AUTOMATIC ROOM CONTROLLER WITH BIDIRECTIONAL VISITOR COUNTER

Catherine Thomas
Department of ECE, Vidya Academy of Science and Technology
Kerala, India 680501
Email: catherinethomasc@gmail.com

Abstract

The project "Automatic Room Controller with Bidi-rectional Visitor Counter" is a reliable circuit that takes over the task of controlling the room lights and fans as well as counting number of visitors in the room very accurately. When somebody enters into the room then the counter is incremented by one and based on the light intensity of the room the light and fan in the room will be switched ON. When any one leaves the room then the counter is decremented by one. The light will be switched OFF only when all the persons in the room go out. The total number of persons inside the room is also displayed on the LCD display. The microcontroller does the above job. It receives the signals from the sensors, and this signal is operated under the control of program which is stored in ROM. Microcontroller ATmega328 continuously monitor the IR sensor. When any object pass through the IR sensor then the IR Rays falling on the receivers are obstructed. This obstruction is sensed by the microcontroller and counts the number of persons inside the room, according to the entering and leaving directions..

Index Terms: Counter, LCD, Microcontroller ATmega328, IR sensor

I. INTRODUCTION

In this digital world we need every possible thing around us to be automatic which reduces human efforts. There are increasing electronic circuits that make today's life easier and simple. Nowadays Energy Crisis is the big problem faced by everyone. So there is a need to conserve energy. This project is very useful for such problems as one generally forgets to turn off lights and fans while leaving a room. The aim of this is to make an automatic controller based prototype to count the number of individuals entering in the particular room and accordingly light up a room. This project has two parts. One is individual count and other is automatic control of light and fan. IR sensors are used to detect number of individuals entering in a room. This circuit counts the number of individuals and displays the count on the LCD display to avoid congestion.

This project is very helpful in schools and colleges for their auditorium. "Automatic room controller with birectional visitor counter" as the name specifies that it controls the task of counting the number of individuals and lights of a room with accuracy. When an individual enters into a room then one counter is incremented by one and one, light and fan in a room will be switched ON and when the individuals leaves a room then the counter is decremented by one. When there is no individual in a room then light and fan will be switched off automatically.

A. Survey of Existing Systems

In the past years, several well established institutions (libraries, community centers, auditorium, etc.) across the globe have encountered various incidents related to traffic monitoring. It has been a necessity to monitor the visitors to carry out the human traffic management task and tourist flow estimate to maintain accurate result for the organizational marketing and statistical research. This eventually indicates the patronage rate of goods and services by consumers. Therefore, we deem it appropriate to identify these problems encountered by our various organizations and find solutions to them by designing a digital bidirectional visitor counter (DBVC).

The primary method for counting the visitors involves hiring human auditors to stand and manually tally the number of visitors who enter or pass by a certain location.The human auditing application or the human-based data collection was unreliable and came at great cost. For instance, in situations where a large number of visitors entering and exiting buildings such as conference rooms,law courts, libraries, malls and sports venues, going for human auditors to manually tally the number of visitors may result in inaccurate data collection. For this reason, many organizations have tried to find solutions to mitigate the inaccurate traffic monitoring issues. It is our intention to design and construct this digital bidirectional visitor counter (DBVC) with maximum efficiency and make it very feasible for anyone who wants to design and construct the prototype. Building this circuit will provide information to management on the volume and flow of people in a building.

Energy loss is occurred with a lighting system when the lighting system illuminates a light which is an area which is not being used currently at that particular time or when it illuminates a light even though sufficient lighting is available to work. The most commonly used lighting system is operated manually. In this method a user has to switch ON and OFF the required lights. Since the user can switch ON and OFF the lights as per their preferences there is a chance of keeping the lights in on state even though it was not need during that time. This may occur because of carelessness of user and a large amount of power is wasted.

II. SYSTEM ARCHITECTURE

General block diagram of the proposed system as shown in Figure 1 below. The proposed idea is designed in embedded platform.
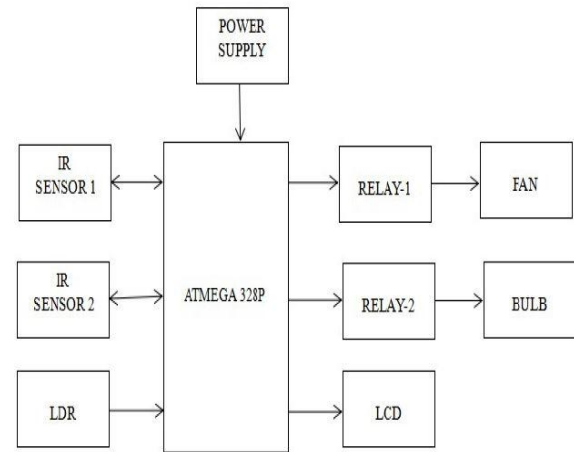

Fig. 1. Proposed Design

Mainly this block diagram consist of the following essential blocks.

A. ATmega 328P

Arduino board is programed to control loads in accordance with the number of persons in the room. Arduino is an open source electronics prototyping platform based on flexible, easy-to-use hardware and software. It is intended for artists, designers, hobbyists, and anyone interested in making interactive objects or environments. The Arduino UNO board is based on the ATmega328 microcontroller. It consists of 14 digital input or output pins, six analogue inputs a USB connections for programming the on- board microcontroller, a power jack, an ICSP header and a reset button it is operated with a 16MHz crystal oscillator. It contains everything needed to support the microcontroller. It is very user friendly; simply connect it to a computer with USB cable to get started.
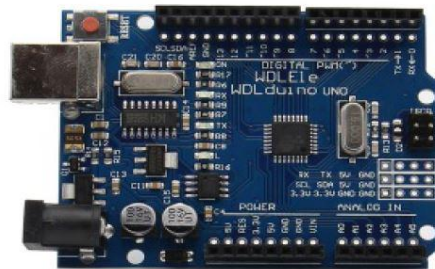

Fig. 2. Arduino UNO board

The microcontroller on the board is programmed us-ing Arduino programming language and arduino develop-ment environment. The ATmega328/P provides the features: High Performance, Low Power Atmel-AVR 8-Bit Microcon-troller Family, advanced RISC

Architecture, 32 x 8 General Purpose Working Registers, 32KBytes of In-System Self-Programmable Flash program memory, 1KBytes EEPROM, 2KBytes Internal SRAM, Programmable Serial USART, 23 Programmable I/O Lines, Operating Voltage: 1.8 - 5.5V, Speed Grade: 0 - 4MHz@1.8 - 5.5V, 0 - 10MHz@2.7 - 5.5.V, 0 - 20MHz @ 4.5 - 5.5V.

B. IR Sensors

IR sensor has transmitter and receiver. Here IR transmitter and IR receiver is attached near the door. Whenever a person is detected the receiver receives signal from transmitter and sends it to microcontroller.

Fig. 3. IR Sensor

The features of IR transmitter are Lamda is 880nm, Chip material is AlGaAs, Package type: T-1 3/4 (5mm lens diam-eter), Matched photosensor: QSD123/QSD124, Medium wide emission angle is 30 degree, High output power.

C. LCD 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 and even custom characters (unlike in seven segments), animations and so on. A 16x2

Fig. 4. LCD display

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.

D. Relay

This module controls the electric appliances. In common, the room appliances operate on 220 V. So, the single relay module turns on and off these appliances of the room in accordance with the output of bidirectional visitor counter. Single relay module is designed using 5 V DC-220 V AC relay. Relay is triggered by the signal asserted on GPIO pin of microcontroller. As soon as the count is incremented from zero, the relay module triggers and turns on the appliances. The relay moves back to its initial condition only when count falls to zero again.

Fig. 5. Relay

E. LDR

A photoresistor or light dependent resistor is a component that is sensitive to light. When light falls upon it then the resistance changes. Values of the resistance of the LDR may change over many orders of magnitude the value of the resis-tance falling as the level of light increases. It is not uncommon for the values of resistance of an LDR or photoresistor to be several megohms in darkness and then to fall to a few hundred ohms in bright light. With such a wide variation in resistance, LDRs are easy to use and there are many LDR circuits available. The sensitivity of light dependent resistors or photoresistors also varies with the wavelength of the incident light. LDRs are made from semiconductor materials to enable

Fig. 6. LDR

them to have their light sensitive properties. Many materials can be used, but one popular material for these photoresistors is cadmium sulphide, CdS.

F. Power Supply

The main function of this block is to provide the required amount of voltage to essential circuits. +5V is given to two IR sensors, two relays, LCD display and controller.

III. SYSTEM DESIGN AND WORKING

The circuit diagram for the proposed system is shown in Figure 7 below. The circuit is drawn using Proteus-ISIS Professional v7.7. Circuit diagram consist of two IR sensor,
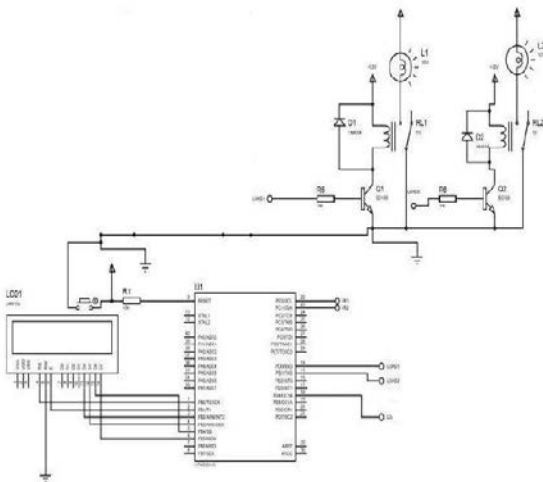

Fig. 7. Circuit Design

two relay, LCD and LDR. The IR transmitter will emit IR signal and at the receiver TSOP1738 (Infrared receiver led)is used. The output goes low when there is an interruption and it return back to high when there is no obstacle to the ray. Input is given to the pin 8 and 9 of the Arduino microcontroller. Pin 11 and 12 is used for the connecting loads using relay for turn ON and turn OFF purpose. In this bidirectional circuit two infrared (IR) sensor components are used for up and down counting, respectively. Whenever an interruption is observed by the IR sensor 1 and IR sensor 2

respectively then counter is incremented. And whenever the IR sensor2 and IR sensor 1 respectively detects any obstacle, the counter is decremented. The number of interruption count depend upon the sensors input and displayed on a LCD. LDR is connected to pin A0 of the controller to sense intensity of light. Whenever the count become greater than or equal to one, then fan get turn ON and light get turn ON depending up on the LDR sensed value or intensity of light inside the room. An arduino relay of 5v is used to connect loads.The relay has two different types of electrical contacts inside normally open (NO) and normally closed (NC). The one you use will depend on whether you want the 5V signal to turn the switch on or turn the switch off. The 120- 240V supply current enters the relay at the common (C) terminal in both configurations. To use the normally open contacts, use the NO terminal. To use the normally closed contacts, use the NC terminal. The signal pins of relay is used to create connection with arduino.Loads are provided with a 220v supply.

IV. RESULTS OF IMPLEMENTATION

The proposed system is implemented as shown in Figure 8. The number of persons inside the room is counted by using IR sensors. The count is displayed in the LCD. According to the count value loads are controlled by the controller.
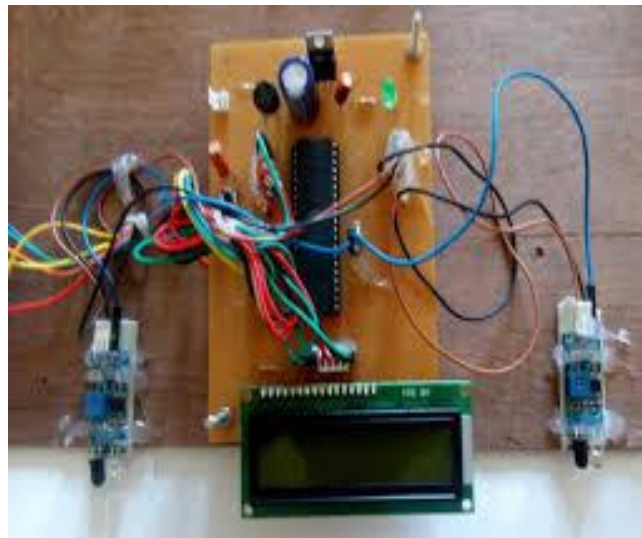

Fig. 8. Implemented Model

V.   CONCLUSION

This project compacts with the usage of the energy in this competitive world of electricity. it is well-organized enough to let someone know about the accuracy of the person entered and have taken the exit from the room. In any big hall if we want to

count number of individuals it is very difficult as it results in congestion and disturbance to the whole Class. This project turns out to be serving hand in such situation because it gives the count on LCD display. Also it controls the lighting system automatically according to how many persons are there in a room. Saves more electric power than it seems and also collaborates the knowledge of electric and digital study. One can be knowledgeable about two different study at the same time with this project. It not only teaches us about the functioning of the circuit but also teaches us how we can preserve electricity even in the electricity based project.

VI. FURTHER SCOPE

By using this circuit and proper power supply we can add various loads depending on applications such as fans, tube lights, A/C, kitchen exhausters, heater etc.

By modifying this circuit we can achieve a task of opening and closing the door.

Voice alarm system can be added to indicate that room is full and person cannot enter inside.

In future, we can send this data to remote areas using mobile or internet

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