

A
Project Report
on
“Scanning Security System”

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ABSTRACT

This paper has been designed to build a Scanning Security System for the security purpose. This project helps us in managing library/study room. It provides a security to library/study room by Scanning the ID of the respective student before entering the room. Light Automation is one of the part of the project which helps us in saving electricity IR Sensors are used in this project to maintain the count of the students in the library/study room. This project makes the room more secure and helps in reducing the usage of electricity as well at the same time.

ACKNOWLEDGEMENT

We wish to express our profound and deep sense of gratitude to Mr. R.G. Mevekari Sir, Project Guide, Department of Electronics Engineering for sparing his valuable time to extend help in every step of our project work.

Secondly, we would like to thank Joshi Sir, Department of Electronics Engineering, for providing us with the required components for the project and also explaining the significance of using each of those.

Lastly, we would like to thank our friends and family members for their help, support and motivation for making this project.

CHAPTER 1

1. Introduction

Scanning Security System is typically oriented upon the growing demands of saving electricity in colleges and other public places and also to provide some sort of security to these places as well. Only the people with valid identification will be allowed to enter into the premises and based on the count of members present in that place, the required number of bulbs and fan will be turned ON, which in turn will be useful in saving power and electricity.

1.1. Background

As technology becomes increasingly important in today's world, it is invaluable to not only learn how to use technology, but also to understand how to create it. Since being the engineer, one should have sound knowledge of the other discipline. Most of the projects have limited scope to only specific discipline. This would limit one's innovation and creativity. This project inspires to make connections across several disciplines rather than learning topics in isolation as it combines mechanical, electronic, electrical and programming skills.

1.2. Motivation

If we see in and around our college as well, we observe that a lot of electricity is being wasted in classrooms and study room. Even though very few students are present in the rooms, the light and fans are unnecessarily ON, leading to a lot of electricity wastage. So keeping these things in mind, we have decided to make a secure system, which can be used to reduce the overall usage of electricity in our college.

1.3. Problem Description

It is estimated that around 35% of the energy supplied to the households/other public places is wasted. The typical sources for wastage include:

- Inefficient insulation for cooling or heating.
- Faulty gadgets or appliances.
- Use of incandescent or spot lights.
- Use of equipment which is costly and consume a lot of electricity.

Our project “Scanning Security System” typically focusses on saving electricity in college premises including library, study room, etc. and also provide some security to these places, which will enable students to study without any disturbance and also helping the college to maintain the count of students who have entered into that particular place as well.

1.4. Objectives

The objectives of the project are:

- To make the Library/Study Room accessible for students via Scanning Procedure.
- To count the number of students with the help of IR Sensors.
- To implement automation of LED (ON/OFF) based on count.
- To design a system for making effective use of power and save electricity.

1.5. Methodology

a) Scanning Process:

- Scanning the IDs of students with the help of Barcode Scanner.
- Arduino will receive the signal from the Scanner.
- Message to be displayed on LCD.

b) Sensing Process:

- IR Sensor Transmitter will detect the student when he/she enters the room and will send the signal to the Arduino.
- Message displayed on LCD.
- LED will turn ON/OFF based on Count.
- IR Sensor Receiver will detect the Student when he/she leaves the room and will send the signal to the Arduino.
- Message displayed on LCD.
- LED will turn ON/OFF based on Count.

1.6. Limitations

The system has restricted to the following limitation.

- In order to enter the place where this system is fitted, the student should always carry in the required verification documents.
- The LEDs will turn ON/OFF on the basis of count, and if the system doesn't detect the person, then count will not be incremented and required amount of LEDs will not be turned ON.

CHAPTER 2

2. Technology and Literature Survey

Due to growing demand in Technology in our country, there has been a great boon in the field of Industries dealing with electronic gadgets and other necessities. Owing to this, there has been a lot of power consumption and wastage of electricity, due to which in some places across India, there has been a scarcity of electricity.

Most of the renowned and notable published works has put for this problem into the notice of common people, but in order to make this a big move, it is important to start this at smaller scale first. Hence, taking this into consideration, our team decided to make this project, keeping in mind the scope which we can use in our college, so as to save electricity and also secure the system using basic electronic devices.

2.1. Basic Operation

The basic operations of the Scanning Security System are as follows:

- Displaying Welcome message on the LCD if valid person enters the room, else not allowing that person to enter the room by making an alarming sound using buzzer.
- Use of Barcode Scanner to scan the IDs of Students and allowing only those students whose record exist in the database.
- The number of students present in the premises will decide the exact number of LEDs being turned ON. This particular will minimize the usage of electricity, which in turns is very useful when practiced for longer duration of time.
- One IR Sensor is used to detect the entry of a particular student, while the other is used to detect the exit of that student from the room.
- Conditions for LEDs is as follows:
 - If there is no one present in the room, the all the LEDs should be turned OFF.
 - If there are less than 5 students present, the LED_1 is turned ON, rest of the LEDs remain OFF.
 - If there are less than 10 students present, the LED_1 and LED_2 is turned ON, rest of the LEDs remain OFF.
 - If there are less than 15 students present, the LED_1, LED_2 and LED_3 is turned ON, rest of the LEDs remain OFF.
 - If there are more than 20 students present, all the LEDs are turned ON.

2.2. Block Diagram

The Block Diagram typically consist of a Barcode Scanner which is connected to the Arduino UNO via the USB Host Module. The Output of the Arduino 1 is connected to the LCD Module for display purpose. An active High/Low Pulse will be sent from Arduino 1 to Arduino 2, based upon the object being detected by the IR Sensor acting at every point. Once this is done, the message regarding count will be displayed on the LCD Module, and based on the count, a number of LEDs will be made to glow. The number of LEDs glowing will depend on the count present.

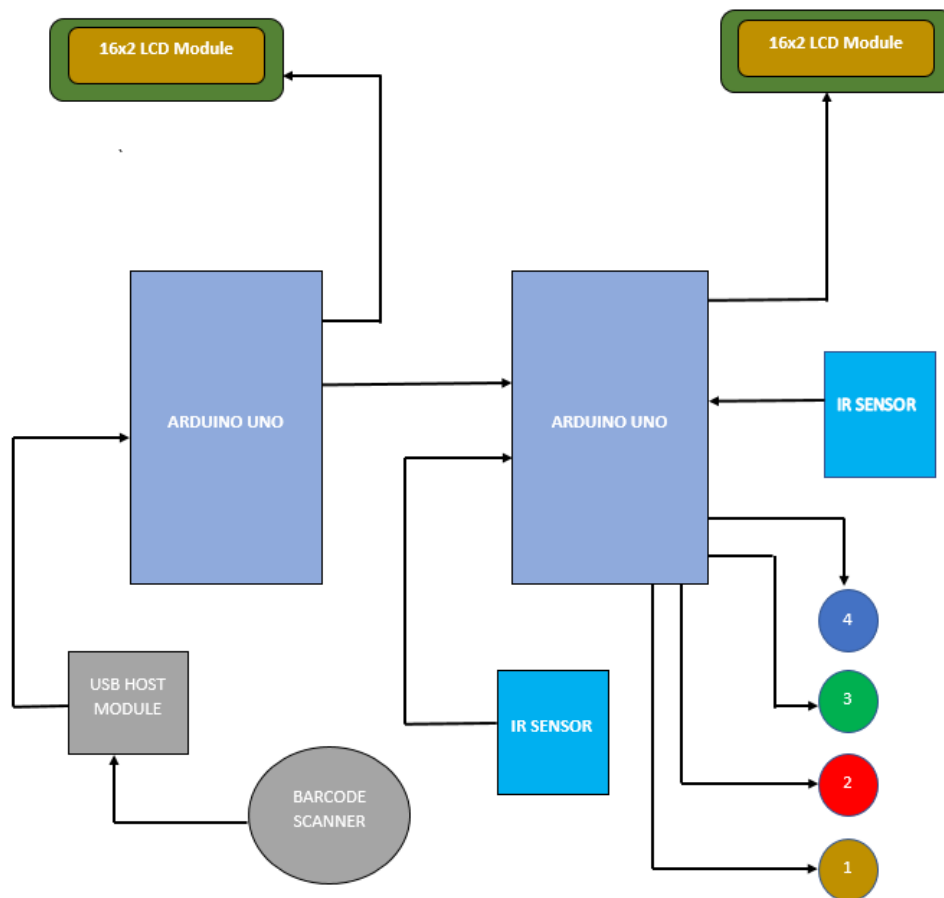


Figure 2.1: Block Diagram of Scanning Security System

2.3. Hardware Required

2.3.1. Barcode Scanner

A Barcode Scanner is an optical scanner that can read printed barcodes, decodes the data contained in the barcode to a computer. Like a flatbed scanner, it consists of a light source, a lens and a light sensor for translating optical impulses into electrical signals.



Figure 2.2: Barcode Scanner

2.3.2. Arduino UNO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board and IDE that runs on your computer, used to upload computer code to the physical board. The Arduino IDE uses a simplified version of C++, making it easier to learn to program.

- Processor: 16 MHz ATmega328
- Flash memory: 32 KB
- Ram: 2kb
- Operating Voltage: 5V
- Input Voltage: 7-12 V
- Number of analog inputs: 6
- Number of digital I/O: 13 (6 of them pwm)



Figure 2.3: Arduino UNO

2.3.3. USB – Host Module

The USB Host Component simplifies the software development of microcontroller systems that allow to connect USB Devices. The USB Host is the USB on the PC size in most of the cases and USB Device is the USB in your mouse, keyboard, flash memory and so on. All the USB transactions are managed by the Host, and the Device only responses to the Host transactions. In our case, the USB Host Module will act as an interface in between the Arduino Board and the Barcode Scanner.



Figure 2.4: USB Host Module

2.3.4. LCD Module

A Liquid Crystal Display is a flat panel display or other electronically modulated optical device that uses the light modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images or fixed images with low information content which can be displayed or hidden.

An LCD screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is a very basic module and is very commonly used in various devices and circuits. 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. The 16x2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. The LCD has 2 registers, namely Command and Data.

Command Register stores various commands given to the display. Data register stores data to be displayed. The process of controlling the display involves putting the data from the image of what you want to display into the data registers, then putting instructions in the instruction register,



Figure 2.5: LCD Module

2.3.5. IR Sensor

IR Sensor, or Infrared Sensor, is an electronics device which is used to detect specific characteristics in its surroundings through emitting or detecting IR radiations. These sensors can also be used to detect or measure the heat of a target and its motion. In many electronic devices, the IR Sensor circuit is a very essential module. This kind of sensor is similar to human's visionary senses to detect obstacles.

In this sensor, an IR LED is used as an emitter whereas the photodiode is used as a detector. Once an infrared light drops on the photodiode, the output voltage and resistance will be changed in proportion to the received IR light magnitude. The IR Sensor module includes five essential parts like IR, Tx, Rx, Operational amplifier, trimmer pot (variable resistor) and output LED. The Pin Configuration of the IR Sensor module is as follows:

- VCC Pin is Power Supply Input
- GND Pin is Power Supply Ground
- OUT is an active-high O/P



Figure 2.6: IR Sensor Module

2.4. Software Required

For the simulation of the circuit, Proteus software is used. For coding and uploading the sketch, the Arduino 1.8.19 is used.

2.5. Flow Chart

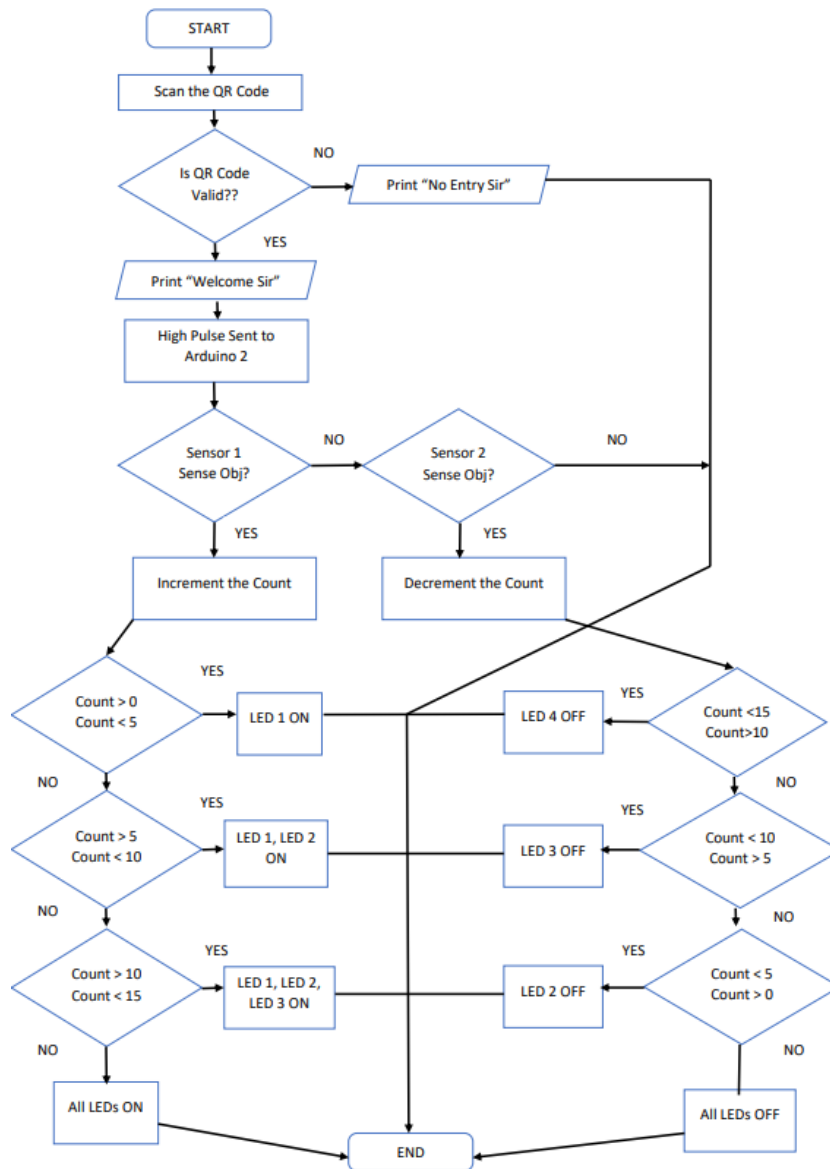


Figure 2.7: Flow Chart of Project

CHAPTER 3

3. Design and Implementation

3.1. Schematic

The schematic of the “Scanning Security System” is shown in the figure. Schematic is drawn using Proteus Simulator and the code has been written in Arduino 1.8,19.

The Components used while designing the hardware is as follows;

- Barcode Scanner
- Arduino UNO
- USB Host Module
- LCD Module
- LED (Red, Green, Yellow, Blue)
- IR Sensor (Detecting the Entry and Exit of the Student)
- Jumping Wires
- Breadboard
- Resistors

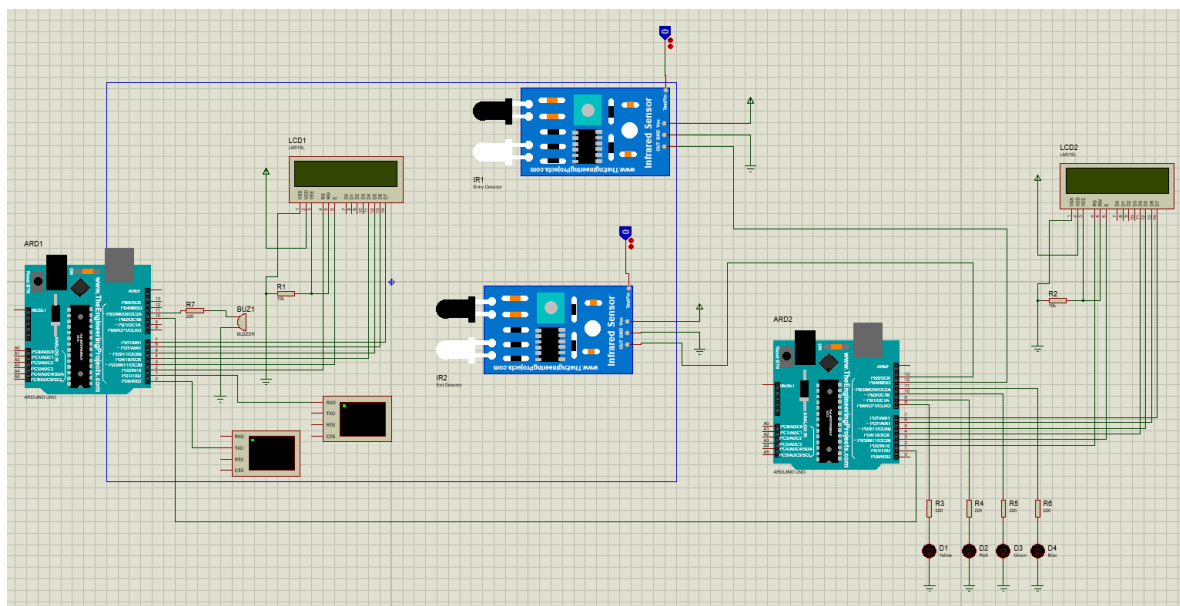


Figure 3.1: Circuit Diagram

3.2. Circuit Explanation

The Scanning Security System is mainly divided into 2 parts:

- Scanning Section
- Detection Section

3.2.1. Sensor section:

This section contains Arduino UNO, LCD, Virtual Terminal. The Virtual Terminal is used to scan the ID of the student and if it matches with the ID included in the code (in the Arduino), then it will display a 'Welcome Message'. Otherwise, buzzer will start alarming indicating invalid entry of a person. After that, a high pulse is sent from Arduino 1 to Arduino 2, assuming valid entry. In this way, the scanning section will ensure that only those students whose PRN is being registered in the database will be allowed to enter into the room, else they will not be allowed to enter the room.

3.2.2. Detection Section:

This section contains Arduino UNO, LCD, 4 LEDs. The number of LEDs which are ON depends on the count of students which are available in the room.

Two sensors are used for detection of student count. When the student crosses the first entry detector sensor, then the count will be incremented by 1. And when the student crosses the second exit detector sensor, then the count will be decremented by 1. The Number of LEDs which are ON depends on the count of student present. All the LEDs will be ON after the count goes beyond a certain limit. When count is equal to 0 and no one is present in the room, then at that time, all the LEDs will be turned OFF, indicating no one is present in the room.

3.3. Working of Scanning Security System:

When any person enters the library/study room or any other place where this system is being preinstalled, then he/she will have to write their respective PRN in the register to mark their presence. If some students don't write their PRN in the registers, then their record will not be validated.

Hence to maintain security of the place, and at the same time, to maintain a record of count of members entering the place, this system has been designed.

All the students have their own ID card issued by the college. So the Barcode Scanner will scan the barcode which is there on the Student's ID, if the ID Scanned is present in the Database, then only the student will be allowed to enter the room, otherwise, a buzzer will be sounded, alerting the security guards of an invalid person entering the room. For project perspective, following is the list of PRNs which are valid, while the rest being scanned by the barcode will be treated as invalid:

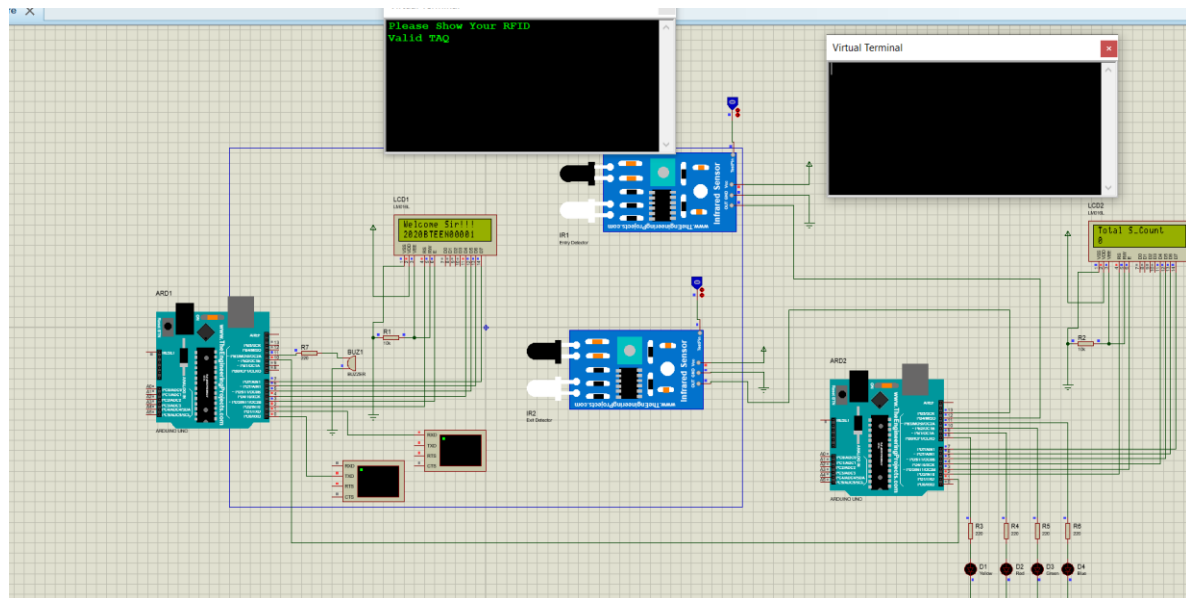


Figure 3.2: Valid PRN Detected

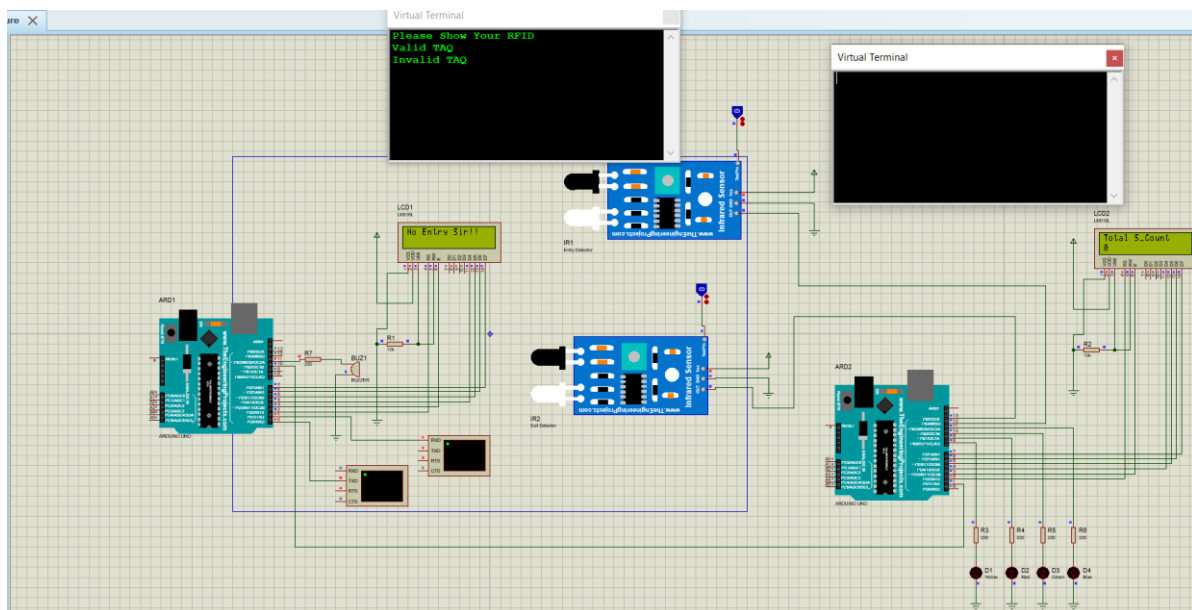


Figure 3.3: Invalid PRN Detected

When students enter the room, then in that case, the IR Sensor Entry Detector will detect it and will pass the count information to the Arduino Board. Hence based on the count, the LEDs will be turned ON. As the number of students in the room increases/decreases, at that time, the count will be automatically changed (increased/decreased).

When any student leaves the room, then in that case, the IR Sensor Exit Detector will detect the student and count will be decreased. When count is exactly equal to 0, means at that time, no one is present in the room. Hence at this stage, all the LEDs will be automatically turned OFF.

In this way, we are able to save power and make effective use of electricity and allow the authority or any other concerned members, access to the count of students present in the room. Also, we are able to give security to the students as well, since students with valid identification will only be able to enter into the room.

CASE 1: When Count of Students present in the room is more than 0 but less than 5.

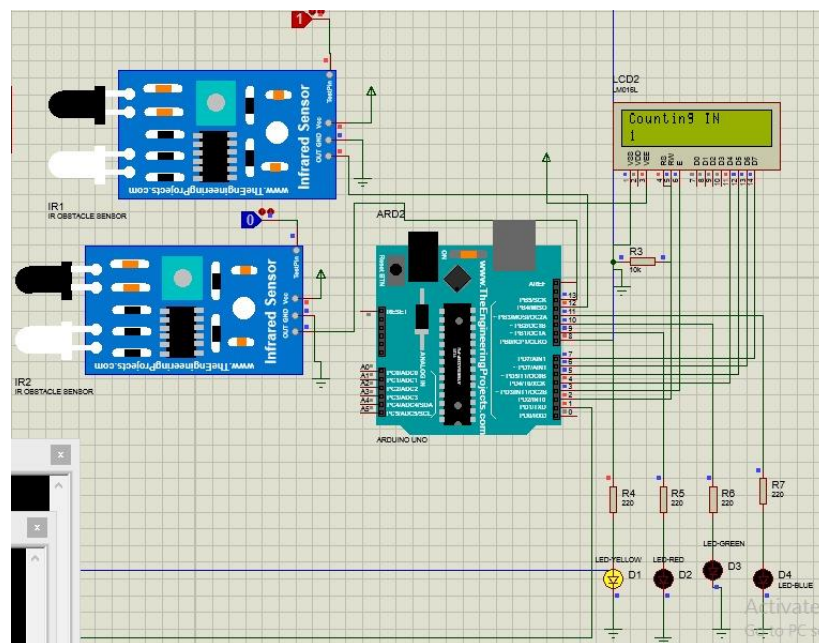


Figure 3.4: 1 LED is Turned ON

CASE 2: When Count of Students present in the room is more than 5 but less than 10.

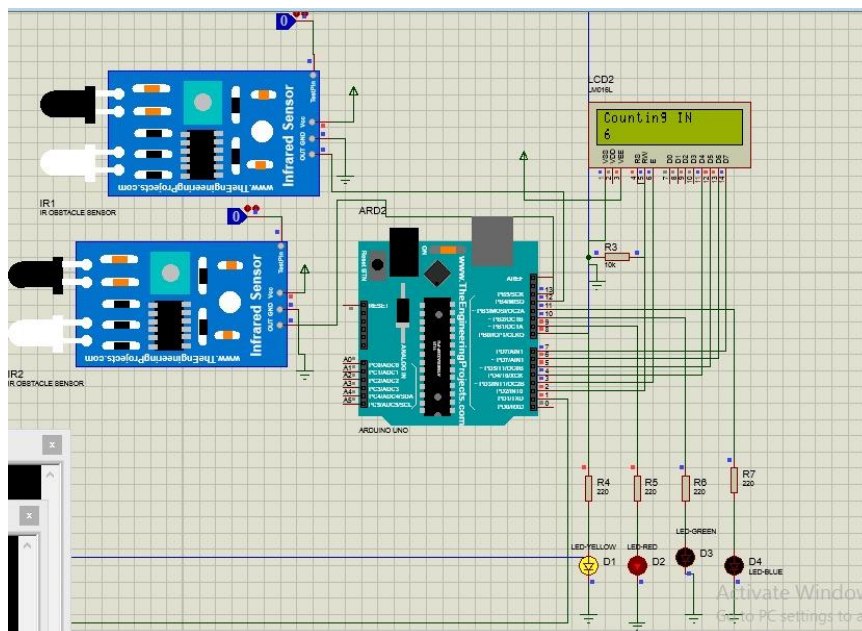


Figure 3.5: 2 LEDs are turned ON

CASE 3: When Count of Students present in the room is more than 10 but less than 15.

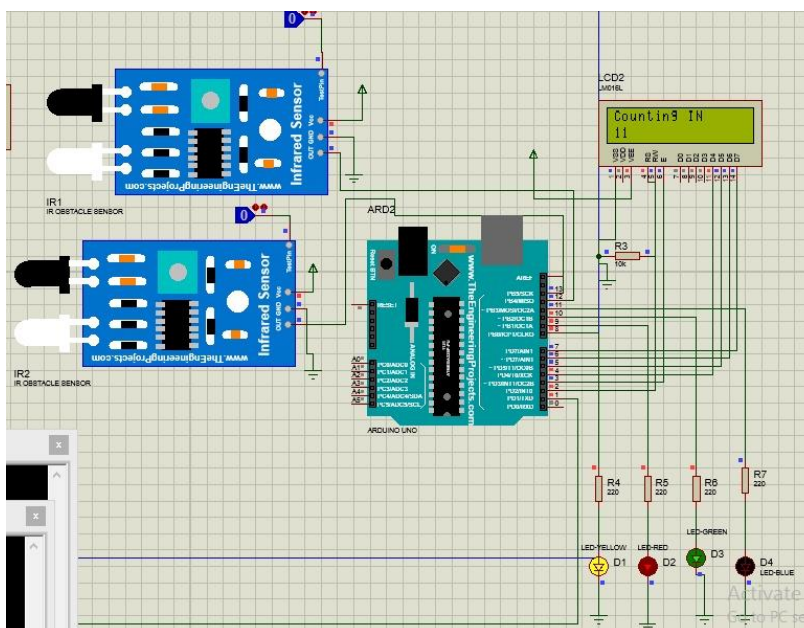


Figure 3.6: 3 LEDs are turned ON

CASE 4: When Count of Students present in the room is more than 15.

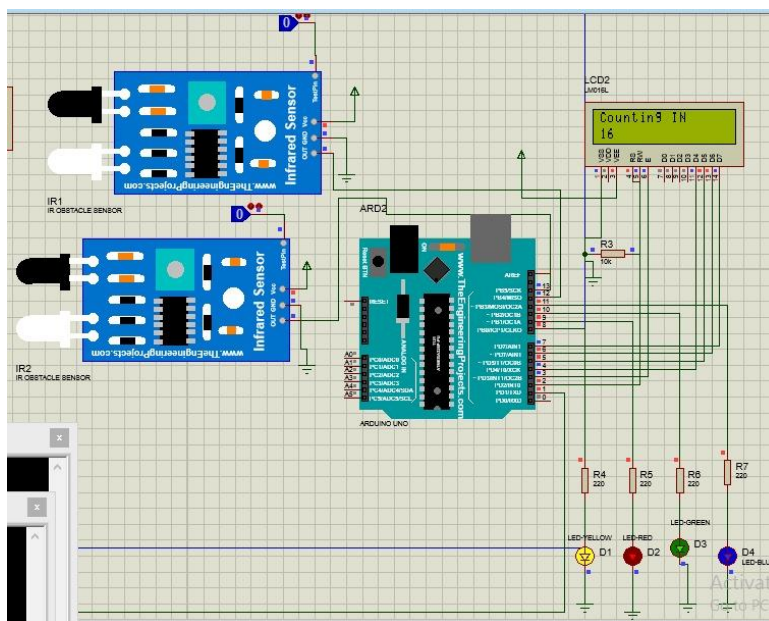


Figure 3.7: 4 LEDs are turned ON

The Tabular Representation of the above is as follows:

Student Count	LEDs Turned ON			
	LED1	LED2	LED3	LED4
0	×	×	×	×
1-5	✓	×	×	×
6-10	✓	✓	×	×
11-15	✓	✓	✓	×
More than 15	✓	✓	✓	✓

Table 1: Logic Table for Scanning Security System

CHAPTER 4

4.1. Applications

- For industrial security and automation.
- Major use in public places like Library, Hospitals, Study Rooms and other private places.
- It can also be implemented in homes for security and automation purpose.

4.2. Advantages

- Reliably interprets and displays the barcode.
- Helps to reduce the overall cost and usage of electricity.
- Security of the system must be preferred.
- Fast operation and easy to use.

4.3. Disadvantages

- The barcode must be aligned properly to scan the student's ID.
- It doesn't scan QR codes or RF Tags and probably its scanning range is around 1 foot.
- If there is abrupt loss of power supply, the count of students present in the room will be lost, and new count will be maintained after that.
- Upfront cost of equipment and installations as well.
- If this project is installed in a big phase, then many people can lose their jobs as well.

4.4. Conclusion

After doing this project, we conclude that electricity is very useful and precious in this modern world. Hence, using this project, we can save electricity and also provide security to the place over which this project has been mounted upon.

COST ESTIMATION

Sr. No.	Name of Component	Quantity	Price Rs.
1)	Arduino UNO	2	440 x 2
2)	Barcode Scanner	1	500 x 1
3)	USB Host Module	1	250 x 1
4)	IR Sensor	2	170 x 2
5)	LCD	2	200 x 2
6)	LED	16	16 x 5
7)	Resistors	10	10 x 1
8)	USB Connector	1	170 x 1
9)	Jumper Wires	50	50 x 3
10)	Breadboard	1	120 x 1
Total Rs.			Rs. 2900/-

Table 2: Cost of Project

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1. *"Why Should I Save Energy?"*, by Jen Green.
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