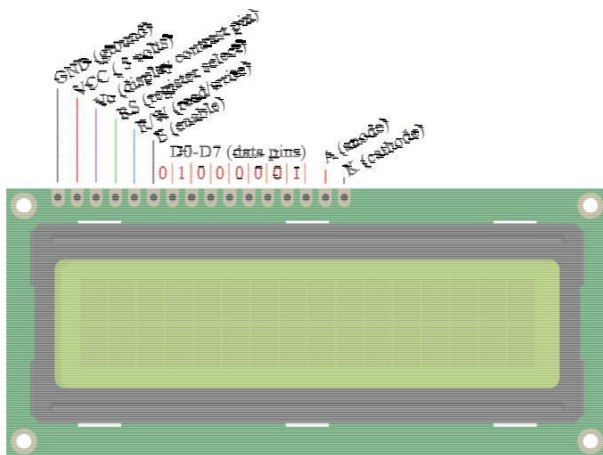

Fig. 5. LCD Display

6) LED: A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode, which emits light when activated.

Fig. 6. LED

7) Transistor: A transistor is a semiconductor device usedto amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit.
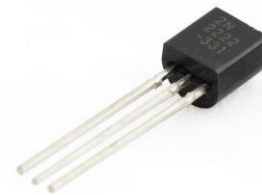

Fig. 7. Transistor

8) Breadboard: A breadboard is a construction base for prototyping of electronics. It is used to design circuits with the electronics components.
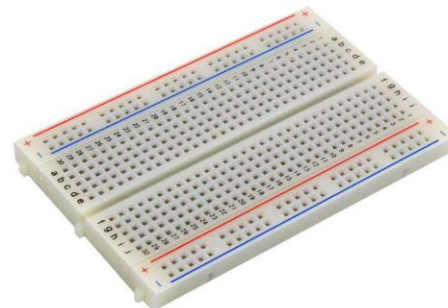

Fig. 8. Breadboard

9) Webcam: A webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network.

Fig. 9. Webcam

B. Software Description

1) Arduino 1.8.1: It is a software based on EmbeddedC for assisting the projects based on ARDUINO. Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems.
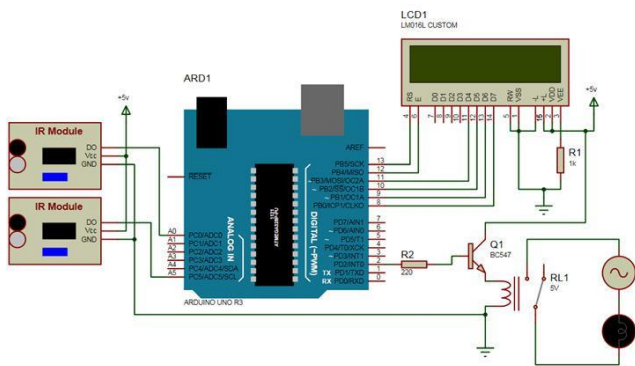
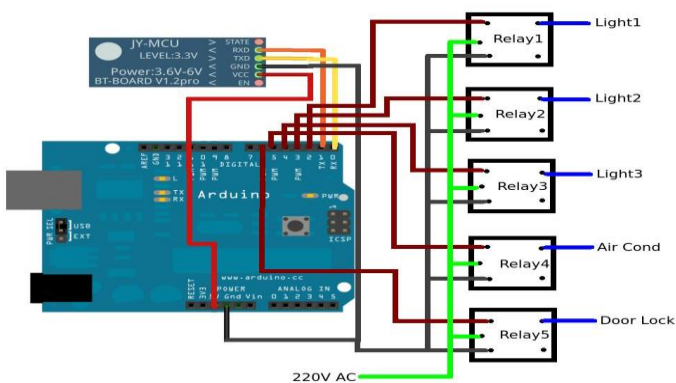### C. Total Circuit

Fig. 10. Circuit for the proposed system

Fig. 11. Block Diagram of the proposed System

III. WORKING PRINCLIPLE

The proposed system is mainly divided into five important sections and they are Sensor, Controller, Counter display, Gate and Camera sections. At first the sensor will observe an interruption and provide an input signal to the controller which will run the counter. The counter is incremented or decremented depending on the entry or exit of the person in a particular room and counting is displayed on a 16x2 LCD through the controller. A camera installed at the door which will capture the image of the person.

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.
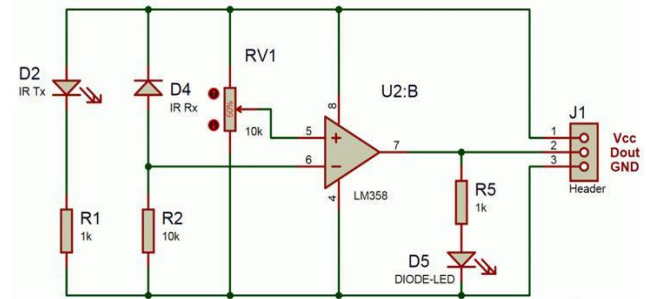

Fig. 12. Sensor Section

B. Control Section

Arduino UNO is used for controlling the 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 relays for light bulb controlling.

C. Display Section

Display section contains a 16x2 LCD. This section will display the counted number of people entering and outgoing and light status in the room.

D. Relay Driver Section

Relay driver section consist a BC547 transistor and 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. Arduino sends commands to this relay driver transistor and then light bulb will turn on/off accordingly.

E. Camera Section

A camera installed infront of door captures image of person entering as soon as the door bell is pressed and stored in the laptop. When the owner verifies the person he/she opens the door.

IV. CONCLUSION

This paper describes a circuit which is used for controlling the room lights according to the count of persons in the room and simultaneously works as a security system when the camera is attached. When somebody enters into the room then the counter will be incremented accordingly the LED light in the room will be switched ON and when any one leaves the room then the counter will be decremented. The light will be only switched OFF when the room is vacant. The number of the LED lights will be ON according to the total number of persons inside the room and the count will be displayed.

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