

Bidirectional Visitor Counter with Automatic Room Light Controller and Arduino as the master controller

Subhankar Chattoraj*, Aditya Chakraborty**

*Department of Electronics & Communication Engineering Techno India University, Salt Lake Main Campus, EM /4 Salt Lake

**Department of Electronics & Communication Engineering Techno India University, Salt Lake Main Campus, EM /4 Salt Lake

Abstract- In today's world, there is a continuous need for automated appliances. With the increase in the living standards, there is an immediate need for developing circuits that would change the complexity of life to simplicity. This Project title "Bidirectional Visitor Counter with Automatic Room Light Controller and Arduino as the master controller" is designed and presented in order to count the visitors of an auditorium, hall, offices, malls, sports venue, etc. The system counts both the entering and exiting visitor of the auditorium or hall or other place, where it is placed. Depending upon the sensors interruption, the system identifies the entry and exit of the visitor. On the successful implementation of the system, it displays the number of visitor present in the auditorium or hall. This is an economical cost reducing system when implemented in places where the visitors have to be counted and controlled. Counting the visitors can be time consuming so it helps to maximize the efficiency and effectiveness of employees, time saving and sales potential of an organization, etc.

Index Terms- IR Sensor Module, Arduino, Arduino (IDE), Counter

I. INTRODUCTION

Bidirectional Visitor Counter with Automatic Room Light Controller is a reliable Circuit that takes over the task of controlling the room lights as well as counting number of person's visitors in the room very accurately when somebody enters into the room then the

Counter is incremented by one value and the light in the room will automatically switched ON and when any one leaves the room then the counter is decremented by one value and 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 LCD displays. The Arduino Uno does the above job. It receives the signals from the sensors, and this signal is operated under the control of software called Arduino(IDE). Also in addition the total number of person in the room be incremented value or decremented value will always be displayed in the LCD thus makes this system a very user friendly.

II. HARDWARE PLATFORM

The hardware part mainly consists of a digital computer, an Arduino Uno board, Infrared Sensor module, LM358, 16x2 LCD

displays, BD139 Transistor which is being discussed along with their specific functions.

A. Arduino Uno

An Arduino board [1] historically consists of an Atmel 8-, 16-or 32-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which let users connect the CPU board to a variety of interchangeable add-on modules termed shields. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I²C serial bus—so many shields can be stacked and used in parallel. It provides 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. This board has a 5 volt linear regulator and a 16 MHz crystal oscillator.

B. Infrared Sensor Module

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. The radiations are invisible to our eyes, which can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED.

C. Dual Operational Amplifiers (LM358)

LM358 [2] is a devices consist of two independent, high-gain frequency compensated operational amplifiers designed to operate from a single supply or split supply over a wide range of voltages. It has Wide Supply Ranges. Single Supply is 3 V to 32 V and Dual Supplies: ± 1.5 V to ± 16 V.

D. Liquid Crystal Display (LCD)

Liquid Crystal Display screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The

command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

E. Transistor (BD139)

The BD139 [3] is a through hole NPN complementary low voltage transistor in TO-126 (SOT-32) package. This device manufactured in epitaxial planar technology. Used for audio amplifiers and drivers, utilizing complementary or quasi complementary circuits. Collector to emitter voltage (V_{ce}) is 80V, Collector current (I_c) is 1.5A, Power dissipation (P_d) is 12.5W, Collector to emitter saturation voltage of 500mV at 0.5A collector current, DC current gain (hFE) of 25 at 0.5A collector current and Operating junction temperature range from 150°C

III. METHODOLOGY

In this paper our main aim is to propose model for visitor counter. Proposed system architecture is shown in Figure 1.1

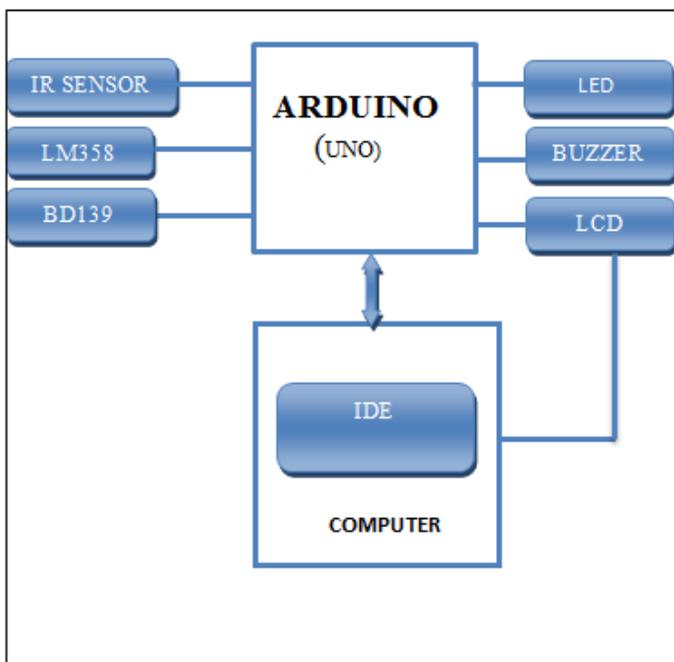


Fig 1.1.A block diagram representing the circuit developed

The System is based on the interruption of IR beam. An IR beam is used as the source of light beam. Bidirectional Visitor Counter with Automatic Room Light Controller and Arduino as the master controller has two sections. The transmitter is a IR diode. It should be powered with 5 volt DC supply and fixed on one side of the door frame. The receiver has a RX at the front end.

A. Monitoring Arduino Reading

Arduino enables users to monitor various kinds of sensors such as IR sensor and motion detectors in real-time. The analog

and digital pins on the Arduino board can serve as general purpose input and output pins (GPIO). Usually The ATmega328 microcontroller embedded on the Arduino board contains the analog-to-digital converter (ADC), which converts the analog input signal to a number between 0 and 1023.

The integer number is always proportional to the amount of the voltage being applied to the analog input. Any sensor operating on 5 volts can be directly connected to the Arduino board. The prototype has been implemented on the board

B. Controlling Actuators

The triggering is finally done by Arduino gateway. While monitoring sensors in real-time. The Arduino takes action in real time to control the on/off of the led and controlling the buzzer.

In this system it has two section one the transmitter section where the power supply and the light output is given. The other one is the receiver section where light input is taken and implemented on enters sensor circuit and exit sensor circuit.

C. System Protection

Often absurd variation in power supply results in damaging the components of the system. When the BD139 transistor is fed with the input power supply and supplies the outputs to the components it not only provides a liner power supply but also protects from the power surges.

D. Infrared Sensing System

The IR sensor modules 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 one for enter sensor & second for exit sensor circuit.

E. Counter Display

In this section we have used LCD to display number of persons in the room. The system is designed using the Arduino(IDE) platform. When Arduino check for zero condition (Zero condition means no one in the room) and finds it is true then Arduino turn off the bulb by deactivating the relay through transistor. And if zero condition is false then Arduino turns on the light. Here is two functions for enter and exit. This increment or decrement is displayed in LCD.

IV. EXPERIMENTAL EVALUATION

In order to implement and demonstrate the system developed theoretically, we created a prototype that represents the system. Thus the whole system that is being developed is given below, (Fig. no: 1.2).

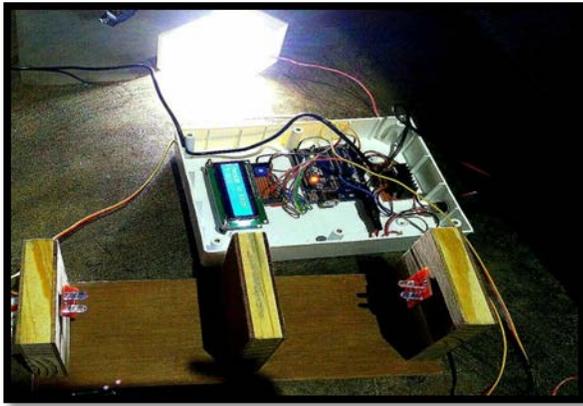


Fig.1.2: Complete Circuit

From this figure given here we can see different parts of the circuit board that is developed, which is connected with the Arduino's digital and analog pins where it is required.

The image of the visitor counter panel designed by Arduino(IDE) is given above which consists of all the components mentioned above.

V. DISCUSSIONS AND CONCLUSIONS

A novel architecture for an economic bidirectional Visitor Counter and room lighter controller is proposed and implemented in this paper. It gives basic idea of how to control the bidirectional visitor counter and room light counter using Arduino Uno and Ardiono(IDE). The cost of this technology is very economical. This project uses low cost off the shelf components, and is based on Arduino platform which is FOSS (Free Open Source Software). So the overall implementation cost is very cheap and is affordable by a common person. This low cost system is designed to improve the living standard and complexity of visitors counting.

It provides accurate data and eliminating the error where possible.

For future work, some recommendation can be made like, addition of cameras through with not only counting but also the image can be stored precisely. Wireless connectivity can be added to system, by controlling the Wi-Fi modules.. The whole system can be fabricated as economic commercial hardware package.

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AUTHORS

First Author – Subhankar Chattoraj is currently pursuing bachelors in Electronics & Communication Engineering from Techno India University, Salt Lake Main Campus, EM /4 Salt Lake.
E-mail: chattorajsubhankar@gmail.com

Second Author – Aditya Chakraborty is currently pursuing bachelors in Electronics & Communication Engineering from Techno India University, Salt Lake Main Campus, EM /4 Salt Lake.
E-mail: adityachakraborty93@yahoo.com