CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

This report provides details of the development and implementation of touch less elevator system. It is specially designed for fighting in pandemic situation to prevent the virus spreading over elevator buttons due to contact. As per Research, there are 3500 bacteria's per square inch on Lift Button. In current Scenario of COVID-19, there is a high possibility that someone could get infected by retouching the same buttons by many people. This interface would give less chances of getting infected. It has been designed to operate when it senses an object or presence in a presence of person choosing the appropriate floor.The tasks accomplishments can be roughly broken down into four main components: Identification of floor level, output of audio for corresponding floor level, memory location of audio files and utilization of aurdino controller. The sub tasks includes procurement of sensor, controller kit.
An elevator is a type of cable-assisted, hydraulic cylinder-assisted, or roller-track assisted machine that vertically transports people or freight between floors, levels, or decks of a building, vessel, or other structure. They are typically powered by electric motors that drive traction cables and counterweight systems such as a hoist, although some pump hydraulic fluid to raise a cylindrical piston like a jack. Elevators usually have floor indicators (often illuminated by LED) and direction lanterns. The former are almost universal in cab interiors with more than two stops and may be found outside the elevators as well on one or more of the floors. Floor indicators can consist of a dial with a rotating needle, but the most common types are those with successively illuminated floor indications or LCDs. Likewise, a change of floors or an arrival at a floor is indicated by a sound, depending on the elevator. Some buildings use proximity technology that recognizes residents and brings the elevator to ground level.

1.2 PROBLEM DEFINITION

In a constraint and enclosed space inside the lift cabin, bacteria and virus expelled when a person coughs or sneezes, can land on lift buttons and survive for a long period. There is a primary concern that virus are easily propagated under such ideal condition.

1.3 MOTIVATION OF THE WORK

Elevators are very common system that are used by us at daily basis whether at school , theaters, offfices ,everywhere it is installed to provide ease to humans. It is used daily by a number of people and hence the elevator buttons are touched a number of time by different people. it is possible that those buttons might have been touched by an infected person that can lead to spread of that infection among other people. So in current Scenario of COVID-19, there is a high possibility that someone could get infected by touching contact based elevator buttons.

The concept of development and implementation of touch less elevator system interface would give less chances of getting infected. It has been designed to operate when it senses an object or presence of person choosing the appropriate floor at a distance of 1-10cm. By this method their will be reduce in the spread of virus among people.

1.4 Objectives and Scope

The main objective of this project is to implement touch less elevator panel for upcoming installation lifts for commercial and public use and the goal is to prevent touching the lift buttons.

Our project aims at reducing the spread of the virus among people by providing touchless elevator control panel.

The project will introduce touch less elevator panel including the following features

- Contact less action using the help of IR sensors for detecting the buttons.
- Ease of use as their is no complexity in selcting the buttons and also the users do not have to go throgh any prior training before use.
- Safety environment options

CHAPTER 2

LITERATURE SURVEY

2.1 LITERATURE SURVEY

They have analyzed the ways of elevator calls: regular call, priority call and voice call, as well as interface as a link between smartphones and elevator control panel[1]. Furthermore, they have shown the design of the application which stimulates control panel for the elevator call and interface which will receive signals, process them and send them to the main elevator control panel(Figure 2.1).

- This presents android application for the elevator control.
- It works on an application which stimulates control panel for the elevator call and interface which will receive signals, process them and send them to the main elevator control panel.
- This is not a general purpose elevator, it is designed only for specific purpose.

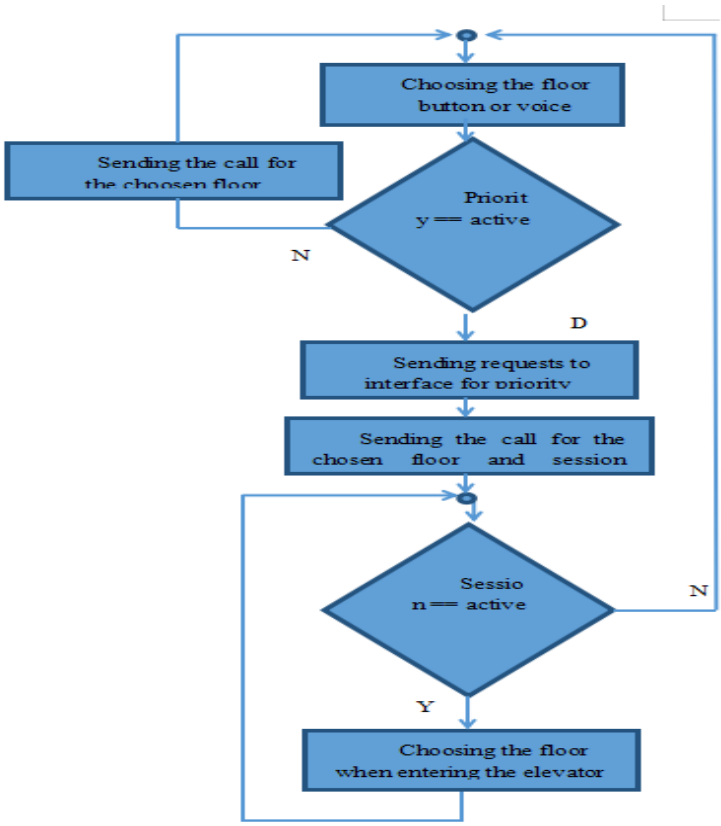

Figure 2.1: Working Flow Chart

(From References Paper[1])

They have used two stage convolutional neural network with perprocessing layer to reduce the complexity of the recognition task is presented[2]. The salient feature of the system is that there is no need to build a model for every gesture using hand features such as fingertips and contours. Background subtraction is used in preprocessing stage to exclude interference close to skin color and simple Gaussian skin color model is used to detect skin color and input image is inverted to binary one. After preprocessing, redundant information in gesture images is reduced and process of background information is omitted, which greatly helps to reduce training time of CNN. Then, a CNN was trained to learn 10 gestures in this paper. In the experiments, they conducted ten-fold cross-validation on the system where 10000 and 2000 images were used to train and test respectively (Figure 2.2).

- A two stage convolutional neural network with pre processing layer is presented to reduce the complexity of the recognition task.
- Then a CNN was trained to learn 10 gestures in this paper.
- This approach is difficult to implement for more than 10 floors.

Figure 2.2: Image Extraction
(From References Paper[2])

They introduces a prototype of a low-performance processor-based system that can be used in elevators, and then introduces a weighted K-nearest neighbors (K-NN) based user gesture learning and number matching method for application in an optimal non-contact button control method that can be used in such an environment[3]. The proposed space-weighted k-NN algorithm reduces the range of adjacent neighbors by observing the user distribution of button usage and re-establishing a button recognition area that fits the frequency of use (Figure 2.3)

- A prototype low-performance processor-based system that can be used in elevators is introduced.
- Along with a weighted KNN-based user gesture learning and number matching method as an optimal non-contact button control method.
- The results of the proposed method show a performance gain of 7.5% compared to the conventional K-NN method.

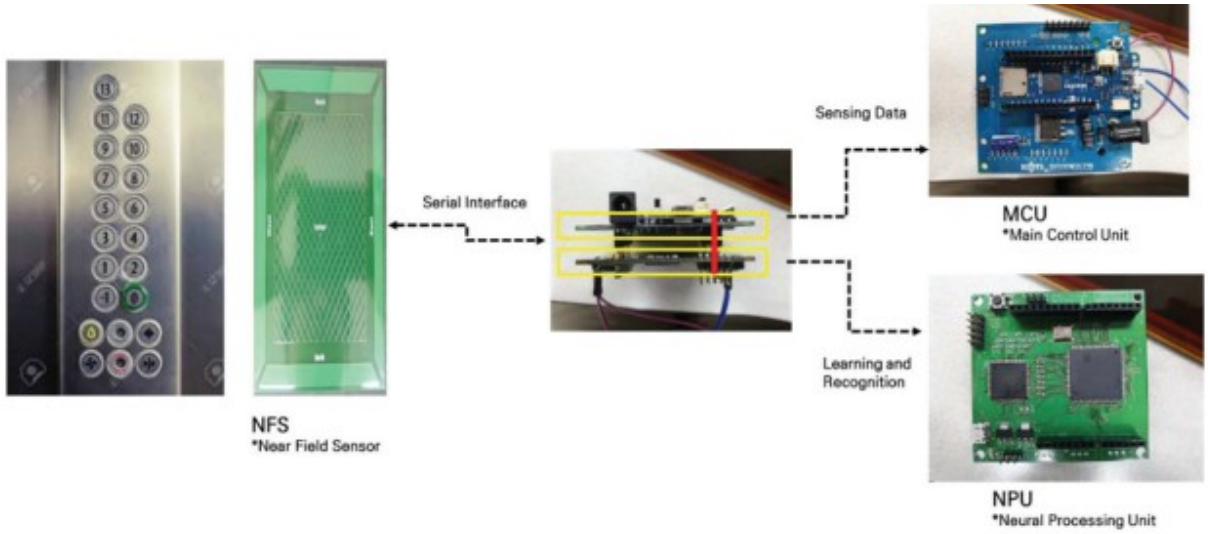

Figure 2.3: Hardware configuration

(From References Paper[3])

CHAPTER 3
METHODOLOGY

3.1 METHODOLOGY

In This Project Methodology Used Is

- The Figure 3.1 represents the design proposed that consists of a panel of buttons with Infrared sensors mounted behind each button ,controller, OLED screen and a stepper motor.
- When our finger approaches a particular button it is recognised by the IR sensor, the digital data is sent to controller (arduino).
- The controller maps the particular IR sensor value to floor number and displays it on OLED screen and stepper motor rotates such that the elevator cabin will move to the designated floor.
- In case if two or more than two buttons are sensed simultaneously then arduino resets the input and commands user to try again and the same is displayed on the OLED screen.

To achieve the above operation we have used -

Arduino IDE

Embedded C

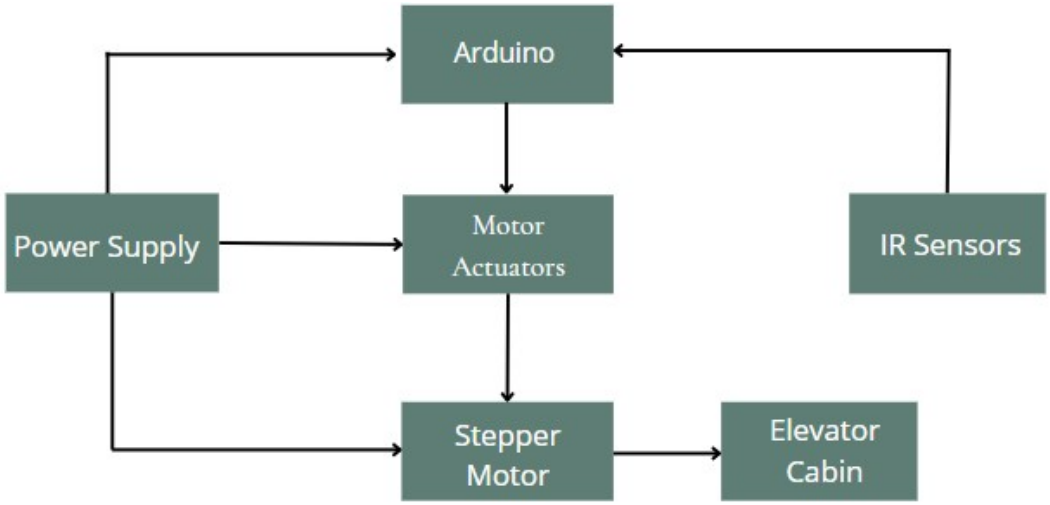

Figure 3.1:Hardware architecture of this project

3.2 Components

This Project Components Used Are

3.2.1 Arduino UNO

Arduino UNO (Figure 3.2) is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP (In-Circuit Serial Programming) header and a reset button. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms

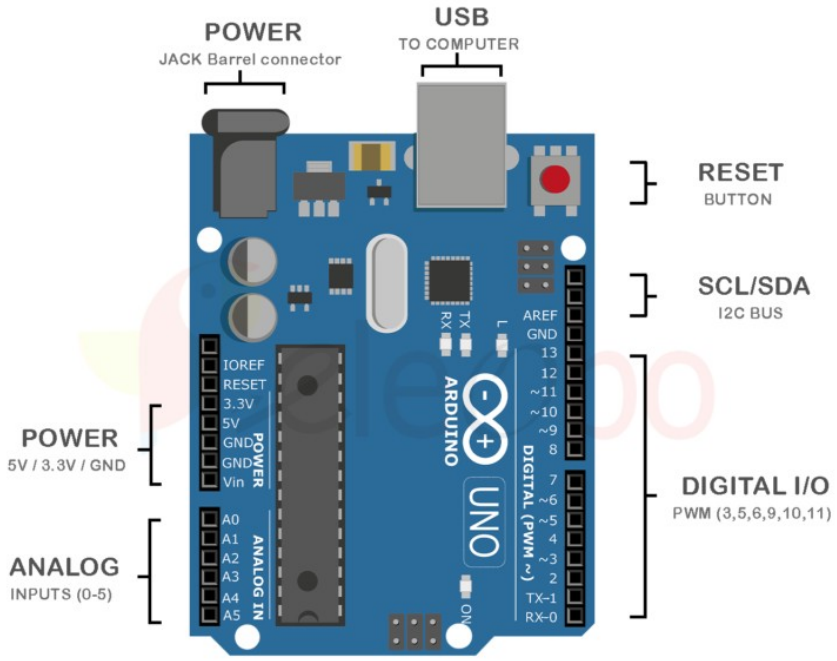

Figure 3.2: Arduino UNO

(https://unsplash.com/photos/hz7EFrw06Qk)

Technical specifications of Arduino UNO

- Microcontroller: ATmega168
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14
- Analog Input Pins: 6
- DC Current per I/O Pin: 40mA
- DC Current for 3.3V Pin: 50mA
- Flash Memory: 32KB (ATmega328)
- SRAM: 2KB (ATmega328)
- EEPROM: 1KB (ATmega328)
- Clock speed: 16MHz

3.2.2 IR Sensor

The IR sensor or infrared sensor is one kind of electronic component, used to detect specific characteristics in its surroundings through emitting or detecting IR radiation. 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.

The sensor which simply measures IR radiation instead of emitting is called PIR or passive infrared. Generally in the IR spectrum, the radiation of all the targets radiation and some kind of thermal radiation are not visible to the eyes but can be sensed through IR sensors.

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 & resistance will be changed in proportion to the received IR light magnitude(Figure 3.3).

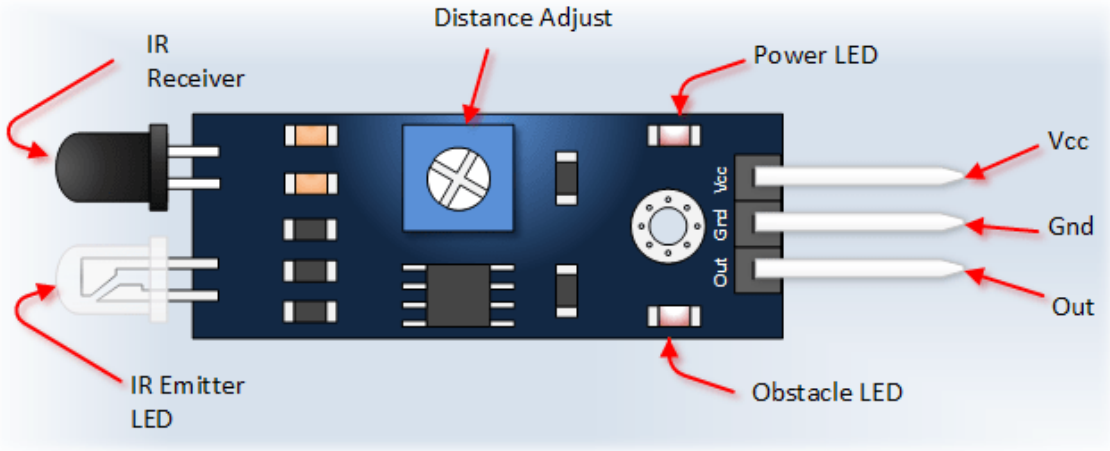

Figure 3.3: IR Sensor

(https://techzeero.com/sensors-modules/ir-sensor/)

3.2.3 OLED Display

The organic light-emitting diode (OLED) display that we'll use in this tutorial is the SSD1306 model: a monocolor, 0.96-inch display with 128×64 pixels as shown in the following (Figure 3.5)

The OLED display doesn't require backlight, which results in a very nice contrast in dark environments. Additionally, its pixels consume energy only when they are on, so the OLED display consumes less power when compared with other displays.

Pin	Wiring to Arduino Uno
Vin	5V
GND	GND
SCL	A5
SDA	A4

Figure 3.4: OLED Display Pin

(https://randomnerdtutorials.com/guide-for-oled-display-with-arduino/)

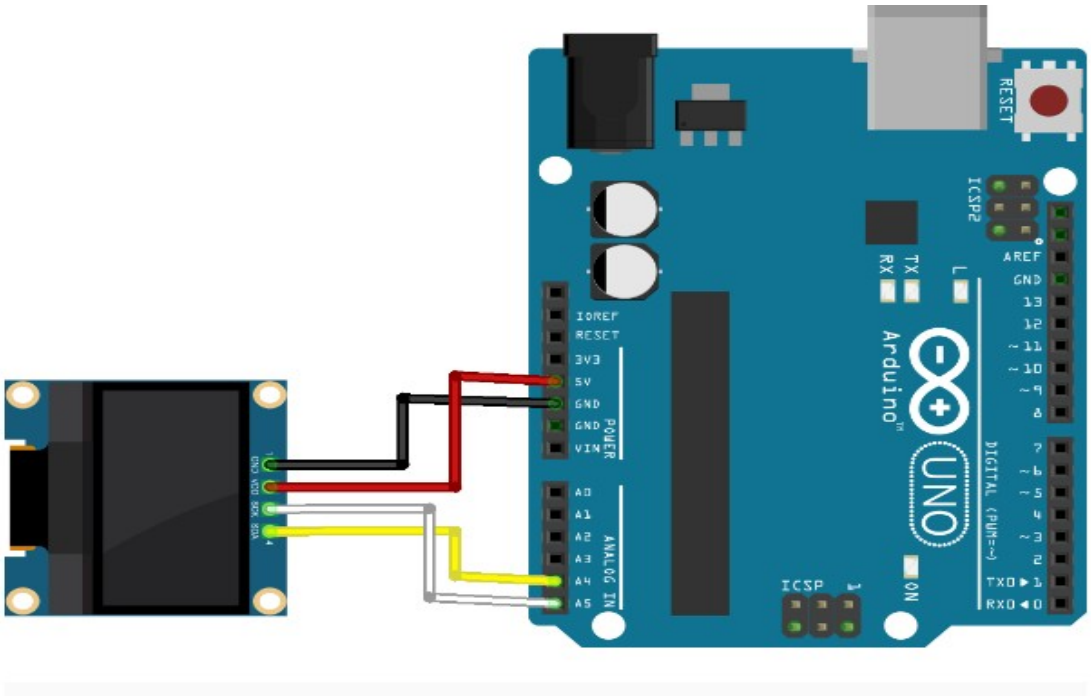

Figure 3.5: OLED Display

(https://randomnerdtutorials.com/guide-for-oled-display-with-arduino/)

3.2.4 Stepper Motor

The 28BYJ-48 (Figure 3.6) is a 5-wire unipolar stepper motor that runs on 5V. The best part about this motor is that it can be precisely positioned one 'step' at a time. It does well in projects that require precise positioning, such as opening and closing a vent.

Figure 3.6: 28BYJ-48 Stepper Motor

(https://lastminuteengineers.com/28byj48-stepper-motor-arduino-tutorial/)

Another advantage is that it is relatively precise in its movement and is quite reliable as the motor does not use contact brushes.

Considering its size, the motor delivers a decent torque of 34.3mN.m at a speed of around 15 RPM. It gives good torque even in stand-still condition which is maintained as long as power is supplied to the motor.

The only downside is that it is a bit power hungry and it consumes power even when it is not moving.

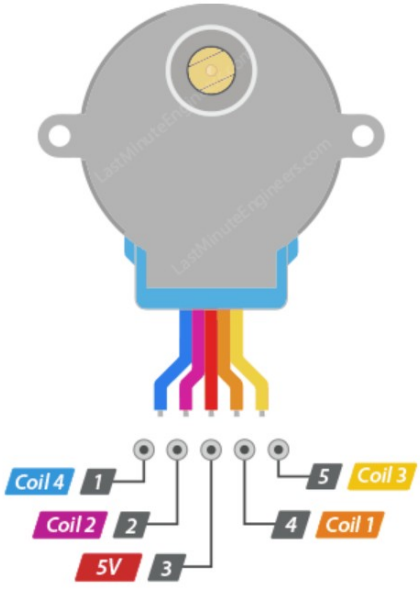

Figure 3.7: 28BYJ-48 Stepper Motor Pin

(https://lastminuteengineers.com/28byj48-stepper-motor-arduino-tutorial/)

3.2.5 Motor Drive

Because the 28BYJ-48 stepper motor consumes high current, a microcontroller like Arduino cannot control the motor directly. It requires a driver IC like ULN2003 to control the motor so this motor usually comes with a ULN2003 (Figure 3.9) based driver board. Known for its high current and high voltage capability, the ULN2003 delivers a higher current gain than a single transistor and enables the low voltage low current output of a microcontroller to drive a high current stepper motor.

The ULN2003 consists of an array of seven Darlington transistor pairs, each pair capable of driving a load of up to 500mA and 50V. Four of the seven pairs are used on this board.

Figure 3.8: 28BYJ-48 Stepper Motor with ULN2003 Motor Drive

(https://lastminuteengineers.com/28byj48-stepper-motor-arduino-tutorial/)

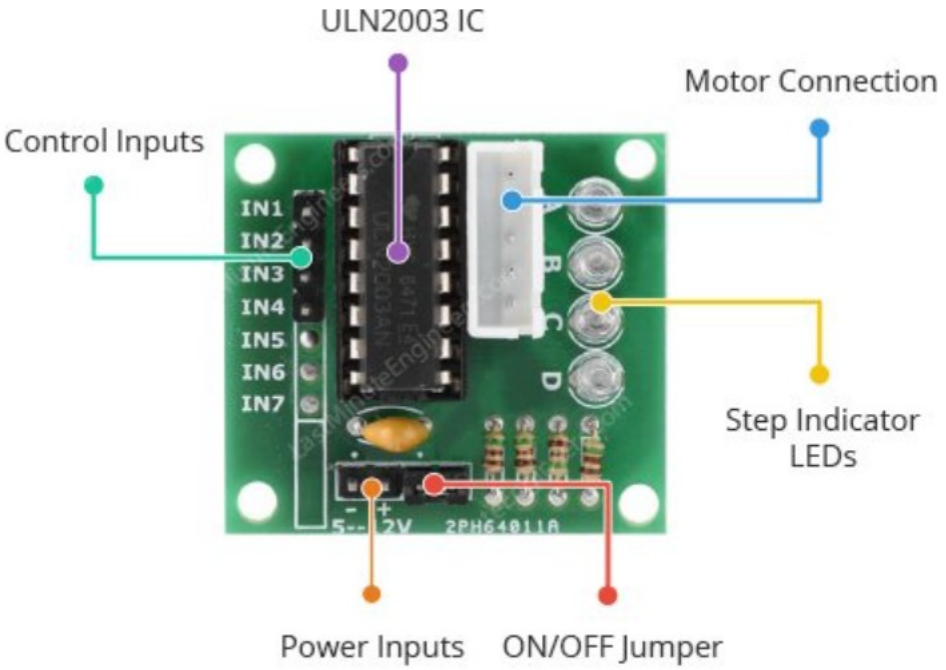

Figure 3.9:ULN2003 Motor Drive

(https://lastminuteengineers.com/28byj48-stepper-motor-arduino-tutorial/)

CHAPTER 4
RESULTS AND DISCUSSION

4.1 RESULTS AND DISCUSSION

A working model is created consisting of IR sensors which detects the finger within a proximity of 2-3 cm for selection of the floor of the elevator, based on the selected floor the elevator car is lifted using a stepper motor.(Figure 4.1)

An embedded based project is developed for a touch less panel for elevator operations. The panel interface uses IR sensor to identify the obstacles and provides an input signal to the controller which maps the IR sensor values to the floor number and gives the input to the motor actuator for achieving the elevator operation. This will help in current pandemic situation to prevent spreading contagious diseases . By implementing this touchless elevator control system we will be acheiving our goal of reducing contact of elevator buttons and reducing spread of diseases. A working model of an embedded based project is developed

Figure 4.1:Final Model

CHAPTER 5
CONCLUSION AND FUTURE WORK

5.1 CONCLUSION AND FUTURE SCOPE

Many people use an elevator every day, whether it's to access an office, apartment, or parking garage. However, with new health and safety guidelines being implemented across the globe, the way we access and use elevators is changing. No matter the size of your facility, enforce social distancing inside elevators, allowing only one or two people inside at a time. Updating the technology of your elevator system is another way to minimize liability in your building.

By implementing this touchless elevator control system we will be achieving our goal of reducing contact of elevator buttons and reducing spread of diseases. This system can be further improved by adding audio commands and adding all the real time features an elevator has. We are looking forward to add multiple floor selection feature into this model and develop this model to run in real time application.

REFERENCES

1. Junuz, Emina & Mušić, Denis & Mirza, Smajic & Ilhan, Karic. "ELEVATOR CONTROL BY ANDROID APPLICATION", 1st International Conference on Education/1. Međunarodna konferencija o obrazovanju, 2017.
2. M. Han, J. Chen, L. Li and Y. Chang, "Visual hand gesture recognition with convolution neural network," 2016 17th IEEE/ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD), 2016, pp. 287-291.
3. S. Lee, I. Cho and C. Hong, "Contactless Elevator Button Control System Based on Weighted K-NN Algorithm for AI Edge Computing Environment", Journal of Web Engineering, 2022.