

**A
Project Report
on**

“Authentication and Automation System”

Submitted By

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CERTIFICATE

This is certified that, the project report entitled

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Walchand College of Engineering, Sangli

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ABSTRACT

This paper has been designed to build a **Authentication and Automation System**. This project helps us in managing study room where there is limited space. It allows authentic entry by scanning ID Card of student before entering the room. Light Automation is one of the part of project which helps us in saving electricity. This project allows valid entries and helps effective management of space.

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We wish to express our profound and deep sense of gratitude to Prof. M.R.Khare Mam, Project Guide, Department of Electronics Engineering for sparing her 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

Authentication and Automation System is the hardware modification of the Security and Automation system which we did in last semester. This project is aimed to provide security to the room it is inhibited upon and also is useful in providing automation of light based on the count of the members present in the room and based on the need and requirements of that person.

1.1. Background and Motivation:

In our 5th Semester, we did a project titled “**Security and Automation System**”, wherein, we tried to provide security to students entering into the room, based on some valid IDs, and based on count of the students present in the room, the number of LEDs were made to glow. But our project had several drawbacks.

Our Project didn't store any ID values in the program, because of which if any ID is having the unique set of code, they were allowed to enter into the room. Also the count of students entering into the room was not assumed to be constant and hence our project lacked some real time expertise as such.

Hence taking into consideration the above mentioned problems, we decided to modify the above and create a new project titled “**Authentication and Automation System**”, wherein we decided to keep this fixed to a room with fixed number of people allowed, also the IDs to be scanned are to be stored in the program and instead of using count to switch ON the appliances, we will sense the presence of any person in a particular location and based on that the appliances will be turned ON.

1.2. Problem Description:

In our college at places like library, study room, labs, classrooms, students are allowed to enter without authentication at most of this places. All the lights, fans are turned ON even if there is no one present in the room or only few students are present. This causes wastage of electricity.

Our project “**Authentication and Automation System**” focuses on following points:

- Allow entry to valid users. The door of the room will only if the ID is valid.
- Turn ON/OFF the LEDs based on the count of students present in the room (LED are used for indication of count).
- Turn ON/OFF the lights if it senses a student.

1.3. Objectives:

The objectives of the project are:

- 1) To make an effective space management system for room with limited occupancy.
- 2) Allow entry to authentic user and reject unregistered user.
- 3) To turn on LEDs to indicate the count of students in the room.
- 4) To turn on bulb if IR senses a student.
- 5) To design a system for making effective use of power and save electricity.

1.4. Methodology:

a) Part A (Authentication)

- 1) Scanning of ID's of student with the help of Barcode Scanner (or RFID).
- 2) Arduino will receive signal from scanner.
- 3) Authentication of student will be done if entering and maximum occupancy is not reached, based on entries inside room, number of LEDs turned ON will increase.
- 4) If maximum occupancy is reached, then no entry will be allowed.
- 5) If student is exiting, based on remaining entries inside the room, number of LEDs turned ON will be decreased. These LEDs are used to indicate the count of students in the room.

b) Part B (Automation)

- 6) IR Sensor will be used to sense presence of person.
- 7) The output of IR sensor will be provided to transistor.
- 8) Transistor is used as a switch.
- 9) If person is sensed, the respective bulb will be switched ON and if no presence is sensed, bulb will be switched OFF.

1.5. Assumed Constraints:

Following are the constraints of the project.

- 1) The number of students entering the room is fixed (4 in case of our project).
- 2) The seating arrangement is such that the benches are located at the corners of the room, and each corner is having 1 bulb. Assuming that the intensity of the bulb is less, it is expected only 1 person can accommodate that place.
- 3) If the student wishes to sit somewhere else in the room, excluding the corner benches, then he/she can sit anywhere in the room, wherein, the IR Sensor located nearby will sense that person and will turn ON the bulb of that respective location.
- 4) LEDs are used as an indication to determine the count of students present in the room.

CHAPTER 2

2. Technology and Literature Survey

We see that in many public places, people are allowed to enter even after the place has reached its maximum occupancy. This creates a lot of problem. Hence, it is important that we show the users that the room has filled with maximum occupancy, so, that the user can wait. At various location where there is a need of authentication/security, people are allowed to enter without any authentication. This is a serious problem which should be eliminated.

There is wastage of electricity at various places, due to which in some places across India, there has been scarcity of electricity. Huge number of electronic product are being made which help in automation of a specific system. So, we should try to design a product which helps in automation of light.

Hence, taking this into consideration, our team has decided to make “**Authentication and Automation System**”. This project will be made keeping in the mind the scope of this project in our college. This System will authenticate the student and help in saving electricity.

2.1. Basic Operation:

Part A (Authentication):

- Displaying Welcome Message on the LCD and showing the initial count of the room.
- Use the Barcode Scanner/RFID EM-18 Reader Module to scan the IDs of students and allowing only those students whose records are present in the program.
- Initially, we have assumed that only fixed number of students are allowed to enter into the room and based on the count of students present in the room, the number of LEDs will be turned ON/OFF accordingly. These LEDs are used to indicate the count of students present in the room.
- If Room is full, and a valid person tries to enter into the room, then he/she will have to wait until the room becomes vacant again.

Part B (Automation):

- This part provides students choices allowing them to sit anywhere in the room and based on their detection by the IR Sensor, the bulb present there will be turned ON.
- The Bulb will be turned OFF as and when the student is not detected as such.

2.2. Block Diagram

The Block Diagram of the project is divided into two parts:

- **Part A (Authentication)**
- **Part B (Automation)**

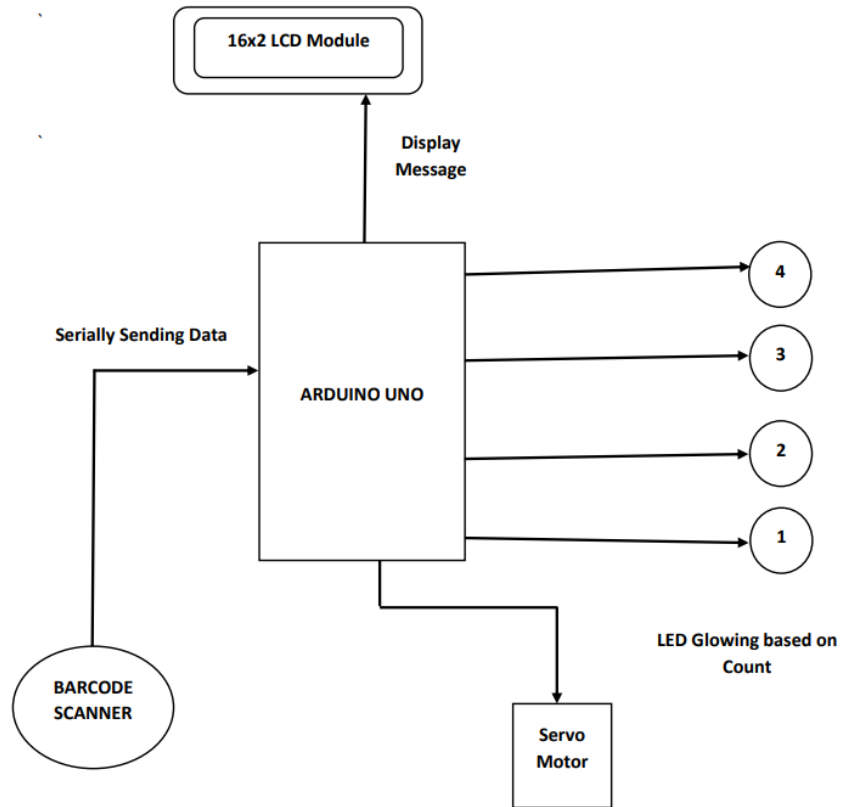


Figure 2.1: Block Diagram of Part A

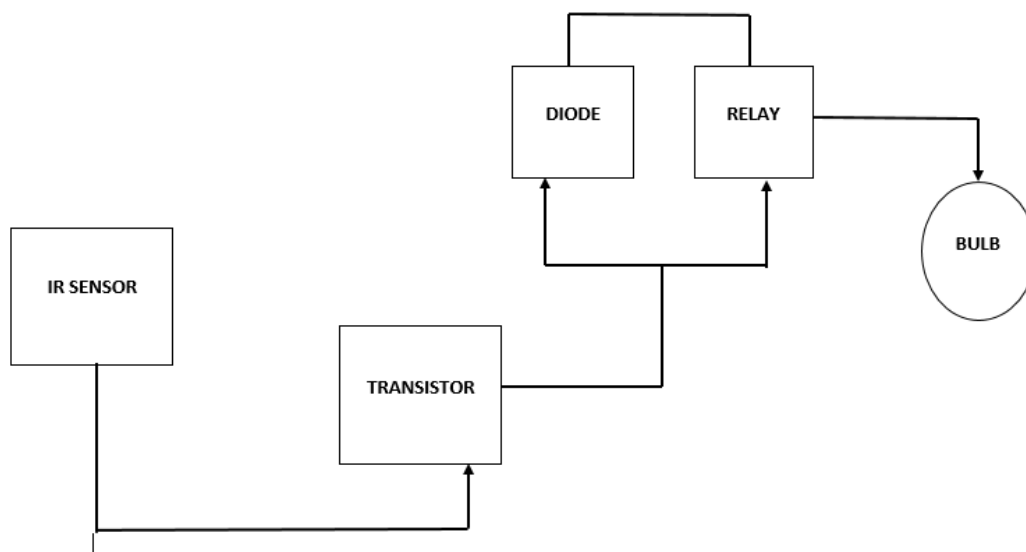


Figure 2.2: Block Diagram of Part B

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.

In our project, the barcode scanner is used to scan the PRNs present in the program and using the Serial Communication, each character will be passed bit by bit and get compared with the previously stored values. If values matches, then we see that Valid Entry Detected, else Invalid Entry Detected.



Figure 2.3: 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 2.4: Arduino UNO

2.3.3. 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.

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,

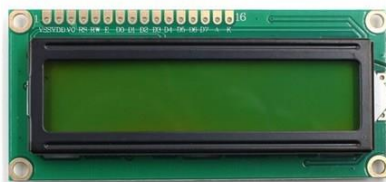


Figure 2.5: LCD Module

2.3.4 Servo Motor

A servo motor is a type of motor that can rotate with great precision. Servo motor is used when there is need to rotate an object at specific angle or distances. In our project, servo motor is used to open and close the door.



Figure 2.7: Servo Motor

2.3.5 AC Bulb

A light-bulb produces light from electricity. In addition, they can be used to show an electronic device is on, to direct traffic, for heat, and for many other purposes. AC bulb is used because, alternating current is the form in which residences receive their supply of electricity. In our project, when an IR sensor senses a student then the respective bulb will glow.



Figure 2.8: AC Bulb

2.3.6 BC547 Transistor

- It is an NPN transistor.
- It has three pin -> Collector, Base and Emitter.
- It is used for Amplifying Current.
- Used as a switch (Transistor as a switch).
- Main Purpose is to amplify and for switching purpose.

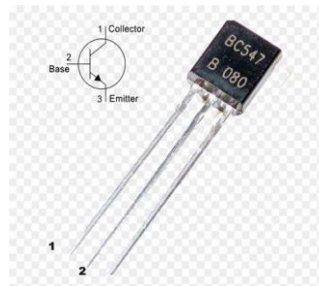


Figure 2.9: BC547

2.3.7 Relay (5V)

- It is an electro-mechanic component which functions as a switch.
- It has 5 Pins:
 - 1) Pin 1 (Coil) : Used to Activate Relay.
 - 2) Pin 2 (Coil) : Used to Activate Relay.
 - 3) Pin 3 (COM) : This pin is connected to the main terminal of the load to make it active.
 - 4) Pin 4 (Normally Closed (NC)) : This second terminal of the load is connected to either NC/NO pins. If this pin is connected to the load, then it will be ON before the switch.
 - 5) Pin 5 (Normally Open (NO)) : If the second terminal of the load is allied to the NO Pin, then the load will be turned OFF before the switch.
- Specifications:
 - 1) Normal Voltage is 5V DC (Voltage to ON Relay).
 - 2) Normal Current is 70mA.
 - 3) AC Load Current Max is 10A at 250V AC or 125V AC.
 - 4) DC Load Current Max is 10A at 30V DC or 28V DC.
 - 5) It included 5-pins and designed with plastic material.
 - 6) Operating Time is 10msec.
 - 7) Release time is 5msec.
 - 8) Maximum Switching is 300 Operating Per Minute.



Figure 2.10: Relay (5V)

2.3.8 1N4007 Diode

- It has two pins:
 - 1) Anode (Current always enters through Anode).
 - 2) Cathode (Current always exits through Diode).
- A Diode is a device which allows current flow through only one direction. That is the current should always flow from Anode to Cathode.
- Here, we use it as a free will diode.
- It will provide protection for components connected to relay from inductive kick back.



Figure 2.11: 1N4007

2.3.9 IR Sensor

An Infrared Sensor (IR Sensor) is a radiation sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range of 780 nm – 50 μ m. In our project, IR sensor is connected to AC Bulb (Transistor and Relay present in this circuit). When the IR Sensor senses a student, it will send the high signal to base of transistor and the AC Bulb will glow.



Figure 2.12: 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

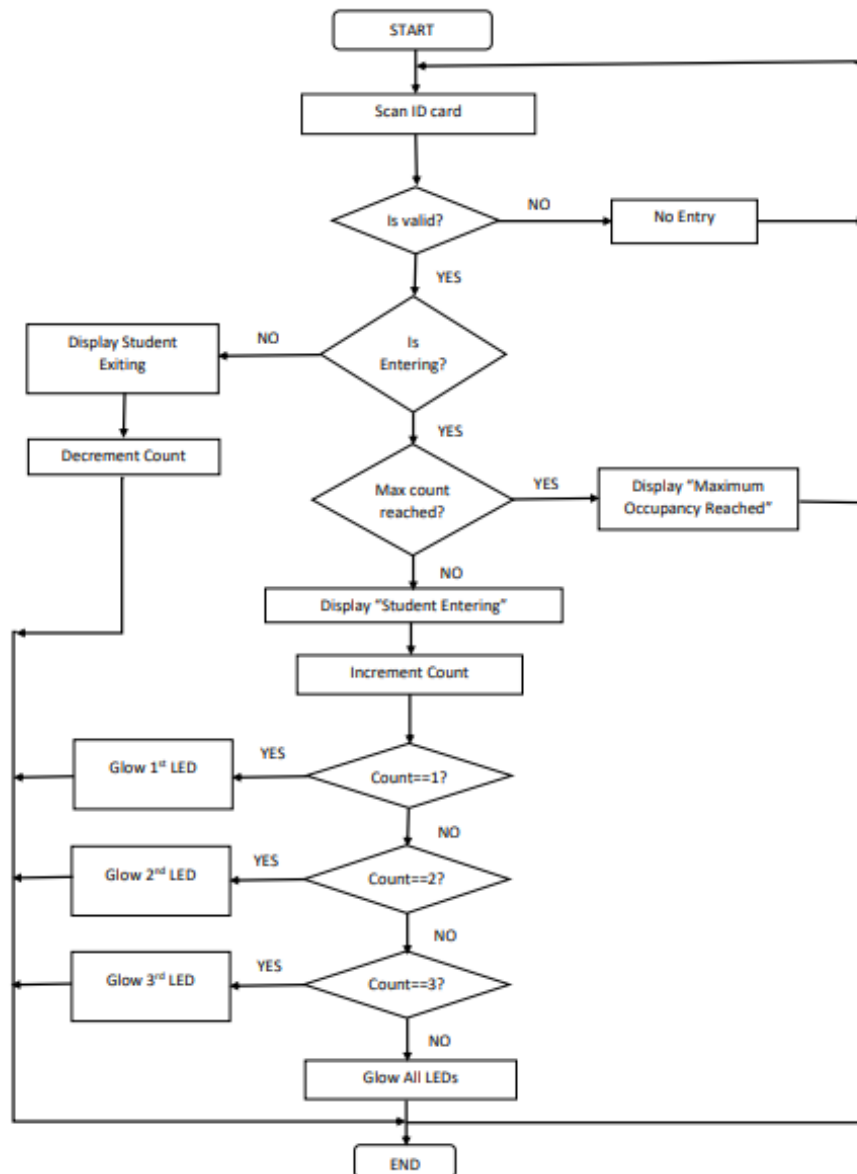


Figure 2.13: Flow Chart of Part A

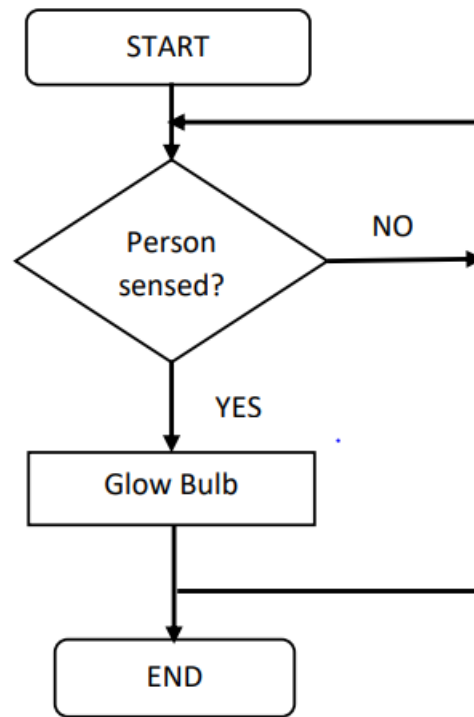


Figure 2.14: Flow Chart of Part B

CHAPTER 3

3. Design and Implementation

3.1. Schematic

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

The Project is divided into two phases:

- Part A (Authentication)
- Part B (Automation)

The Components used while designing the circuitry are as follows:

- Arduino UNO
- IR Sensor
- LCD Module
- LED
- Resistors
- Transistors (BC547)
- Diode (1N4007)
- Relay

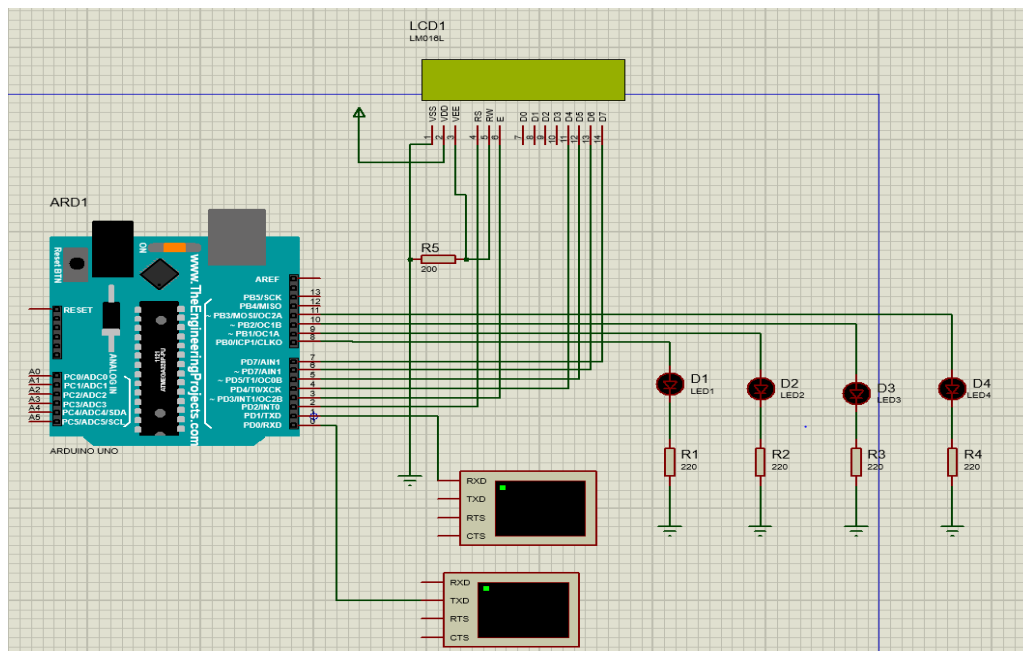


Figure 3.1: Circuit Diagram (Part A)

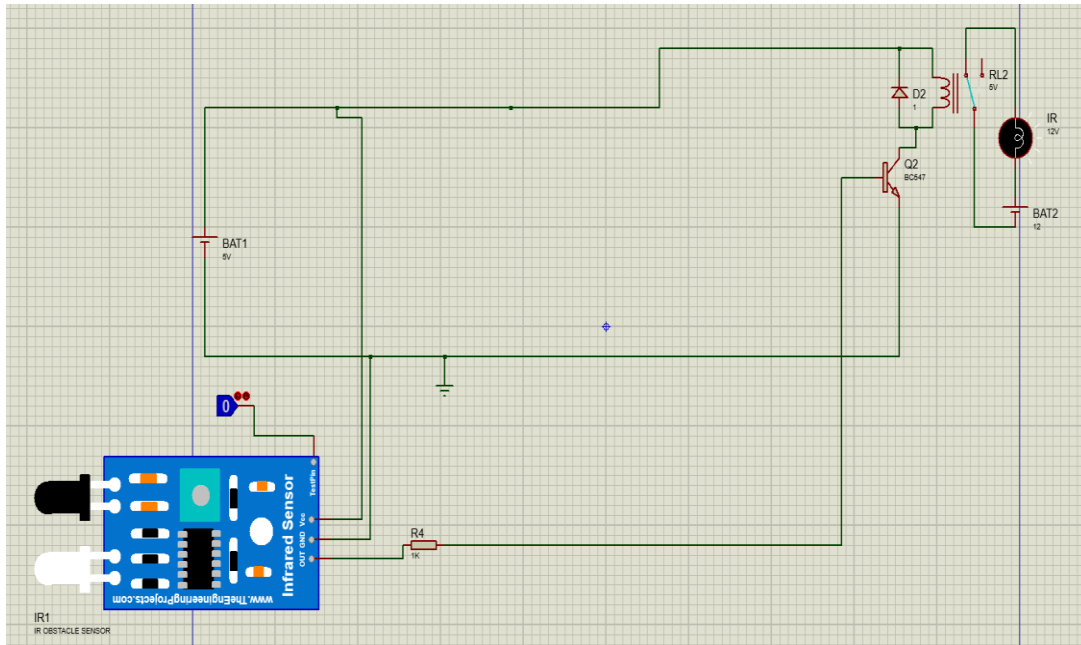


Figure 3.2: Circuit Diagram (Part B)

3.2. Circuit Explanation

The Authentication and Automation System is mainly divided into 2 parts:

- Authentication Section
- Automation Section

3.2.1. Authentication Section:

This section contains Arduino UNO, virtual terminal and LCD. The virtual terminal is used to scan the ID of the student and if it matches with the valid IDs inside the code and the maximum count is not reached, the count is increased. This is how authentication part allows only valid entries. When a person wants to exit, he/she will scan ID cards and the count will be decremented.

3.2.2. Automation Section:

This section contains Arduino UNO, LCD, Bulb and IR sensor. When the count is increased in Automation part bulb is turned on as per the count and when the person is exiting one bulb is turned off according to the count of persons inside. The specific bulb will turn on or off according to presence of person. When IR sensor senses presence of person, the bulb will glow on and when IR sensor is not sensing the person the bulb will be turned off.

3.3. Working of Authentication and Automation System:

When any person enters the room where this system is not installed, 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 marked. Hence to maintain security of the place, to allow limited students to enter based on the capacity of the room, to maintain a record of count of members, and at the same time, to turn LEDs ON/OFF based on the number of students entering the place, this system has been designed. The LEDs will indicate the count of students in the room. The bulbs in the room will turn ON/OFF, if the IR connected to then senses a student.

All the students have their own ID card issued by the college. So the Barcode Scanner /EM-18 RFID Reader Module will scan the barcode/tag which is there on the Student's ID, if the ID Scanned is present in the code, then only the student will be allowed to enter the room, otherwise, the student will not be allowed to enter 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:

- 2020BTEEN00001
- 2020BTEEN00002
- 2020BTEEN00003
- 2020BTEEN00004
- 2020BTEEN00005

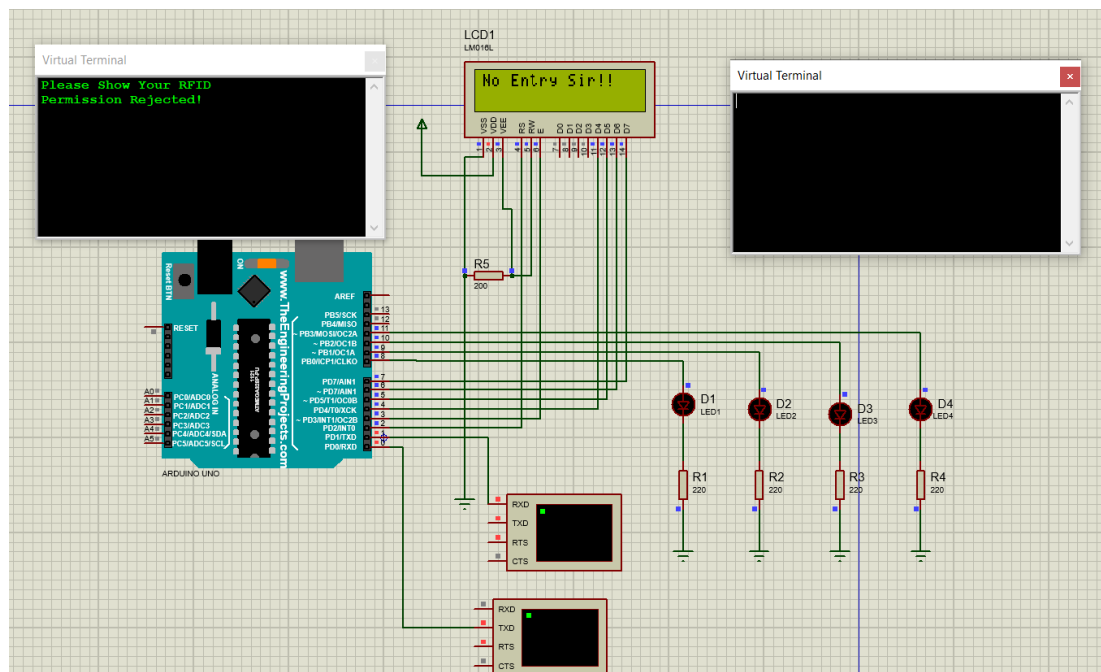


Figure 3.3: Invalid PRN Detected

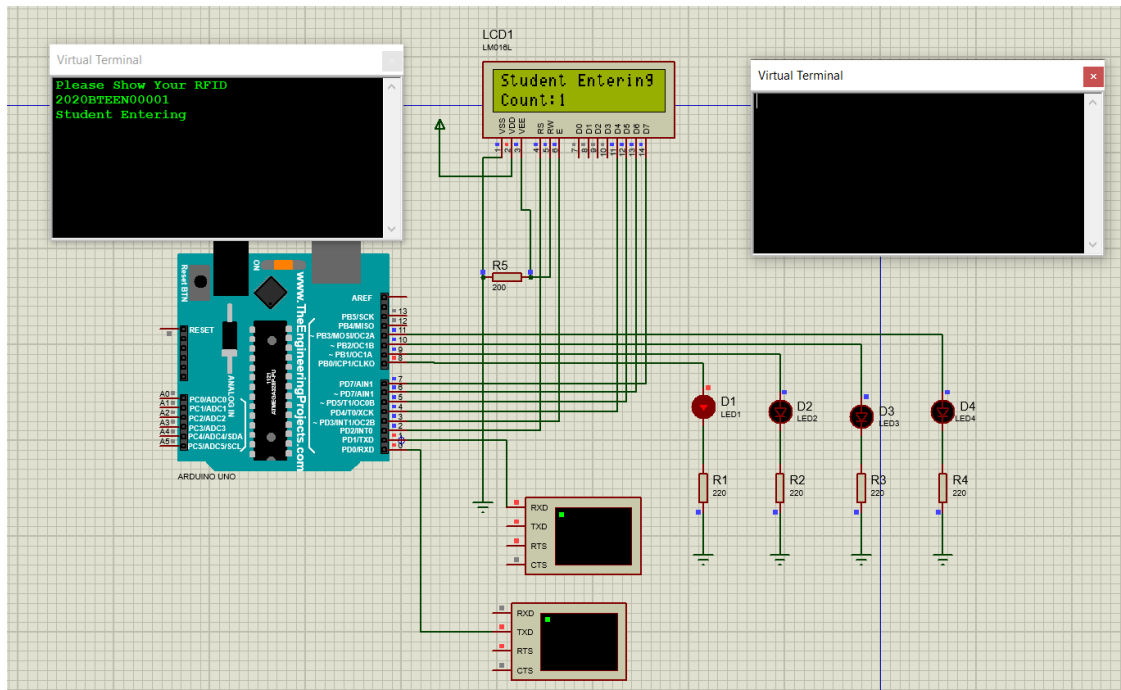


Figure 3.4: Valid PRN Detected

PART A:

When students enter the room and there is a vacant bench, then in that case, Barcode Scanner/EM-18 RFID Reader Module will scan the ID and the count is increased. The count information to the Arduino Board. Hence based on the count, the LEDs will be turned ON. The LEDs indicate the count of students in the room. When any student leaves the room, then in that case, Barcode Scanner/EM-18 RFID Reader Module will scan the ID and the count is 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. When the room is full, student will not be allowed to enter and will have to wait for some time.

PART B:

When students enter the room and there is a vacant bench, then in that case, Barcode Scanner/EM-18 RFID Reader Module will scan the ID and the count is increased. The count information to the Arduino Board. Hence based on the count, the LEDs will be turned ON. The LEDs indicate the count of students in the room. When any student leaves the room, then in that case, Barcode Scanner/EM-18 RFID Reader Module will scan the ID and the count is 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. When the room is full, student will not be allowed to enter and will have to wait for some time.

CASE 1: When Room is Vacant (Part A)

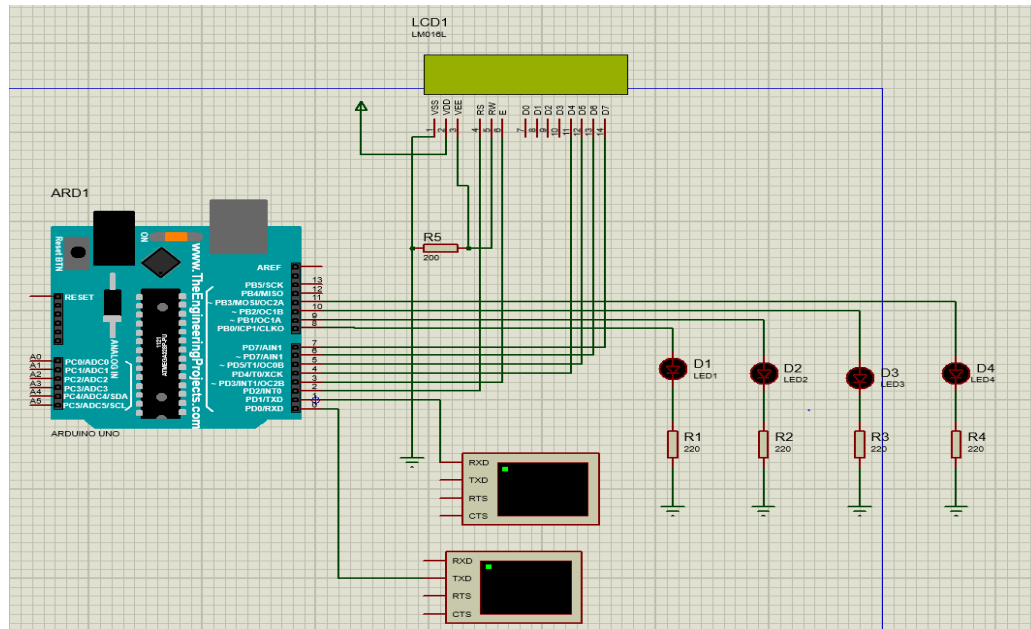


Figure 3.5: Room is Vacant

CASE 2: When 1 Student is Present in the Room (Part A)

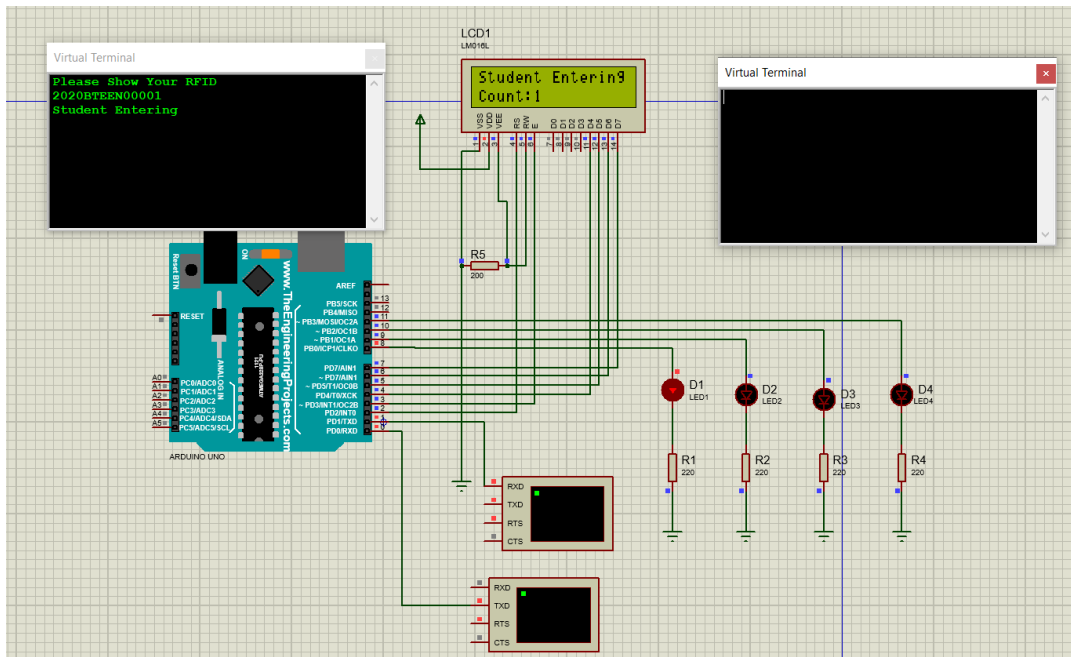


Figure 3.6: 1 LED turned ON

CASE 3: When 2 Students are Present in the Room (Part A)

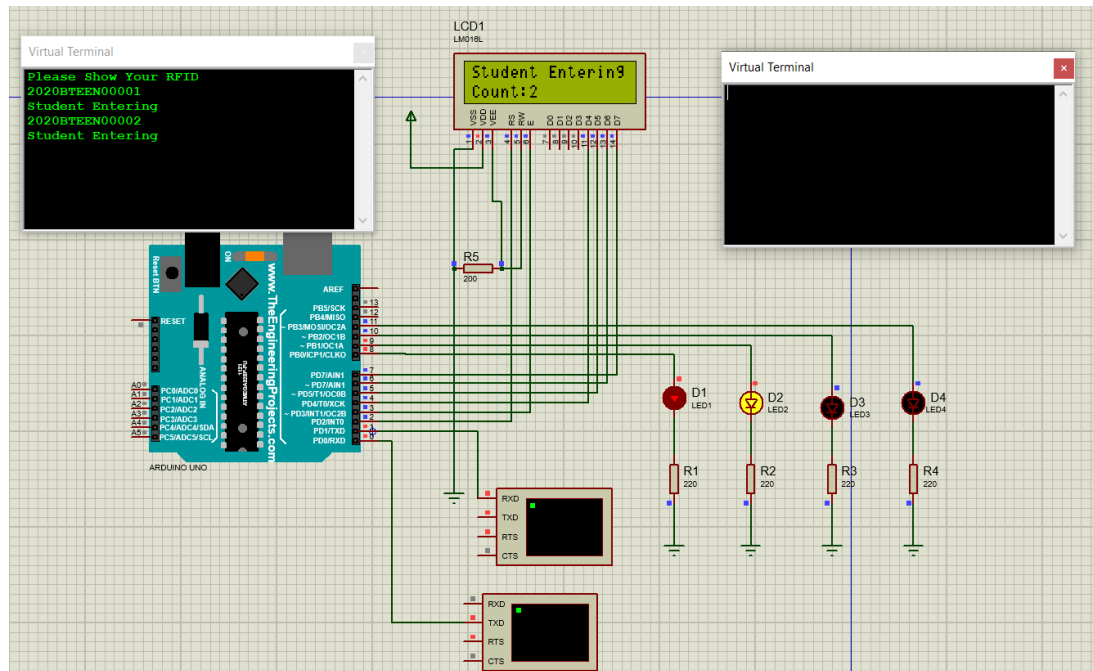


Figure 3.7: 2 LEDs turned ON

CASE 3: When 3 Students are Present in the Room (Part A)

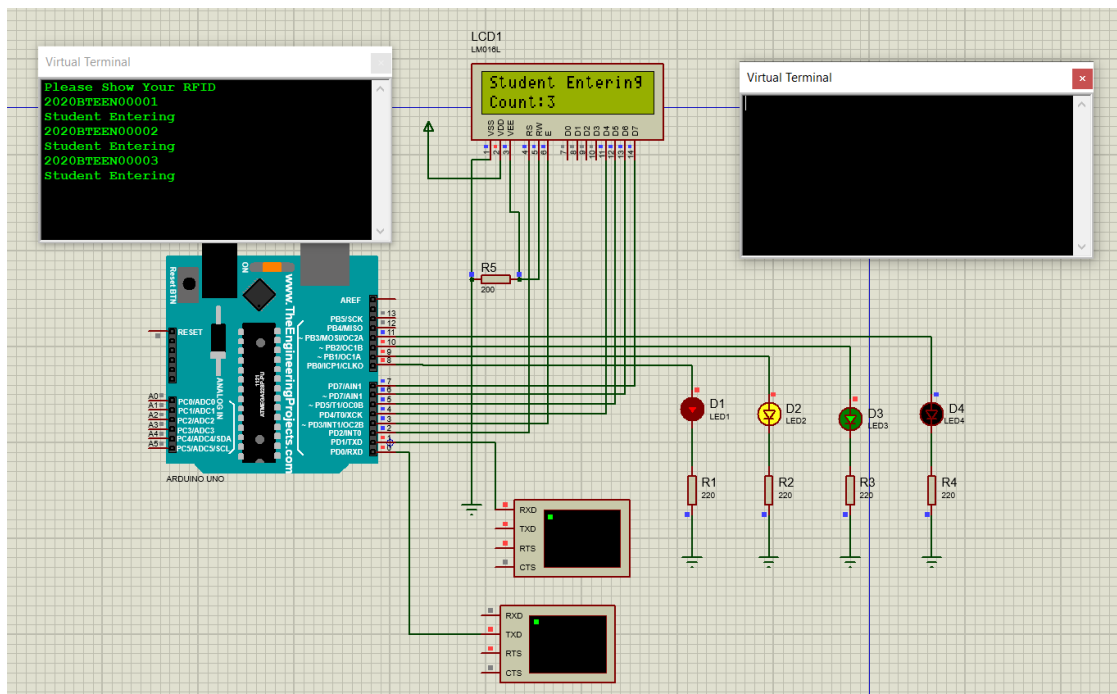


Figure 3.8: 3 LEDs turned ON

CASE 4: When 4 Students are Present in the Room (Part A)

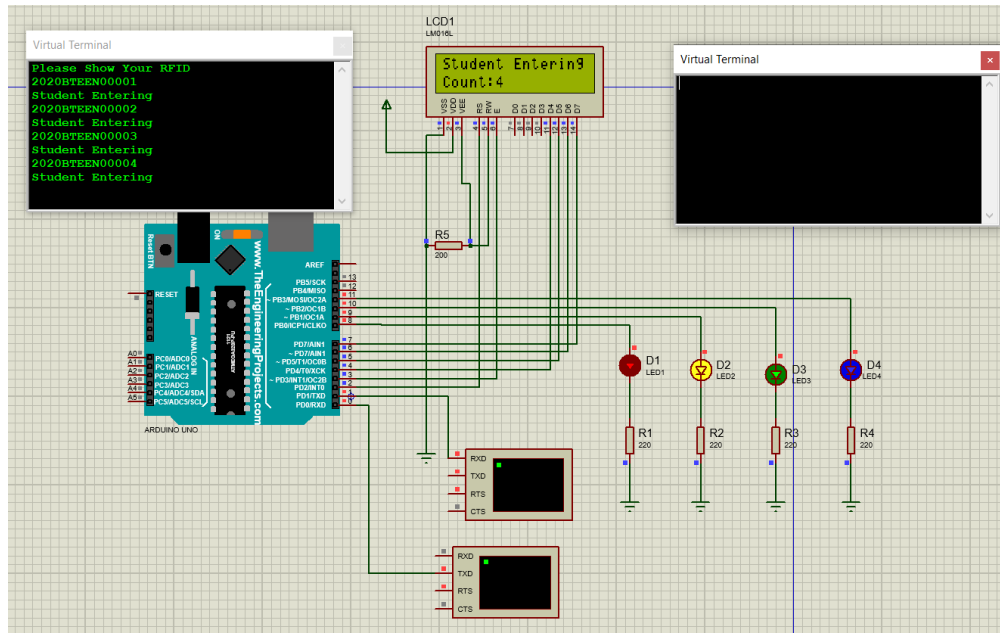


Figure 3.9: 4 LEDs turned ON

CASE 5: When Room is Full (Part A)

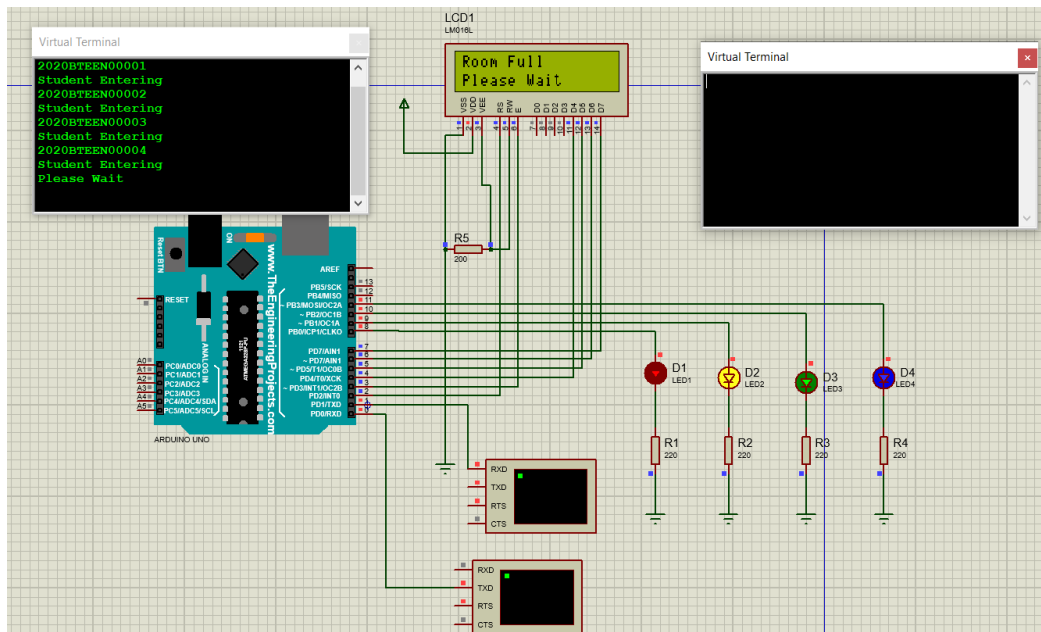
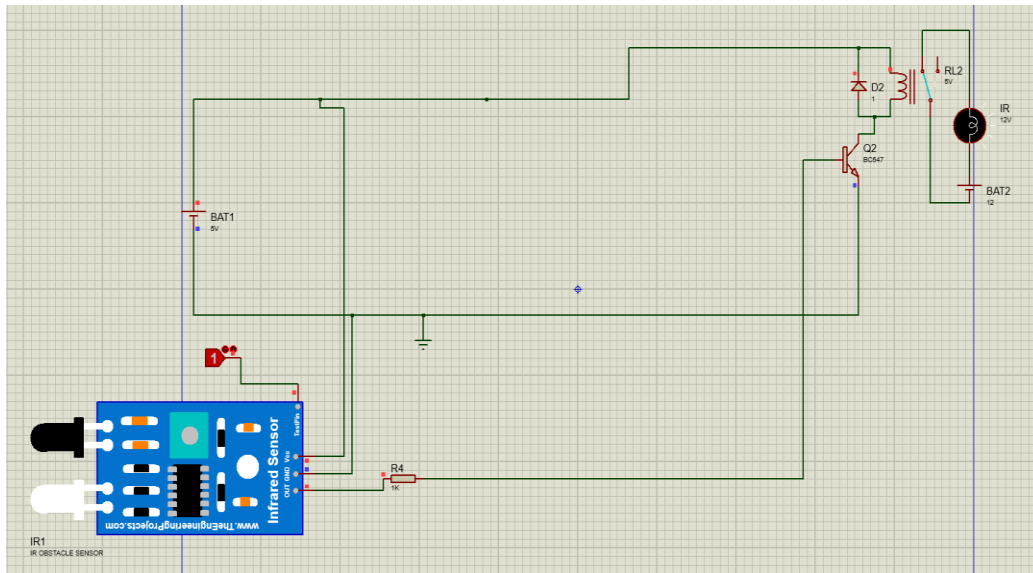
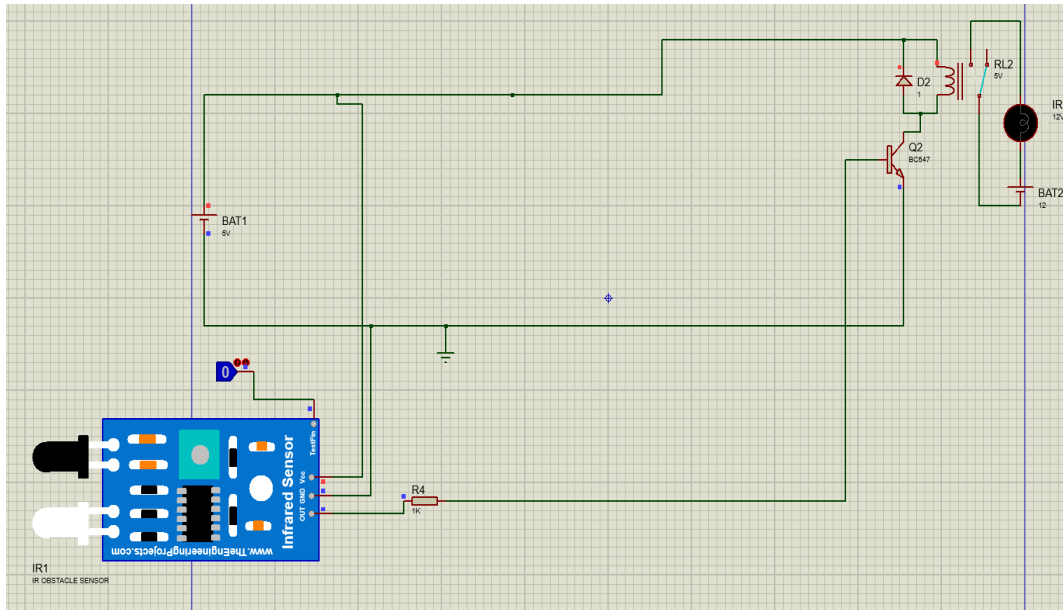


Figure 3.10: Room is Full

CASE 6: When Person is detected in Room (Part B)*Figure 3.11: Person Detected***CASE 7: When Person is detected in Room (Part B)***Figure 3.12: Person Not Detected*

The Tabular Representation of the above is as follows:

Student Count	LEDs Turned ON			
	LED 1	LED 2	LED 3	LED 4
0	✗	✗	✗	✗
1	✓	✗	✗	✗
2	✓	✓	✗	✗
3	✓	✓	✓	✗
4	✓	✓	✓	✓

Table 1: Logic Table for Authentication and Automation

CHAPTER 4

4.1. Advantages

- Automation of light which saves power.
- Provides Security based on validity of person.
- Entries after a specified count are restricted to enter the room, which maintains occupancy barrier.
- Easy to implement and use.

4.2. Disadvantages

- IR Sensor senses anything, it can be object as well.
- Data is stored locally on the controller, which restricts to perform crude operations.
- Number of people in the room is fixed.

4.3. Applications

- Project idea can be implemented in school, college and departmental areas where count of members in the room tentatively remains fix.
- Project idea can be implemented in hotels.
- Project idea can be implemented in home.

4.4. Conclusion

The Authentication and Automation System in some sort eliminates some of the drawbacks being based in the Security and Automation System. This project is a success and next phase of the project with modifications as such will be done in the Mega Project in 4th Year.

Cost Estimation of the Project

Sr. No.	Name of Component	Quantity	Price (Rs.)
1)	Arduino UNO	1	440 x 1
2)	Barcode Scanner	1	500 x 1
3)	IR Sensor	4	170 x 4
4)	LCD (16 x 2)	1	200 x 1
5)	LED	16	16 x 5
6)	Resistors	10	1 x 10
7)	Transistors (BC547)	10	1 x 10
8)	Diode (1N4007)	10	1 x 10
9)	Relay (5V)	4	20 x 4
10)	Bulb Holder	4	15 x 4
11)	AC Bulb	4	15 x 4
12)	Servo Motor	1	150 x 1
13)	USB Connector	1	170 x 1
14)	Jumper Wires	70	3 x 70
15)	Breadboard	1	120 x 2
Total			Rs.2910/-

Table 2: Cost of Project

References

1. *“Arduino: Advanced Methods and Strategies of using Arduino”*, by Ethan Thorpe.
2. *“Technology & Society”*, by Deborah Johnson and Jameson Wetmore.
3. *“Home Automation with Arduino: Automate your Home using Open-Source Hardware”*, by Marco Schwartz.

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2. <https://www.youtube.com/watch?v=FWvEEtrTGRQ/>
3. <https://www.youtube.com/watch?v=IK0oIyC76M4/>
4. https://www.youtube.com/watch?v=KBnENMTY_C0/