SMART DOOR

Submitted in partial fulfillment of the requirements of the degree

BACHELOR OF ENGINEERING IN

INFORMATION TECHNOLOGY

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CERTIFICATE

This is to certify that the Mini Project entitled **"SMART DOOR"** is a bonafide work of **MR. RAHUL SHINDE (Roll No. 64), MR. SIDDHARTH SONI (Roll No. 66), MR. PRATIK UTEKAR (Roll No. 73), MR. NISHAD SHINDE (Roll No. 63)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of **"Bachelor of Engineering"** in **"Information Technology"** .

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MINI PROJECT APPROVAL

This Mini Project entitled " **Smart Door** " by **Mr. Rahul Shinde (Roll No. 64) , Mr. Siddharth Soni (Roll No.66), Mr. Pratik Utekar (Roll No.73), Mr. Nishad Shinde (Roll No.63)** is approved for the degree of **Bachelor of Engineering** in **Information Trchnology.**

Examiners

1………………………………………
(Internal Examiner Name & Sign)

2………………………………………
(External Examiner name & Sign)

Date:

Place:

DECLARATION

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original source. I also declare that I have adhered to all principle of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea / data / fact / source in my submission. I understand that any violation of the above will be cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

Many times we need to monitor the person/people visiting some place like Shopping mall / temple. To provide solution for this we are going to implement a project called "Digital Visitor Counter". This project has a "Visitor counter". Main concept behind this project is to measure and display the number of persons entering in any room like seminar hall, conference room. LCD display placed outside the room displays number of person inside the room. This project can be used to count and display the number of visitors entering inside any conference room or seminar hall. This works in a two way. That means counter will be incremented if person enters the room and will be decremented if a person leaves the room.

ACKNOWLEDGEMENTS

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Chapter 1

INTRODUCTION

1.1 Introduction

Many times we need to monitor the person/people visiting some place like Shopping mall / temple. To provide solution for this we are going to implement a project called "Digital Visitor Counter". This project has a "Visitor counter". Main concept behind this project is to measure and display the number of persons entering in any room like seminar hall, conference room. LCD display placed outside the room displays number of person inside the room. This project can be used to count and display the number of visitors entering inside any conference room or seminar hall. This works in a two way. That means counter will be incremented if person enters the room and will be decremented if a person leaves the room

The major report is all about the embedded system and its application in various fields of real world with the help of Arduino software. As a result of enhanced civilization and modernization, the human nature demands more comfort in his life.The man seeks ways to do thing easily and which saves time.So automatic gadgets are one of the example that human nature invent to bring comfort and ease in its daily life. Smart door is widely used in laboratory etc. Smart door provides advanced security level for owner. The smart door project is an innovative acess control system based on human detection. The prposed system can first identify a person with the help of Ultra sonic sensor and counts no of people enterd in the lab.

1.2   Objectives

Wastage of electricity is one of the main problems which we are facing now-a-days. In our home, school, colleges or industry we see that fan and lighting point are kept on even if there are nobody in the room or area and passage. This happens due to negligence or because we forgot to turn lights off or we are in a hurry. To avoid all such situations this project called visitor counter" is designed. This project has modules who is known as "Smart Door".

Main concept behind this project is known as "Visitor counter" which measures the number of persons entering in any room like seminar hall, conference room, hotel rooms. This function is implemented using Ultrasonic sensor. Here Arduino receives the signals from the sensors, and this signal is operated under the control of software which is stored in the ROM. LCD display placed outside the room displays this value of person count. This person count will be incremented if somebody enters inside the room.

Objective of this project is to design a circuit useful for detecting person enter / exit from room

1.3   Purpose, Scope, and Applicability

Purpose, Scope and Applicability: The description of Purpose, Scope, and Applicability are given below:

1.3.1   Purpose

The purpose of this thesis is to evaluate the use of Ultrasonic sensors for people counting, which is portable system. The people counting problem is an interesting problem as it serves as the basis for many commercial and security applications

1.3.2 Scope

The global people counting system market is anticipated to touch USD 1100 million by 2022, as per a brand-new report by Market Research Future (MRFR). The need for accurate measurement of footfall, retail management, queue analytics, and building management are expected to drive market growth over the forecast period (2016-2022).

The integration of internet of things (IoT) and cloud services for fortifying the security of buildings and complexes is likely to augment the demand for people counting systems. The implementation of such devices in night clubs, concert halls, and events to comply with government-outlined rules and policies is expected to bode well for the market in the forthcoming years. The people counting system market can expand at a CAGR close to 14% owing to their application in retail and transportation sectors. But privacy concerns among wireless based systems can hamper market growth.

1.3.3 Applicability

1. Can be used in various rooms like seminar hall, where the capacity of room is limited ane should not be exceeded. Project will display the actual number of persons inside the room.

2. Can be used in conference room, study rooms in colleges.

1.4 Achievements

Imagine you could know in any given moment how many people are currently standing at each line. That would surely help immensely.

1.5   Organisation of Report

Serves as the introductory chapter and Theory literature review where we try to relay the concept and acceptable reasons why the project should be implemented for the intending user of the work.

Deals with the Related of all possible related or closely related work of the design. The evolutionary trend in automatic room light controller operations and design, specification will also be looked at. The use and importance of this project design will also be mentioned here. It will be looking at the best place where this project design can be use and where it cannot. This chapter will also make room for adding additional information on past works in the area that will help in the actualization of this project design.

Treats system component description of this project design. It comprises of the information gathering, the source of the materials used in designing and writing the project report. The components and devices used in the course of designing this project will be analyzed to know their basic means of operation and how they will help in putting up this design, system design approach; the possible way to tackled the project design from scratch, bottom-up; it will treat how the practical detail was gotten before considering about the general principle of the system design, choice of design system; it focuses on why the project design was done using a microcontroller rather than using only digital logic.

It presents the detail design work and discusses the system, test carried out, Expected results, and Performance evaluation. The schematic diagram of the design and the source code (in C language) used in programming the microcontroller were also outlined. Summary and conclusion of the design will be presented

It will be looking at the problems encountered in designing the project and possible solutions to them.

Chapter 2

LIRERATURE SURVEY

Although not same but many related work have been done by many researchers. Some of the papers have been studied and described below. Asha Rawat, et al. [2016] has done an "Automated Room Light Controller with Visitor Counter". The main purpose of the project is automation, saving electricity, increasing appliance life span and yet providing a desired output smartly. Subhankar Chattoraj , Aditya Chakraborty et al [2016] has done a "Bidirectional Visitor Counter with Arduino as the master controller. This paper gives the basic idea of how to control the bidirectional visitor counter and room light counter using Arduino Mega and Ardiono(IDE). The cost of this technology is very economical. Sonali K. Pawar et al [2016] has done a "VISITOR COUNTER ".This digital world Technology is very advanced and we prefer things to be done automatically without any human efforts. This project also helps to reduce human efforts. Also it is very useful to conserve resources. E.Shilpa et al[2017] has done a" Implementation of Automatic Room Light Controller with Visitor Counter Design using 8051 Microcontroller". This project compacts with the usage of the energy in this competitive world of electricity. This project is well-organized enough to let someone know about the accuracy of the person entered and have taken the exit from the room. D.Hari Priya et al [2014] has done a "Gas Leakage System". The heart of this paper here is a LPG gas leakage sensor circuit that detects the outflow of LPG gas and the circuit is a gas sensor module SEN 1327. QM 6 gas sensor is used in the SEN 1327 module. Kausik Sen et al[2015] has done a " Automated Fire Detection and Controlling System". In this paper basically a low cost fire detection and control system based on smoke and heat 12 detection is proposed. It is comprised of a combination of electrical/electronic devices/equipments working together to detect the presence of fire and alert people through audio or visual medium after detection. Winfred Adjardjah et al[2016] has done "Design and Construction of a Bidirectional Digital Visitor Counter". This paper presents the design and construction of a digital bidirectional visitor counter (DBVC).

The DBVC is a reliable circuit that takes over the task of counting number of persons / visitors in the room very accurately and beeps a warning alarm when the number of visitors exceeds the capacity limit of the auditorium/hall. Gaurav Waradkaret al

[2016] has done "Automated Room Light Controller with Visitor Counter". This paper presents the design and construction of a digital bidirectional visitor counter . This is reliable project that takes over the task of counting number of visitors in the room. Kimbley et al[2016]has done "VISITOR COUNTER". The Project 'Automatic Room Light Controller Using microcontroller ATMEGA16A and bidirectional visitor counter' controls a room light as well as count the number of individuals entering and leaving a room. When an individual enters into a room then one counter is incremented by one and one light in a room will be switched ON and when the individuals leaves a room then the counter is decremented by one.

Chapter 3

REQUIREMENTS AND ANALYSIS

3.1   Problem Definition

➢ The distance from the object is very important and in some cases the IR sensor is not suitable for these applications. If the distance from the object is greater than 20-30cm, the ultrasonic sensor can be a better choice.

➢ If at a same time more than one person enter or exit from class the sensors can't recognise more than one person are enter or exit from class, it will asume that only one person are enter or exit

➢ Every obstacle is assumed as person, so every obstacle its perform increment or decrement in count.

3.2   Requirements Specification

Arduino UNO micro-controller used along with some sensors, lcd and battery. First of all, due to the requirement of portable device we need to attach **Battery** with the arduino uno. Here **Ultra sonic** sensor are used to identify the person's entery / exit. There are are two ultra sonic sensors are use for bi-directional perpose. Where the device not only count entery point where person are enter in (class), but also there one more (2nd ultra sonic) sensor are detect the person are leaving the area (class).

We attach both ultra sonic sensor to arduino uno at pin no 8 , 9 , 10 , 11. To get input from ultra sonic sensor and by performing some opration it provide to 16x2 **LCD** which connect to arduino uno at pin no 2,3,4,5,67. GND and VCC power supply are used and provide power to all sensor's and lcd by **Bread Board**

3.3 Software and Hardware Requirements

3.3.1 Software –

➢ Arduino-1.8.13-windows

3.3.2 Hardware –

➢ Arduino UNO

Arduino refers to an open-source electronics platform or board and the software used to program it. Arduino is designed to make electronics more accessible to artists, designers, hobbyists and anyone interested in creating interactive objects or environments. An Arduino board can be purchased pre-assembled or, because the hardware design is open source, built by hand. Either way, users can adapt the boards to their needs, as well as update and distribute their own versions.

➢ Liquid Crystal Display 16×2

An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

➢ Connecting Wires

A wire is a single, usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Wire is commonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of a gauge number. The term *wire* is also used more loosely to refer to a bundle of such strands, as in "multistranded wire", which is more correctly termed a wire rope in mechanics, or a cable in electricity.

➢ Ultrasonic Sensor (HC-SR04)

Ultrasound is sound waves with frequencies higher than the upper audible limit of human hearing. Ultrasound is not different from "normal" (audible) sound in its physical properties, except that humans cannot hear it. This limit varies from person to person and is approximately 20 kilohertz (20,000 hertz) in healthy young adults. Ultrasound devices operate with frequencies from 20 kHz up to several gigahertz's.

Ultrasound is used in many different fields. Ultrasonic devices are used to detect objects and measure distances

➢ Battery

It is simple battery, to make project portable by providing power supply.

3.4   Preliminary Product Description

It is use to count the no of people enter or get exit from particular place
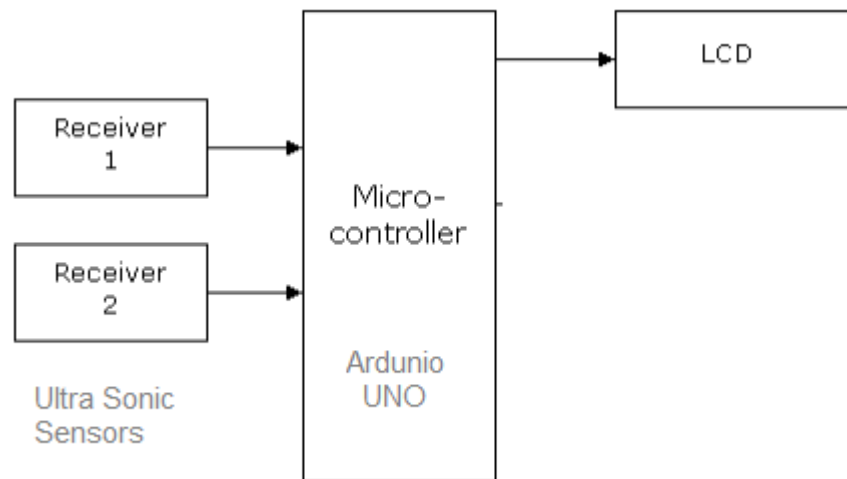
3.5   Conceptual Models

Fig.3.5 Block Diagram Ultra Sonic Sensors

1. Transmitter: We are going to implement the Person counter module using 2 transmitters and 2 receivers. We are going to use (Ultra sonic) transmitters because infrared beams are not visible to human eyes. Transmitters used are Ultra sonic sound.

2. Receiver: We are going to use an Ultra sonic receiver. It is an active low device which means it gives low output when it receives the Ultra sonic sound.

3. Microcontroller: This is the CPU (central processing unit) of our project. We are going to use a microcontroller of 8051 family. The various functions of microcontroller are like I. Reading the digital input from two infrared receivers and calculate the number of persons from them.

4. LCD: We are going to use 16x2 alphanumeric Liquid Crystal Display (LCD) which means it can display alphabets along with numbers on 2 lines each containing 16 character.

Chapter 4

SYSTEM DESIGN

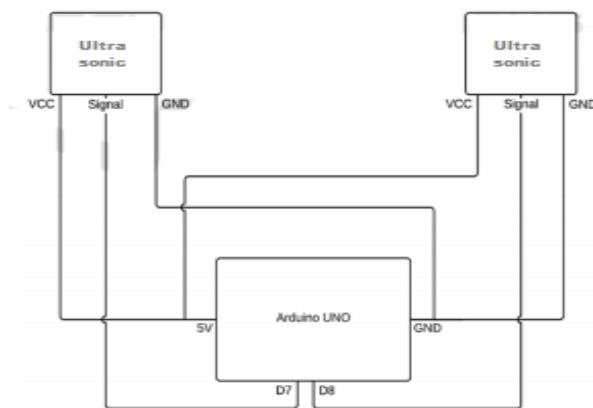## 4.1   Basic Modules

4.1.1   Logic Diagrams

Fig.4.1.1 Logic Diagram of Module

Person counter is presented on Figure, This circuit is composed by two Ultra sonic sensors connected with one Arduino Uno. The power of these sensors (VCC) is supplied by the 5V Arduino pin. The ground (GND) of each sensor is attached in the GND Arduino pin, the signal output of the first sensor is connected at the digital pin 7 and the signal of the second one at digital pin 8. Motion person counter circuit schema. In its default state, the motion sensor sends through the signal pin a LOW (0) output, meaning that there is no movement. When the Ultra sonic sensor detects motion, the signal output is HIGH (1) on the correspondent Arduino digital pin. The combine of Evaluation of an Arduino-based IoT Person Counter combination of two of these sensors

4.1.2 Algorithms Design

To perform people counting process the algorithm presented in Algorithm was deployed in the circuit. It use two procedures and one library to compute the information. The library is called "ultrasonic.h" (), and it is used to perform two types of processing:

• timing(): Gives the time passed between the emission and reception of an ultrasonic wave.

• convert(bool, int): receives the sensor id (in this case a boolean value), and the precision wanted (in this case centimeters).

The library was adapted to work with boolean values as a sensor id. Besides that, two procedures were implemented; read_ultrasonic_distance(bool) and count_persons(float,float,bool). The first one uses the library functions to return the distance that an object is from the sensor. The count_persons procedure counts the number of persons who passed in front of one sensor. The main procedure uses the following preconfigured information: delay, min_dist and max_dist. Delay indicates the time when the microcontroller has to switch the direction of reading. For example, if the delay time is set to 200 milliseconds, the device will verify how many persons are entering the room for 200ms, then it will verify how many persons are exiting the room for 200ms. The min_dist and max_dist represents the distance range, this interval indicates the size (width) of the corridor where people can pass. Therefore, the algorithm is executed while the device is on, and checks if anybody has passed in any direction. If so, this amount is incremented or decremented from the people global counter. In each iteration the direction is changed so the device can read in both directions. To finish the procedure the device sends to the server the captured information, through the rest interface, in order to preserve a historical ballast.

Algorithm : Ultrasonic Persons Counter

```
procedure read_ultrasonic_distance (bool direction) : float distance

microsec = ultrasonic.timing();

distance = ultrasonic.convert(direction, Ultrasonic::CM);

return distance;   end procedure

procedure count_persons(float min_distance, float max_distance, bool direction):

int amount_people

float distance_dir = 0;

float distance_oposite_dir = 0;

number_of_people = 0;

do

distance_dir = read_ultrasonic_distance(direction);

distance_oposite_dir = read_ultrasonic_distance(!direction);

if(same_distance_range(distance_dir, distance_oposite_dir))

number_of_people++;

while(distance > min_distance &&

distance < max_distance)

return number_of_people;

end procedure

procedure main() : void

float delay = 200;

int max_dist = 100; //centimeters

int min_dist = 40; //centimeters

int direction = 1;

amount_of_people = 0;

while(device_on)

while(time < delay)    if(direction)

amount_of_people += count_persons(min_dist, max_dist,direction);

else

amount_of_people -= count_persons(min_dist, max_dist,direction);

end while  end while

direction = !direction;

send_to_server(amount_of_people);

end procedure
```

The ultrasonic counter has limitations related to the distance that the object is from the device. In other words, if someone passes in front of the device at a distance greater than one meter it usually loses precision. In addition to that, if there is a group of people passing in front of the device, in the same distance range, it is possible that the proposed device also loses accuracy. Even with those limitations, for counting a large numbers of people the ultrasonic approach was more consistent than motion technology based approach.

4.2   User interface design

First we set the distance between two end, one end where device attach to wall and another end is door.

We set a default actual distance between them, For example : 1000mm. then if person enter in class, distance is decrease by assuming obstacle for Ultra sonic sensor. Now distance is something like less than 1000mm (300/400 mm).
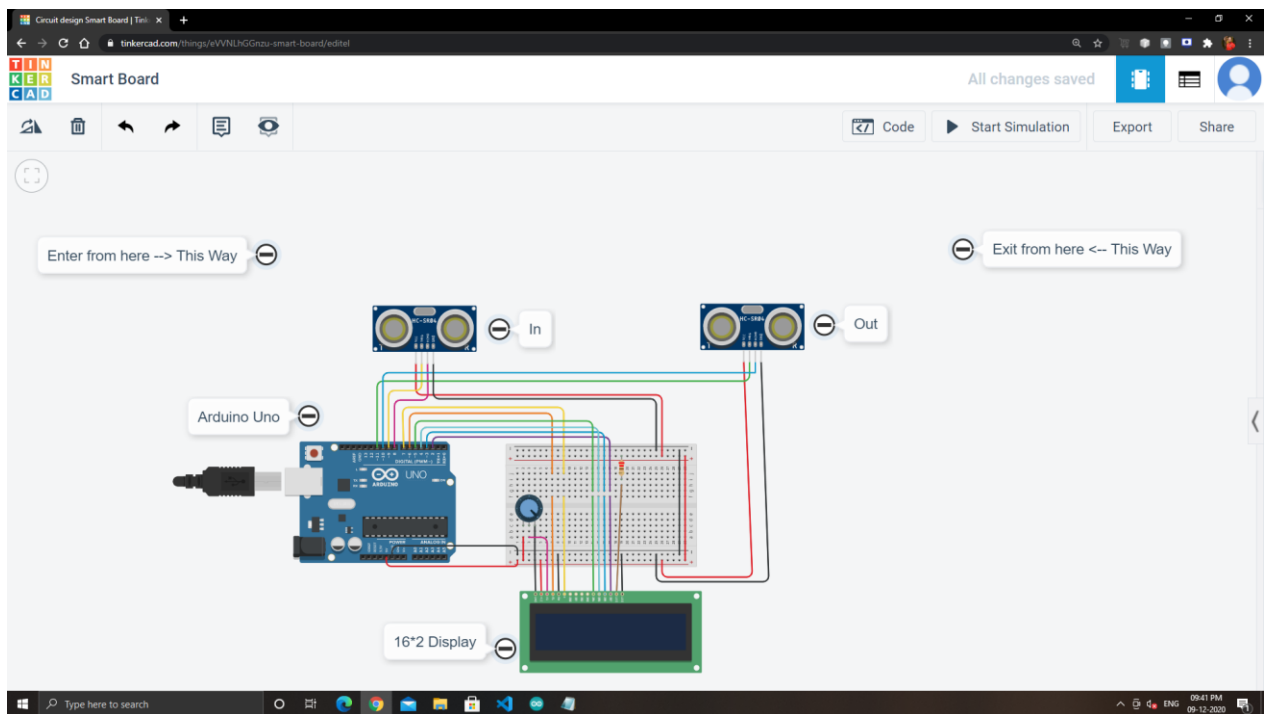
Then device assume as person are enter or exit from a class. It will increment / decrement count by 1 and so on. Total entry/exit are shown in form of count.
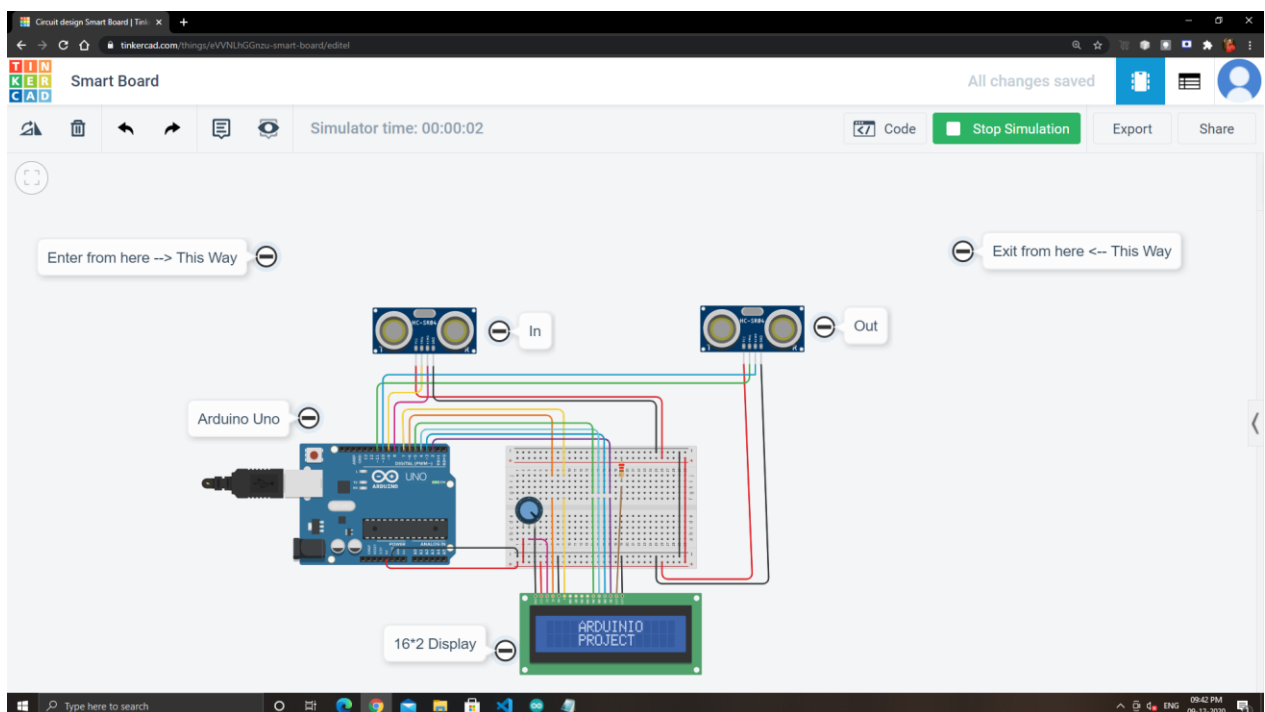
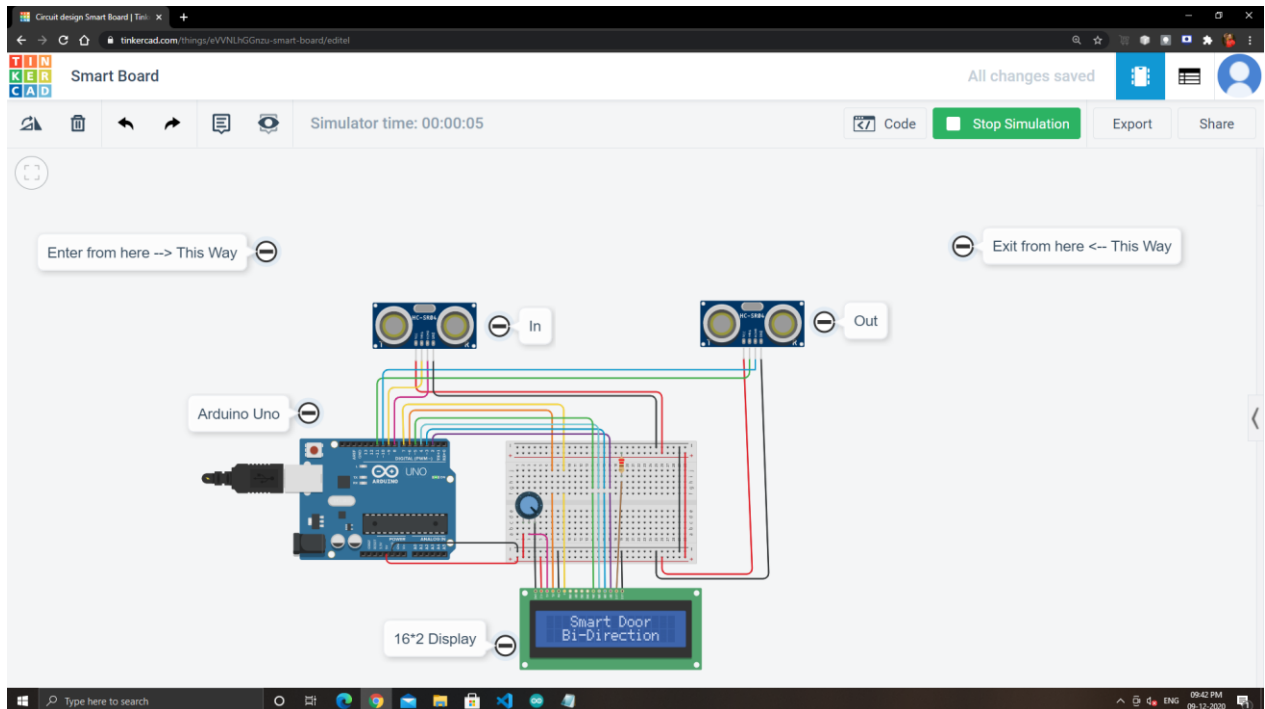# Chapter 5

RESULTS

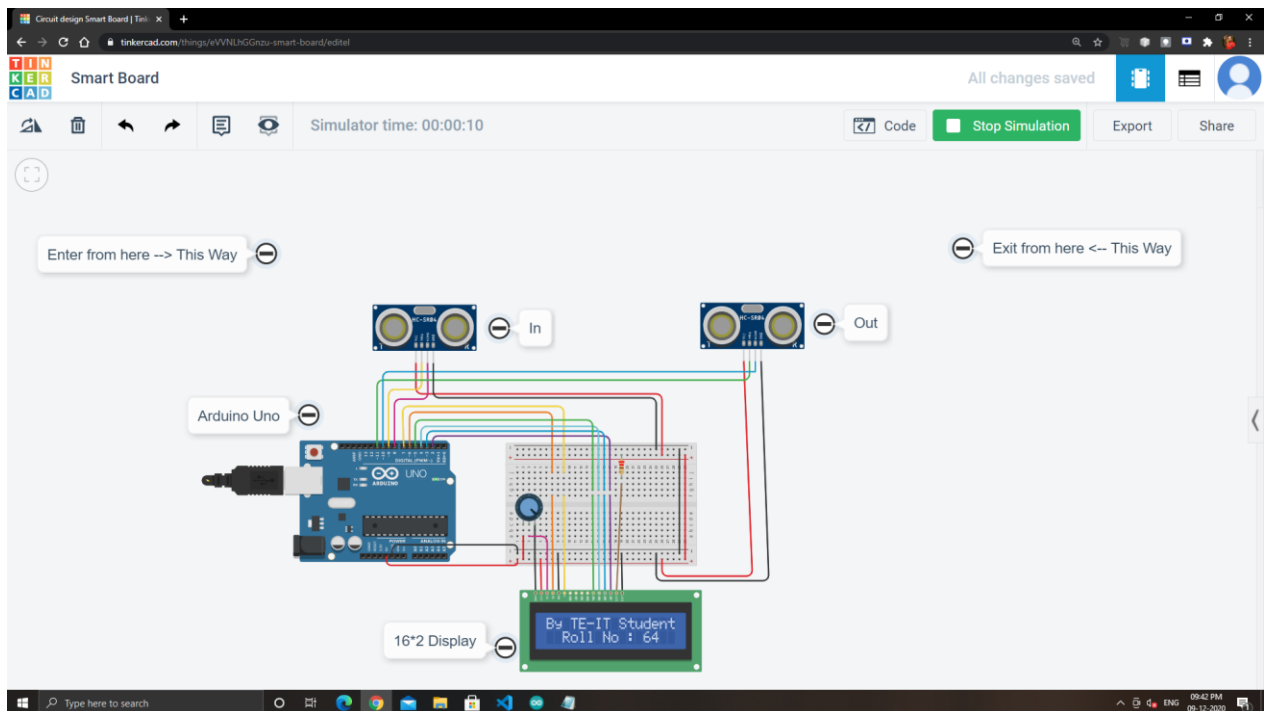## 5.1 Software Simulation Result
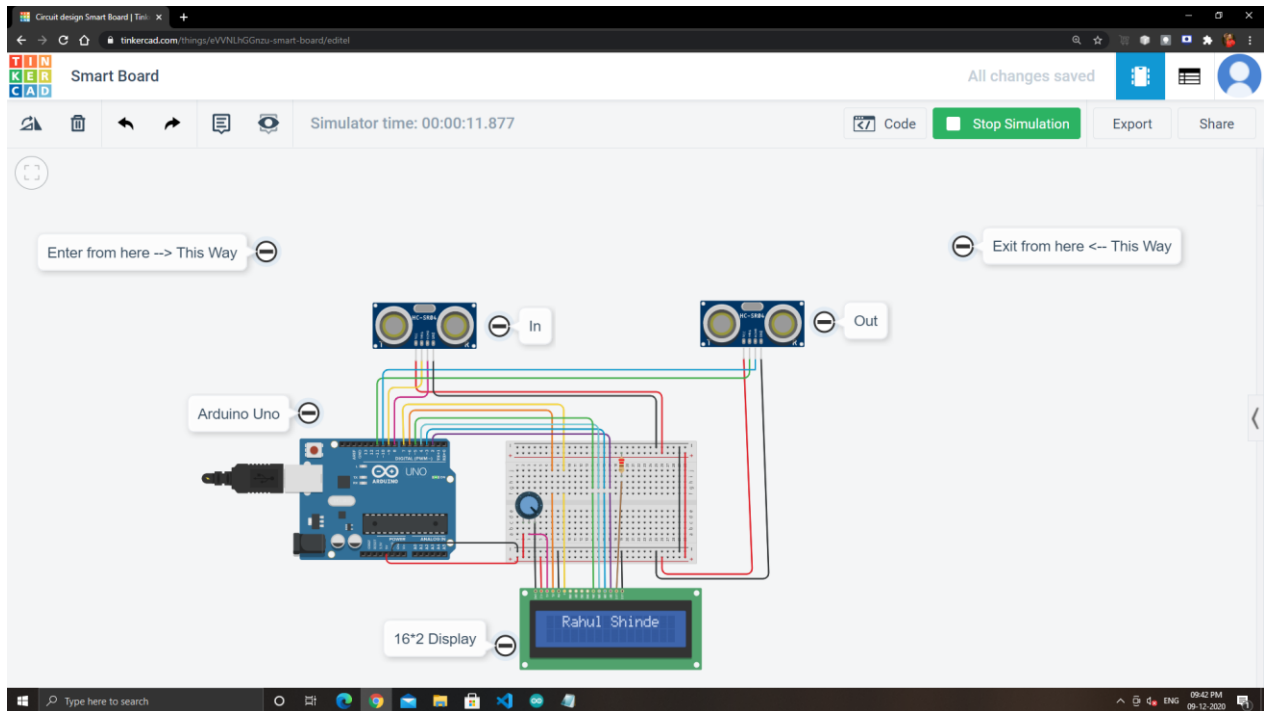
Connection:-

Display Arduino Project:-

Display Smart Door Bi-Direction:-

Display TE-IT Students And Roll No.:-

Display Admin Name:-

Chapter 6

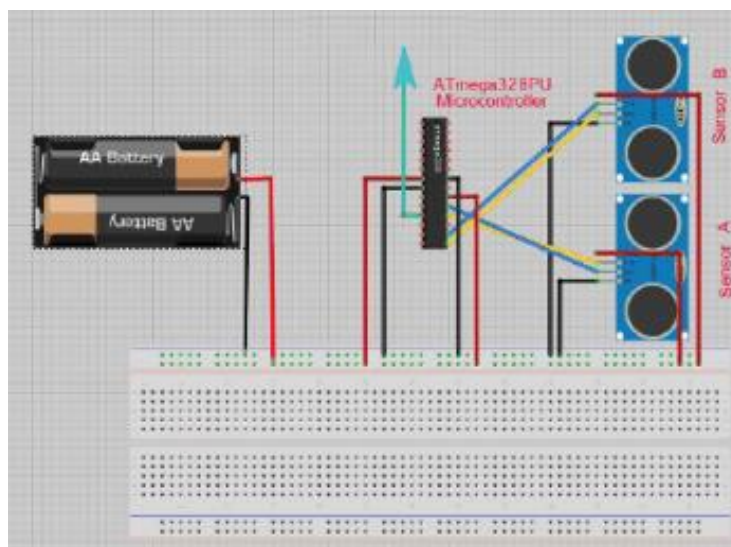# IMPLEMENTATIONS

6.1   Hardware Implementation

Fig.6.1 Hardware Implementation

Bidirectional Visitor counters section – It is bidirectional because 2 sensors are used on a single door. Microcontroller does the function of Reading the digital input from two ultrasonic sound distance sensor and calculates the number of persons from them.

6.2   Software Implementation

Software design is divided into two parts. First we write the Arduino program in Arduino software. Then we compile it to the Arduino hardware. This Arduino command is control the Arduino hardware and other circuit and display connection.

Installing Arduino, Arduino runs on Windows.

Go to the Arduino software web site at http://arduino.cc/en/Main/Software and download the version of the software compatible with our system. We use Arduino 1.0.5 version.

Arduino Language

The Arduino language is implemented in C/C++ and based in Wiring. When we write an Arduino sketch, we are implicitly making use of the Wiring library, which is included with the Arduino IDE. This allows us to make run able programs by using only two functions: setup () and loop (). As mentioned, the Wiring language is inspired by Processing, and the Arduino language structure is inherited from the Processing language, where the equivalent functions are called setup (). We 51 need to include both functions in every Arduino program, even if we don't need one of them. Let's analyze the structure of a simple Arduino sketch using again the Blink example.

Chapter 7

CONCLUSIONS

7.1   Conclusion

We presented a moving object counting system, targeted to count moving objects, especially pedestrians in restricted area while determining their direction. After analysing the current technologies, such as video and infrared, we adopted ultrasound sensing and we made use of wireless sensor networks as our data collection and analysis platform. The three-node sensor cluster is the basic functional unit we developed for counting pedestrians. Using intra-cluster analysis and inter-cluster cooperation, our experiments showed that the counting and motion direction analysis can reach 90% accuracy

7.2   Limitations of the System

➢ Lack of identification
➢ Lack of Accurency
➢ It is a low range circuit and cannot be implemented at large areas.
➢ With frequent change in the count value, after a certain time the output may look confusing.

7.3   Future Scope of the Project

In future work, we will concentrate on the following aspects. As this is our prototype work, we focus on counting the pedestrians in some restricted area. Counting moving objects in an open area is extremely hard, because the direction of motion may be more arbitrary as well as the moving velocity especially in a crowded space. Intra-cluster analysis and inter-cluster cooperation algorithm should be improved to solve the replicate, miss and wrong direction problems in these complicated scenarios. Since always-on ultrasound sensor boards are power consuming, we should schedule the sensing term. Finally, restricted by hardware at hand, we are only able to deploy a small-scale prototype of ultrasound sensor network. Large-scale deployments are needed to further exploit our ideas.

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