

IOT INTERNSHIP REPORT

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ABSTRACT

In this project, we will make a Object Counter System with an Automatic Light Control System using Arduino. This project is based on a pair of Infrared Sensor that detects interrupt when it detects an obstacle. The pair of IR sensors can detect the visitor from both directions, i.e. the number of entering visitors and the number of exiting visitors.

This Arduino Bidirectional Visitor Counter Project can be used to count the number of persons entering a hall, Shopping mall, office, functions in the entrance gate. It can also be used at gates of parking areas and other public places. The device counts the total number of people entering through the gate and also the total number of people leaving through the same gate. And finally, it counts the total number of people currently present inside the room. When no people are inside the room, i.e. the total number of people is zero then the room light is turned off. When even a single person is found inside the room, the light turns on. The light control system is automatic based on the visitors' presence.

We can make the entire project using a single Arduino Nano Board. We can use a 16x2 LCD Display to show the number of visitors. But you can prefer a 0.96" OLED Display for the project. A 5V Single channel relay gets activated when a person is detected inside a room. The light turns ON automatically which is connected to the Relay.

The microcontroller is used for detecting an entry or exit action and computing the figures (addition and subtraction) to acquire accurate results. It receives the signals from the sensors, and this signal is operated under the control of embedded programming code which is stored in ROM of the microcontroller. The microcontroller continuously monitors the Infrared Receivers. When any object pass through the IR Receiver's then the IR Rays falling on the receivers are obstructed. The obstruction occurs under two circumstances, either you obstruct sensor 1 (i.e. outside the building) before sensor 2 (i.e. which is inside the building) this shows that you are entering the building or you do it the other way round, which is obstructing sensor 2 before sensor 1 to indicates an exit movement. This obstruction is sensed by the Microcontroller, computed and displayed by a 16x2 LCD screen. Keywords: Digital bidirectional visitor counter, IR Rays/Receivers, Microcontroller, Liquid Crystal Display and Circuit.

INDEX

Chapter No	Title	Page No.
1	Introduction	1
2	Aim and Objectives 2.1 Problem statement 2.2 objectives 2.3 Methodology 2.4 Specification of the System	9
3	Block Diagram of the system and its explanation 3.1 Arduino 3.2 IR 3.3 OLED Display	11
4	Hardware Design	14
5	Software Programming	16
6	Test Result And Analysis	19

List Of Figures

Figure No.	Title	Page No
3.1	Block Diagram of the system	11
3.2	Arduino	12
3.3	IR	12
3.4	Oled Display	12
4.1	Hardware Design	13
5.1	Proteus	16

Introduction

Object counter using Arduino and Infrared Sensors- In this article we are going to make a bidirectional visitors counting system using Arduino, a pair of Ultrasonic Sensors, and an Oled display module. The Arduino visitors counter will help us in maintaining the number of people who go in and out of a venue or a shop and maintain a maximum limit on the number of people inside it and hence help to maintain social distancing and reduce the transmission of covid-19. So let's get started so as you can see in the poster here there are a number of people waiting outside the shop and at the door there's a device and that is the device we are going to make it, a visitors counter and it counts the number of people going in or out of the shop or the venue and that's exactly what we are going to make. Counting visitors can be quite handy in situation when you need to keep track of all the visitors inside a building, room, or any place. Counting visitors can be implemented using different techniques, you can also make the same visitor counting system using IR sensors, But the reason I am using Ultrasonic sensor is that it's detection range is higher than the IR Sensors. You can also implement the same version of the Visitor counting system using PLC .

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 vindicate 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

2.Aim And Objectives

2.1Problem Statement

To Automatically count objects and monitor the count for display.

3.2 Objectives

This Project 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.

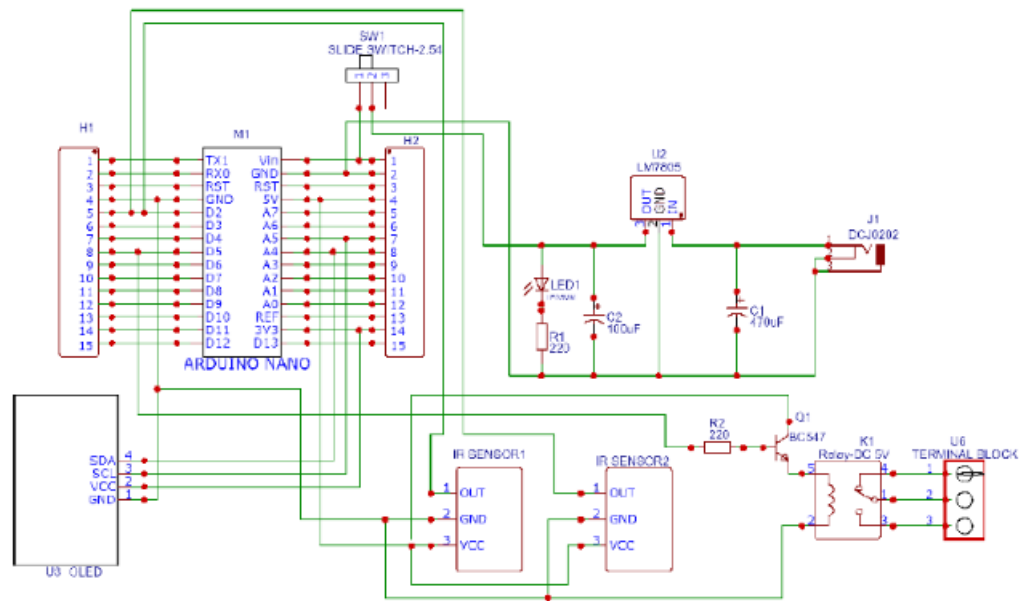
3.3 Methodology

This section introduces the methodology involved in the design and construction of the Digital ObjectCounter . Using the Takoradi Polytechnic Library crowd management situation as a case study, it was realized that the library's capacity often gets exceeded during its peak usage period (examination period) and therefore makes the environment uncomfortable for learning. This problem was studied by visually observing students reaction anytime the library's capacity was exceeded. Another study was made on the Melcom tragedy incident, whereby the exact number of people trapped in the collapse building was unknown. False information about the number of people trapped was given to the rescue team at their arrival, but they ended up rescuing more survivors than the expected number revealed to them. This means a lot of people could have died if the rescue team relied on the information given to them.

3.4 Specification of the System

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.

3. Block Diagram of the system and its explanation.

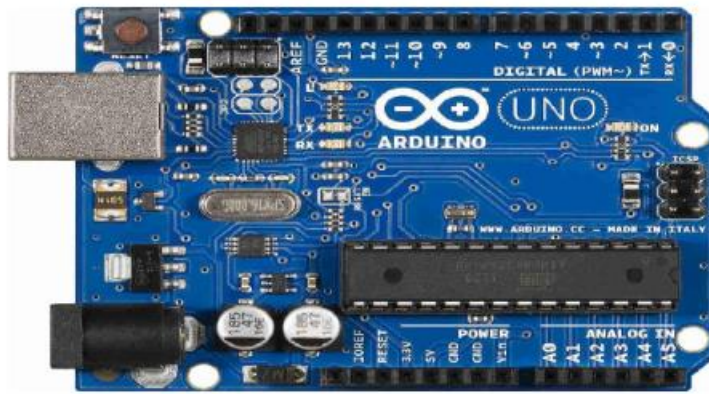


Arduino

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are –

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.



INFRARED SENSORS

Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations. Hence, they are called IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye.

Infrared receivers detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation.

The basic concept of an Infrared Sensor which is used as Obstacle detector is to transmit an infrared signal, this infrared signal bounces from the surface of an object and the signal is received at the infrared receiver.

The IR sensor VCC and GND pins are connected to the corresponding pins of the Arduino board and the OUT pin of the sensor is connected to Arduino pin 6.

We have include a buzzer and an led connected to pin 5 and pin 4 of the Arduino Board respectively.

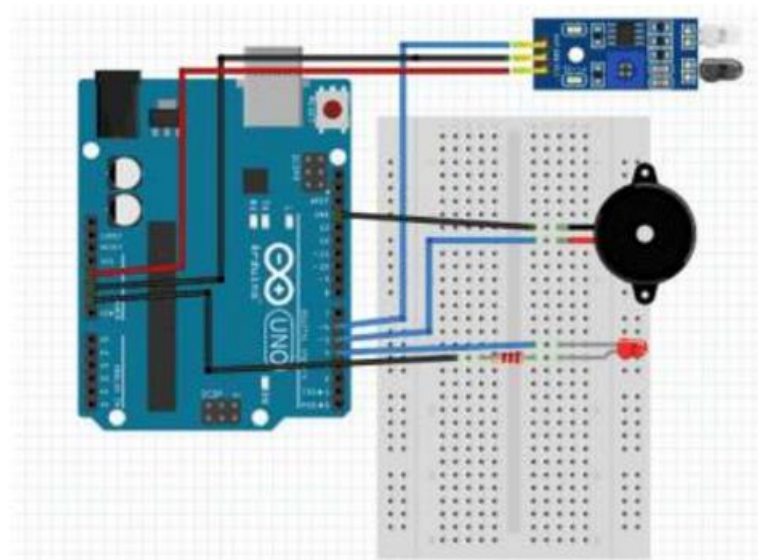


OLED DISPLAY

- Matrix Orbital 16x2 Character Serial OLED displays provides you with a cost-effective industrial HMI user interface solution for that great product/project you are developing. OLED displays features optional on-board medium digits, bar graphs and 3 GPOs will allow fast development for any application.
- OLED technology improves readability by offering a high contrast display with wide viewing angles and requires significantly less power to operate than VFD or even LCD units.



4. HARDWARE DESIGN



ADVANTAGES:

- Low cost of implementation
- Easy to set-up and use
- Can be implemented wherever single entry/exit point is present
- No need of human intervention.
- Can work 24x7 without any problem.
- Low cost and very easy to implement

DISADVANTAGES:

- If there are multiple doors for the same room the project becomes quite complex.
- IR sensor cannot detect if lots of people are entering at one time

5.SOFTWARE PROGRAMMING

- Proteus 8 Professional v8.11(for simulation)
- Arduino IDE

5.1 Proteus 8 Professional

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards. It was developed in Yorkshire, England by Lab center Electronics Ltd and is available in English, French, Spanish and Chinese languages.

The first version of what is now the Proteus Design Suite was called PC-B and was written by the company chairman, John Jameson, for DOS in 1988. Schematic Capture support followed in 1990, with a port to the Windows environment shortly thereafter. Mixed mode SPICE Simulation was first integrated into Proteus in 1996 and microcontroller simulation then arrived in Proteus in 1998. Shape based auto routing was added in 2002 and 2006 saw another major product update with 3D Board Visualisation. More recently, a dedicated IDE for simulation was added in 2011 and MCAD import/export was included in 2015. Support for high speed design was added in 2017. Feature led product releases .

5.2 Arduino IDE Software

Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment. A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo ,Arduino Micro and many more. Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment support both C and C++ Language.

Conclusion

This report describes a circuit which is used for counting the objects and simultaneously work as a security system when the camera is attached. When some objects or a person encounter by the IR the counter will be incremented accordingly. We can also use it in smart homes to switch on and off lights if somebody is inside then light will turn on and if no one is there light will be turned off automatically.

6. Test Results and Analysis

- After uploading the visitor counter code to Arduino Board, the device is ready for installation. You can use a 5V DC Adapter to Power on the Device.
- The device has a pair of IR Sensor module. One of the IR Sensors needs to be placed at the entrance and the other at the exit, i.e. inside the room door and outside the room door.
- When no visitors are inside the room, the light turns off and the OLED Display will indicate no visitors are present inside the room.
- When someone makes an entry, the visitor is added and OLED Display, displays the number of incoming visitors. At this instance, the light automatically turns ON.
- When a person leaves the room or exit, the visitor is subtracted. Hence the total number of current visitors is displayed on OLED. The OLED Display also displays the number of visitors who visited the room and the number of visitors who exit.
- This is how an Arduino Visitor Counter with Light Control System works. You can use this project for Hall, Schools, Office, Functions, etc.
