Fabrication and Performance Test of an App Controlled Lift

A Project Thesis

By

Md Nahid Hasan

A.N.M. Asamud Dowla

Subrato Roy

Md Faisal

Parvez Hossain

DEPARTMENT OF MECHANICAL ENGINEERING

Sonargaon University, Dhaka.

September 2023

Fabrication and Performance Test of an App Controlled Lift

A Project Thesis

By

Md Nahid Hasan
Student ID: BME2001020573

A.N.M. Asamud Dowla
Student ID: ME2101023185

Subrato Roy
Student ID: BME2001020591

Md Faisal
Student ID: BME1803016455

Parvez Hossain
Student ID: BME2001020648

Supervisor:

Khandoker Mohammad Faisal Karim

Lecturer

Submitted to the

DEPARTMENT OF MECHANICAL ENGINEERING

Sonargaon University, Dhaka.

In partial fulfillment of the requirements for the award of the degree

of

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

September 2023

Fabrication and Performance Test of an App Controlled Lift

A Project Thesis

by

……..

Md Nahid Hasan
Student ID: BME2001020573

……

A.N.M. Asamud Dowla
Student ID: ME2101023185

……

Subrato Roy
Student ID: BME2001020591

……

Md Faisal
Student ID: BME1803016455

……

Parvez Hossain
Student ID: BME2001020648

……...

Khandoker Mohammad Faisal Karim

Lecturer

……..

Prof. Md. Mostofa Hossain

Head of the Department

Submitted to the

DEPARTMENT OF MECHANICAL ENGINEERING

Sonargaon University, Dhaka.

In partial fulfillment of the requirements for the award of the degree of

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

September 2023

ACKNOWLEDGMENT

First and foremost, we want to thank Allah, the Almighty, for providing us with the power and energy we needed to accomplish our research. It is obvious that research is not possible without other people, their guidance, advice, and motivation to understand goals and objectives. Our sincere gratitude is to **Lecturer Khandoker Mohammad Faisal Karim**, our supervisor for his helpful guidance, suggestion, and encouragement throughout this study. He encouraged us in every way he could, with passion, patience, and a good sense of humor. We owe it to **Prof. Md. Mostofa Hossain**, Head, of the Department of Mechanical Engineering, and the entire faculty for inspiring us to take on this challenge. This project would not be able to be awarded without their valuable work, project hardware suggestions, and criticism. We would like to express our gratitude to all of our teachers and staff of Sonargaon University, Dhaka. It would have been difficult to complete the study without their assistance.

ABSTRACT

The COVID-19 pandemic started in the early months of 2020, and COVID-19 variants spread significantly more quickly than the original virus. All around the world, the epidemic is steadily growing. Two families that shared many floors of a building in Fongshan, Kaohsiung, at the same time in June 2021 were infected with COVID-19. According to the investigation's findings, a building's elevator was the most likely location for viral transmission. Elevators, a vital amenity for occupants of high-rise buildings to move vertically, are controlled by pressing buttons. If a person who is carrying a virus enters the elevator without washing or hand-sanitizing, they may accidentally touch their lips, eyes, or nose, which might spread the infection to other people. The lift systems of today need you to select a floor by pushing the lift's button. If someone touches his face while holding diseased hands, side rails and lift buttons pose a risk. Passengers can use their own mobile devices to enter their locations into our system. To eliminate manual work, we provide a solution that uses a mobile application. We also employ motors, node MCUs, and sonar sensors as additional fundamental tools. A QR code in our system is used to give input for the mobile application. The mobile QR code scanner decodes the command, notifying the microcontroller of which floor has to be halted so that people may be conveyed. The user must first enter the lift and scan the QR code there in order to access the lift controls and choose the appropriate level. The passenger instructs the elevator to carry him to his designated location after choosing the proper floor on his smart device. The average trip time on an app basis is faster than on a manual base, saving time. For example, the lift takes 34.41 seconds in the manual base, but 7.49 seconds less in the app base.

TABLE OF CONTENTS

LIST OF FIGURES

NOTATIONS

In this project, we have used some shortcut keywords. For that reason, all the abbreviations are given below-

1. **IoT Based -** Internet of Things Based.
2. **PHP -** Personal Home Page.
3. **HTML -** Hypertext Markup Language.
4. **APP -** Application (Mobile).
5. **PC -** Personal Computer.
6. **Minefleet -** Mobile Data Stream Mining Environment.
7. **PCA -** Principle Component Analysis.
8. **NodeMCU -** Open Source Electronics Platform.
9. **LED -** Light Emitting Diode.
10. **PCB -** Printed Circuit Board.
11. **Arduino -** Open-Source Electronic Platform.
12. **USB -** Universal Serial Bus.
13. **IOS -** Internet Work Operating System.
14. **APK -** Android Application Package.
15. **LCD -** Liquid Crystal Display.
16. **GPS -** Global Positioning System.
17. **Buzzer -** An Electrical Device that makes a Buzzing Noise & Used for Signaling.
18. **PVC Board -** Polyvinyl Chloride board.

CHAPTER 1

INTRODUCTION

1.1 About App Controlled Lift System

The rapid advancement of science, technology, and medical treatment has increased the length of human life. The world's wealthy countries, particularly Japan and China, have increasingly entered an aging society. Aside from the long-term care issue, other issues arise as people age, such as infectious diseases such as COVID-19 and flu [1]. Smart Lifts are advanced constructions that allow for the automatic vertical transfer of goods or people. Because this system is automated, it saves time and improves visitor performance in residential, business, and other settings. Smart Lift systems incorporate cutting-edge virtual security device controls, such as biometric, contact display, destination dispatching, and access to manipulate structures, allowing them to advance [2]. We must press the lift button to select a floor in today's lift systems. If your hands become contaminated and you contact your face, lift buttons and side rails pose a risk. Passengers can use their own mobile devices to enter their destinations in our system. To eliminate manual work, we offer a solution with a web application. The web application database is managed by local communication via the Eps8266 module in this system. We also make use of three additional crucial devices- sonar sensors, Node MCU, and Motor.

Figure 1.1: App Based Touchless Elevator

1.2 Components of Non-Contact Lift System

There are Numerous components are used in this system. Those components are divided into some sub-segments which are given below.

- **Sonar sensors (Ultrasonic sensors)**
- **Node MCU (ESP-8266)**
- **Easier Pro (12V)**
- **EasyIoT**
- **Motor**
- **Mini Gear Motor**
- **Gear Motor (100 rpm)**
- **Buck Module**
- **Motor Driver**
- **Limit Switch**
- **Push Button Switch**
- **Toggle Switch**
- **JST Connector**
- **Arduino (Microcontroller)**
- **QR Code Display**
- **Power Supply-12V DC.**
- **MicroUSB Cable**

1.3 Problem Statement

- Possibilities of spreading viruses due to direct contact with the lift buttons.
- The lift can not be usable after any defect in the lift buttons.
- No IoT-based control of the existing system.
- A Lift operator is needed to supervise the lift.

1.4 Our Objectives in this Project

1.4.1 Objective

a) The major goal of this technology is to reduce the spread of the COVID-19 virus, which is very often spread by elevator buttons. According to one study, about 43% of the COVID-19 viruses are likely to be found in elevator buttons. Develops the QR code scan and ESP processing system then signal the Lift to operate.

b) To reduce the trip time of the automatic lift system.

1.4.2 Our Contribution

To select a floor with today lift systems, we must press the lift button. If your hands become contaminated and you contact your face, lift buttons and side rails may pose a risk. Passengers can use their own mobile devices to access our system and enter their destinations. To eliminate manual effort, we offer a solution with a web application. The web application database is managed by the Firebase cloud in this system. We also make use of three additional crucial instruments- Motor, NodeMCU, and Sonar sensor.

We created a QR code in our system to provide input to the mobile application. The mobile QR code scanner detects the command, which then tells the microcontroller which floor has to be halted for passengers to be taken. After entering the lift, the passenger must scan the QR code located within the lift to reveal the lift controls and choose the appropriate level location. The elevator receives the command to convey the passenger to his preferred location once the passenger presses the desired floor on his mobile device. [3]

CHAPTER 2

LITERATURE REVIEW

2.1 Background Information on the COVID-19 Pandemic

In late 2019, the first verified case of COVID-19 was announced in Wuhan, Hubei Province, China. COVID-19 eventually spread over the world, causing a pandemic and one of the deadliest plagues in human history. Fever, cough, hyperventilation, and loss of taste and smell are all common COVID-19 symptoms. In most cases, the incubation time between infection and symptom manifestation is between 1 and 14 days. It is most contagious in the first three days after symptom onset, but it can also be shared before symptom onset and by asymptomatic people. According to one study, about 40–45 percent of patients with COVID-19 infections are asymptomatic [3].

The COVID-19 virus is primarily spread through droplets produced by coughs and sneezes. Even though these droplets do not fly far in the air, those standing near an infected person can still be infected by inhaling them or touching their faces after coming into contact with contaminated surfaces. Aerosols can also transfer pathogens, and pathogens can live in an aerosol condition for several days. [4]

Air transmission is a common way for viruses to spread in crowded and poorly ventilated interior environments, such as restaurants, nightclubs, public transit, and funeral homes. Viruses can be found in phlegm and saliva. [5]

2.2 Scientific&Technological COVID-19 Prevention Measures

The Taiwanese government took full advantage of smart technologies for pandemic prevention during the COVID-19 epidemic. Through the use of big data, artificial intelligence (AI), and data analysis, Executive Yuan integrated the databases of various governmental units and established a smart pandemic prevention system and a pandemic prevention big data team, facilitating pandemic investigation and epidemiological analysis. The COVID-19 prevention network is based on the National Health Insurance card and cloud system, which is used to distribute face masks, gain access to medical data, perform quarantine, and provide information

regarding admission into Taiwan. The National Health Insurance Administration developed the Instant Alert System using the existing Health Insurance Medical Information Cloud-based Inquiry System, which allows front-line medical workers to check up on information. [6]

"The best method to prevent disease is to avoid getting exposed to this virus," according to the US Centers for Disease Control and Prevention. Handwashing often, maintaining respiratory hygiene, quarantine measures, social distancing, implementing indoor ventilation, wearing masks in public places, and vaccination are all steps people can take. COVID-19 transmission can be effectively reduced using these techniques. [7]

2.3 Building Elevators as a Transmission for COVID-19

Two families that lived on the third and seventh floors of a building in Fongshan, Kaohsiung, were infected with a cluster illness. They did not know each other or had direct contact with each other. They were, however, infected with COVID-19 at the same time. One theory for the cluster infection is that a member of one family hit an elevator button that had been contaminated by the virus via nasal mucus transmission to the eye, nose, and mouth. According to a recent study, the COVID-19 virus is 43 percent likely to be present on the elevator buttons in an elevator frequented by COVID-19 patients. [8]. If elevator users eat with their hands, rub their eyes, or pick their nose shortly after pressing a virus-infected elevator button, the virus is likely to enter their bodies through the mucosa in their eyes, nose, and mouth, resulting in non-droplet transmission from nasal mucus to the eye, nose, and mouth[9]. The COVID-19 virus can be found in patients' nasal mucus, saliva, skin, urine, and feces.

Patients' hands may become contaminated with nasal mucus when they sneeze and cover their nose and mouth with their hands. The virus in their nasal mucus may contaminate surfaces such as elevator buttons and doorknobs if they touch them subsequently. [11]

Recent Research on the Contamination of the Daily Necessities of Patients with COVID-19

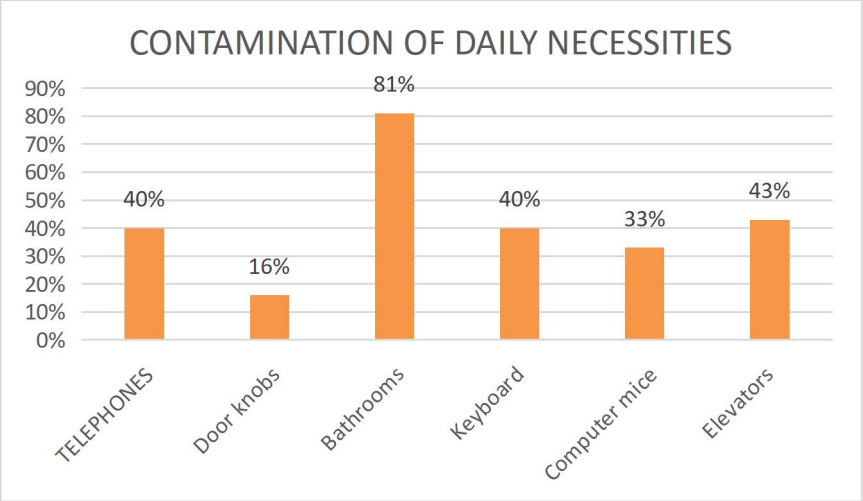


Figure 2.1 Statistics of Contamination of Daily Necessities

2.4 Our Proposal

Elevators are compact enclosed spaces that are used in a variety of contexts and frequently see several users in a short period. COVID-19 and other illnesses with comparable transmission patterns are in danger as a result of this. The current pandemic highlights the necessity to modify present infrastructure, especially elevators, to reduce disease spread. Current approaches rely on time- and manpower-intensive manual cleaning and disinfection of elevator cabins. User compliance is required for elevator hygiene standards such as hand sanitization and mask use. This paper presents a mechanism for automatic elevator disinfection that eliminates the need for touching. This is done in a way that does not interfere with the ordinary operation of the elevator, which is controlled by a microcontroller. To further improve safety standards. physical buttons are replaced with touch-less ones using a Mobile device and QR code.

CHAPTER 3

MATERIALS AND METHODOLOGY

3.1 Project Planning

Project planning is a discipline for determining how to execute a project within a specified timeline, with defined stages and resources. First and foremost, we encounter several common issues in our daily lives. Then look for this problem and consider how we might handle it in a precise manner. We talked about it with our teammates and teachers. We began planning how to make the project successful after receiving our supervisor's approval. To address this issue, we've devised a smart system that can transfer data to NodeMCU and other devices. The device will provide operators with vital information that will assist them in regulating all equipment.

3.2 Information Collection

Once the problem is discovered and learned how to tackle it effectively. After reading several research articles on the subject, data from a Non-contact lift management system that is used based on an Arduino and an Application to compile this report. Then we discovered several serious issues, such as removing infections, time-wasting, and app development, which is convenient for all. We've also looked at how to make a database and how to keep all of our data in one place. We also look for solutions on the Internet. We looked into the many types of sensors that were used in this system. The ultrasonic sensor (Sonar) was identified as one of the best input devices for this purpose. We looked at how to convey this signal across the processing device and how to connect people quickly. We've also looked at whether this strategy is feasible after it's been planned, as well as the society's requirements and how it may be implemented quickly.

3.3 Required Skill

We studied fundamental electronics, basic programming, Arduino control, IoT systems, and Android applications while working on this project. We've also looked into PCB design. In terms of programming, we've learned a lot about C/C++. We covered the basics of loops, functions, conditions, and algorithms. In the Arduino part, we learned how to connect to a computer and how to use the Embedded C++ language on the Arduino module.

3.4 Design and Development

The process of defining the components, modules, interfaces, and data for a system to meet specific criteria is known as system design. The process of establishing or altering systems, as well as the procedures, techniques, models, and methodologies required to do so, is referred to as system development. We created a system architecture that included a NodeMCU and power supply, as well as a 3D Model by SolidWorks and an Android app.

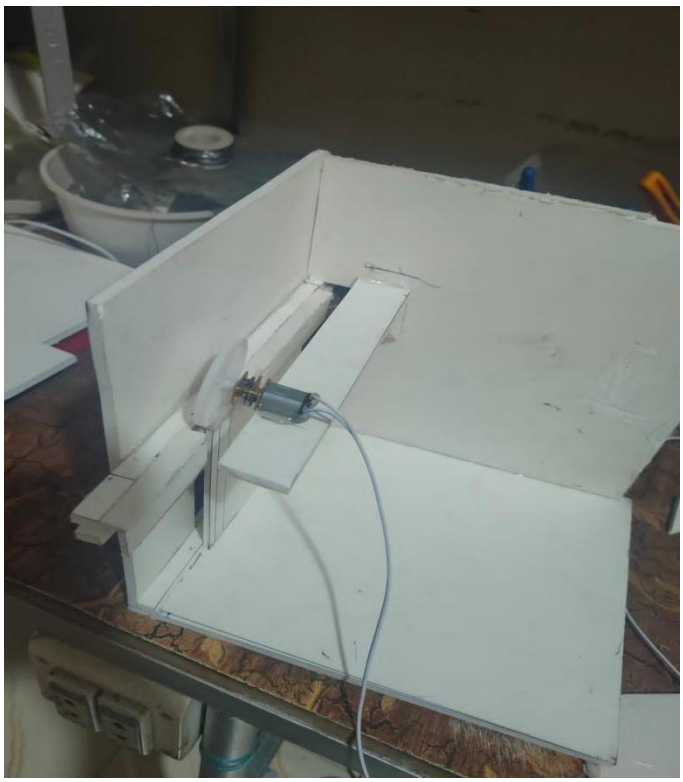


Figure 3.1 Prototype Design

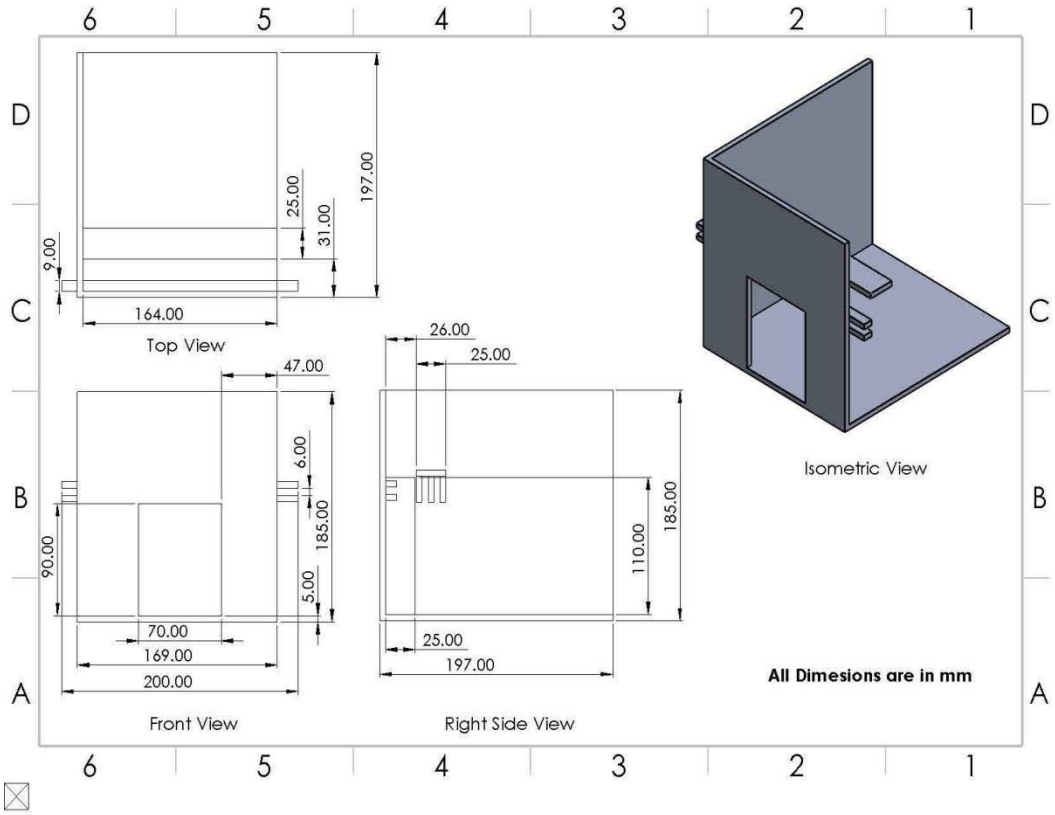


Figure 3.2: Prototype Design Final (CAD)

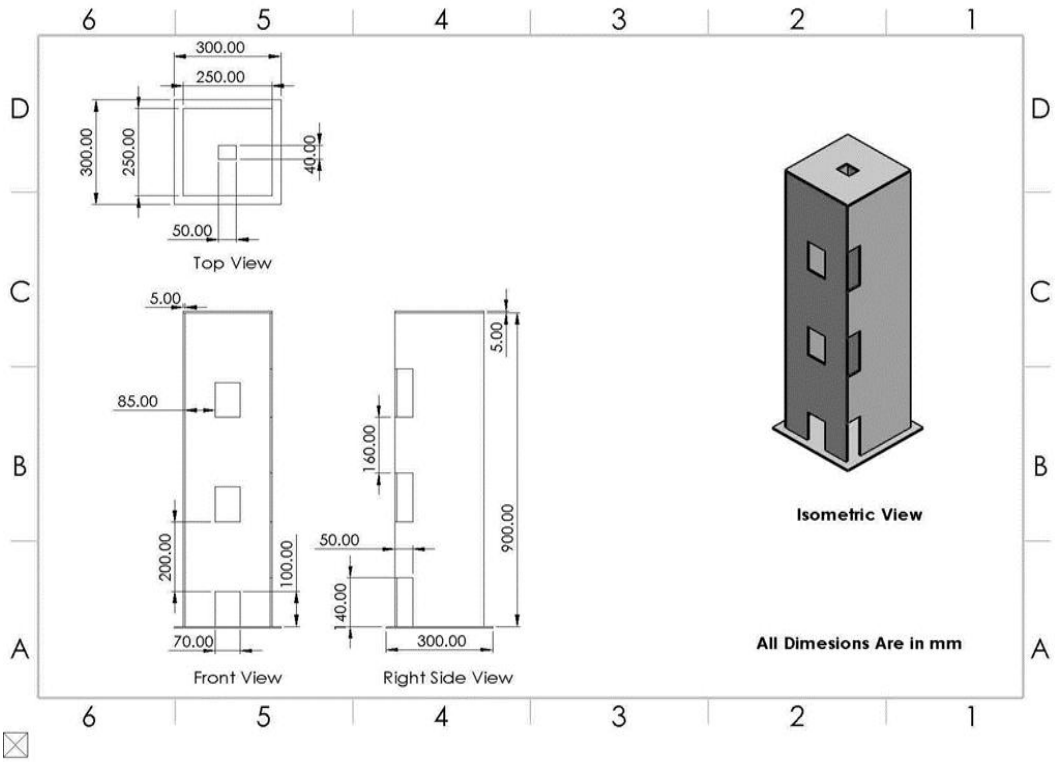


Figure 3.3: Prototype Design Final (CAD)

3.5 System Design and Description

We used an ultrasonic sensor as an input device to identify the elevator's floor location. Once the floor location has been determined, the data is sent to the processor, which then processes the next move by the app's command. The QR code on the outside of the lift is scanned using the smartphone application. When the QR code is scanned from the outside of the elevator, it indicates whether the user should move upward or downward. The elevator stopped on the floor using the elevator default algorithm after receiving confirmation from the user. After that, the user is granted access to the lift. The user must then scan the QR code once more to obtain the elevator floor buttons, which are kept inside the elevator. Finally, after picking the floor location, the user can use his mobile device to gain access to his desired floor.

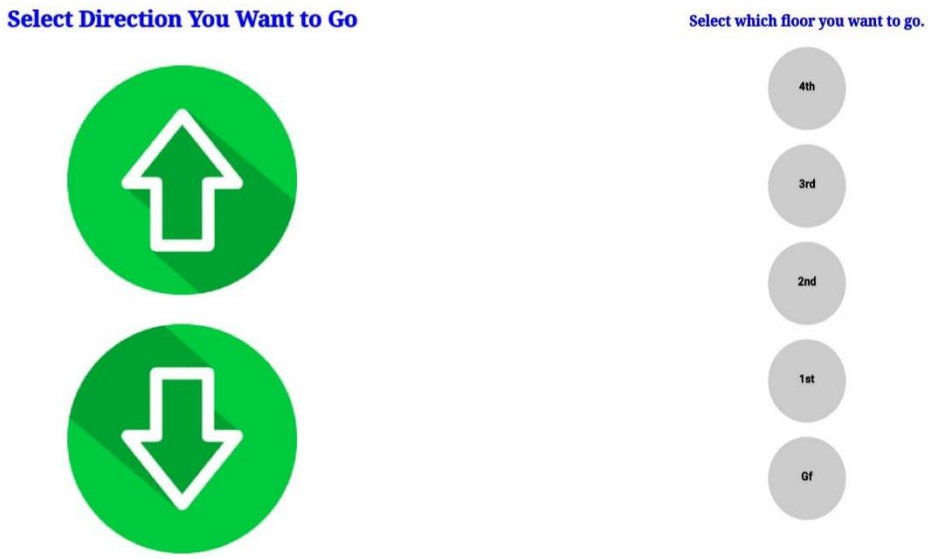


Figure 3.4: Elevator Buttons Outer Side And Inner Side (App Screen)

3.5.1 Block Diagram

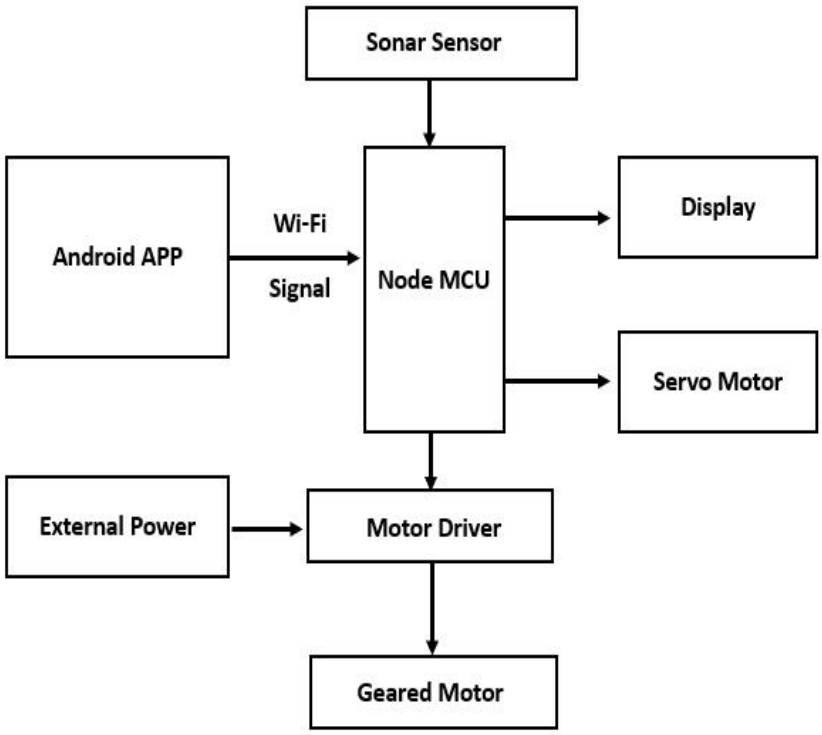


Figure 3.5: Block Diagram of the Contactless Elevator System

3.5.2 Outer Side Process Flow Chart

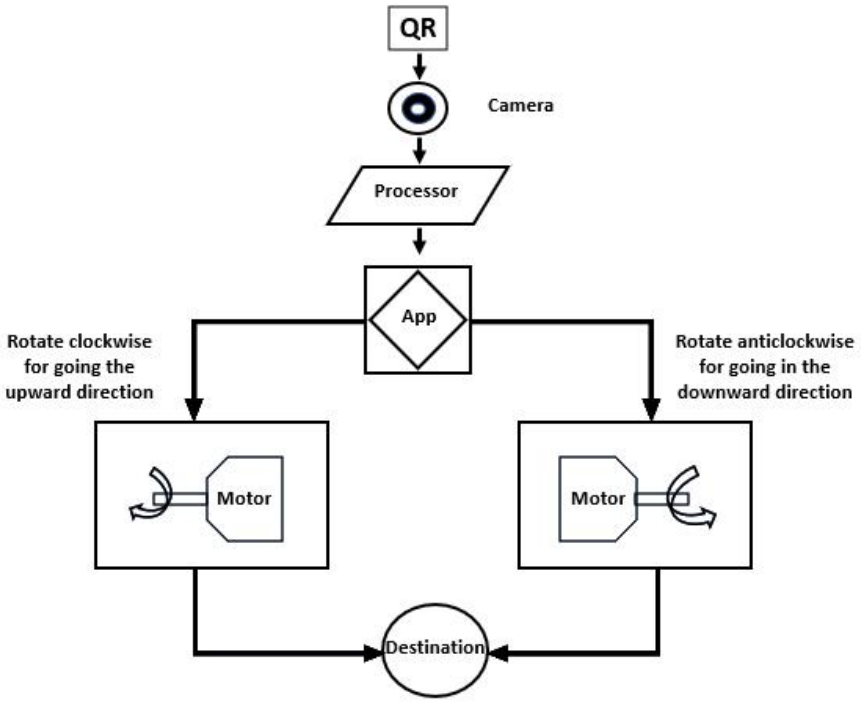


Figure 3.6: Outside Process Diagram of the Contactless Elevator System

3.5.3 Inner Side Process Flow Chart

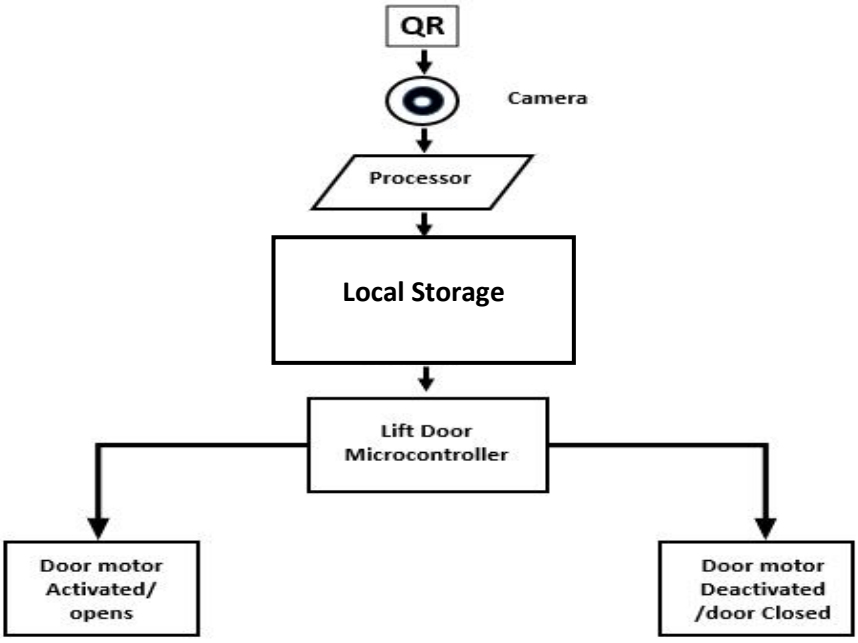


Figure 3.7: Inside Process Diagram of the Contactless Elevator System

3.5.4 Elevator Control Process Flow Chart

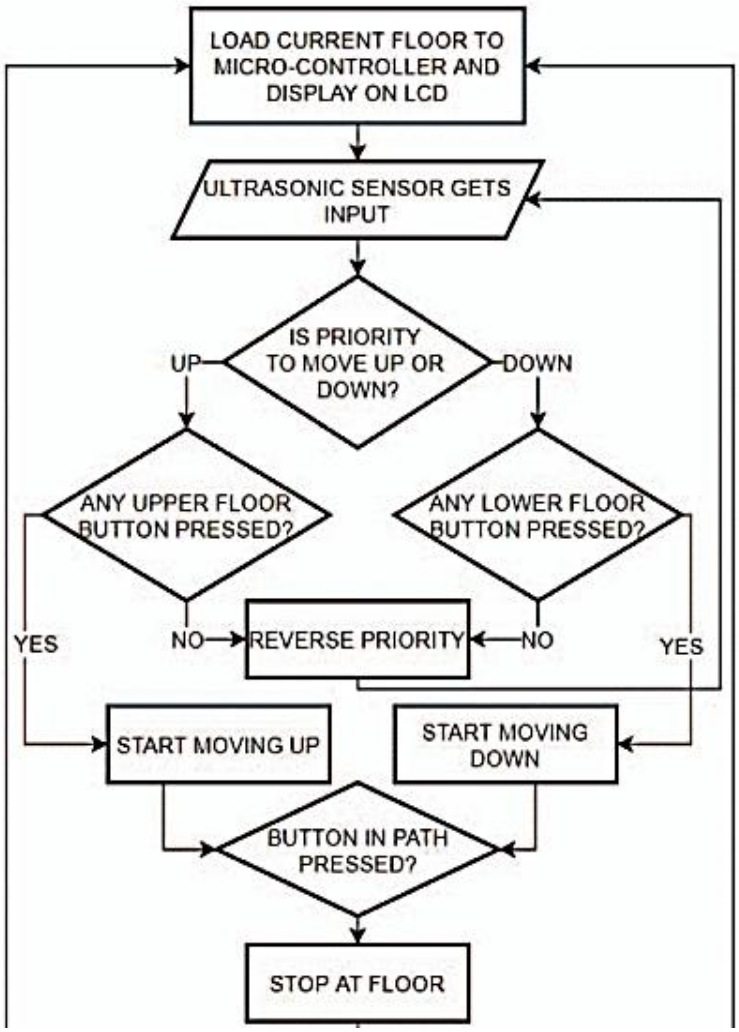


Figure 3.8: Elevator Control Diagram of the Contactless Elevator System

CHAPTER 4

HARDWARE AND PROCESSING UNITS

4.1 NodeMCU ESP8266

NodeMCU is a Wi-Fi SOC (system on a chip) produced by Espressif Systems. It is based on the ESP8266 -12E Wi-Fi module. It is a highly integrated chip designed to provide full internet connectivity in a small package. It can be programmed directly through the USB port using the Arduino IDE. By simple programming we can establish a Wi-Fi connection and define input/output pins according to our needs exactly like Arduino, turning into a web server. It can be used as an access point or station, host a web server, or connect to the internet to fetch or upload data.

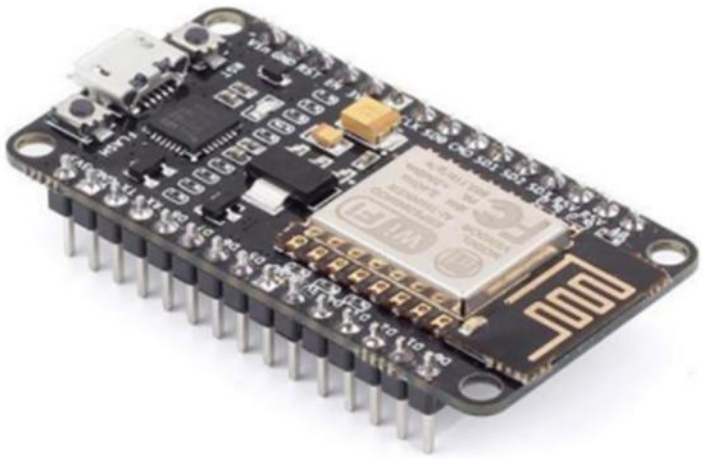


Figure 4.1: NodeMCU EPS8266

4.1.1 Working Principle of ESP8266

A user gives input in the form of source and destination stops on a particular route. The route will consist of multiple stops. GPS modules are installed on the bus. The GPS module tracks the location of the bus in real time and sends the data to the server through which it is displayed on the Google Map interface to the user. To send data to the server Node MCUESP8266 module is used as it has built-in support for Wi-Fi connectivity. This data is constantly updated on the server and real-time data is

continuously provided to the user on the client device. The estimated time of arrival (ETA) taking into consideration the traffic conditions is displayed to the user. It is a highly integrated chip designed to provide full internet connectivity in a small package. It can be programmed directly through the USB port using the Arduino IDE. By simple programming we can establish a Wi-Fi connection and define input/output pins according to our needs exactly like Arduino, turning into a web server. It can be used as an access point and/or station, host a web server, or connect to the internet to fetch or upload data.

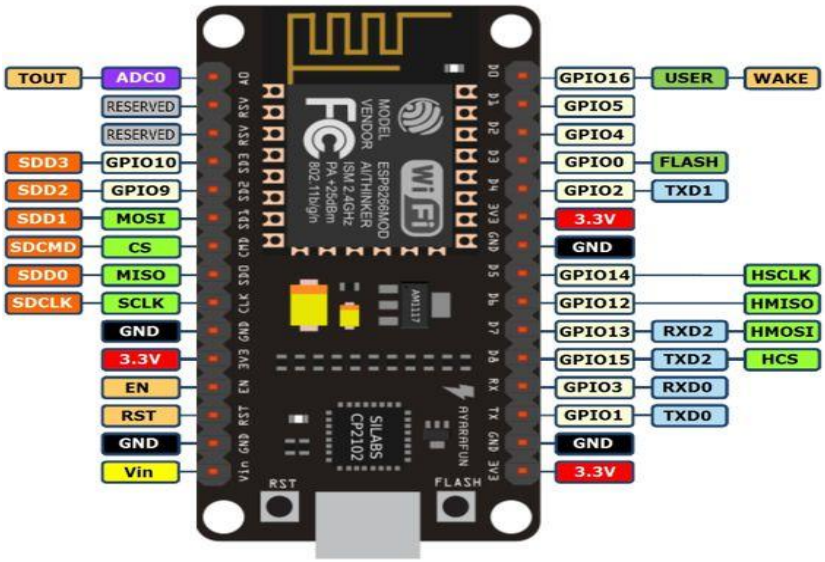


Figure 4.2: NodeMCU EPS8266 Pinout

Table 1: ESP8266 Module Pin Description

NO.	Pin Name	Function
1	GND	GND
2	GPIO2	GPIO, Internal Pull-up
3	GPIO0	GPIO, Internal Pull-up
4	RXD	UART0, Data Received Pin RXD
5	VCC	3.3V Power Supply (VDD)
6	CHPD	Chip Enable Pin. Active High
7	TXD	UART0,Data Send Pin RXD
8	RST	✓ External Reset Pin, Active Low ✓ Can Loft or External MCU

4.2 The Motor Driver

A high voltage, high current dual full-bridge motor driver module for stepper and DC motors is called the L298N module. Two DC motors can have their speed and rotation direction controlled. An L298 dual-channel H-Bridge motor driver IC makes up this module. Two methods are used in this module to regulate the DC motors' rotational direction and speed. These are PWM for speed control and H-Bridge for rotation direction control. These modules have simultaneous control over two DC motors or one stepper motor.

The L298 motor driver IC and a 78M05 5V regulator are the two major parts that make up this motor driver module. Two methods are used in this module to regulate the DC motors' rotational direction and speed. These are PWM for managing speed and H-Bridge for controlling rotation direction.

The H-Bridge method is used by the L298n motor driver module to regulate the direction of rotation of a DC motor. In this method, the polarity of the input voltage to the H-Bridge was changed to alter the direction in which the DC motor rotated. An H-Bridge circuit consists of a motor in the middle and four switching components, such as transistors (BJT or MOSFET). The switches of the H-Bridge circuit are controlled by the input pins IN1, IN2, IN3, and IN4 of the L298N IC.

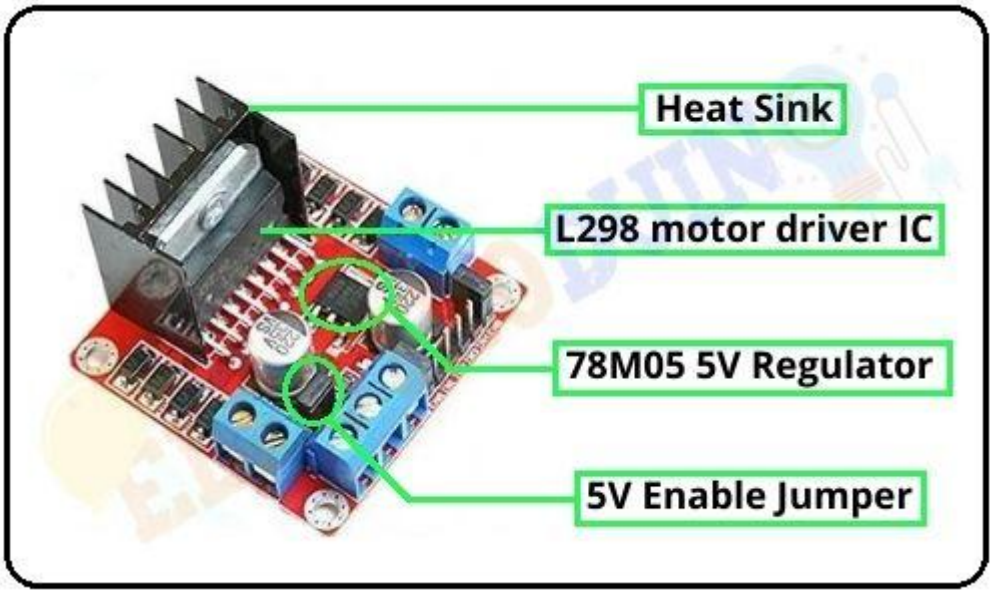


Figure 4.3: Motor Driver

By simultaneously turning on two certain switches, we may change the direction of the current flow, which will modify the motor's spinning.

4.3 Gear Motor (100 rpm)

100RPM Gear Motor In 37GB Low-Speed, High-Torque, 12V DC Gear Motor, 12V, 100RPM Micro Gear Boxed Motor For Toy 3D Printers Parts Robot Car.

Electric Motor with High Torque and 12V DC Speed, 37GB Speed control of 5W.100% fresh and great caliber. It works well for controlling speed. Give your testing and electrical equipment a fresh lease of life. Benefiting from little noise and great torque. The construction of this engine is sturdy. The majority of high-torque applications are acceptable for this motor.

Replace your worn-out or completely malfunctioning gearbox motor with this brand-new, premium 37mm, DC 12V, 100RPM replacement to extend the life of your electrical and testing equipment. This motor is well-built, has great torque, and is prepared for installation in a variety of applications.

Figure 4.4: Gear Motor (Big)

Electric Motor with High Torque and 12V DC Speed, 37GB Speed control of 5W.100% fresh and great caliber. It is excellent for controlling pace. Give your testing and electrical equipment a fresh lease of life. Gaining from reduced noise and great torque. The construction of this engine is sturdy. The majority of high-torque applications may use this motor.

4.3.1 Specifications

- Product Name: DC Gear Motor
- Model Number: 37GB
- Rated Voltage: DC 12V
- Rated Current: 0.92Amp
- Output Speed: 100RPM
- Shaft Diameter: 6mm
- Gearbox Part Diameter: 37mm
- Motor Part Size Length: 85mm
- Shaft length: 15 mm
- Output Power: 5W
- Rated Torque: 12Kg.cm
- Commutation: Brush
- Protect Feature: Drip-proof
- Construction: Permanent Magnet
- Certification: ROHS, CE, CCC
- Weight: 200gm

4.4 Buck Module

This module includes the adaptable LM2596 step-down (buck) switching regulator, which has good line and load control and can drive a 3A load. This LM2596 DC-DC buck converter step-down power module has a high-precision potentiometer and can drive a load up to 3A while operating at a high efficiency. It may be used with the Arduino UNO as well as other main boards and fundamental modules. Please add a heat sink to the device if the output current is higher than 2.5A (or the output power remains higher than 10W).

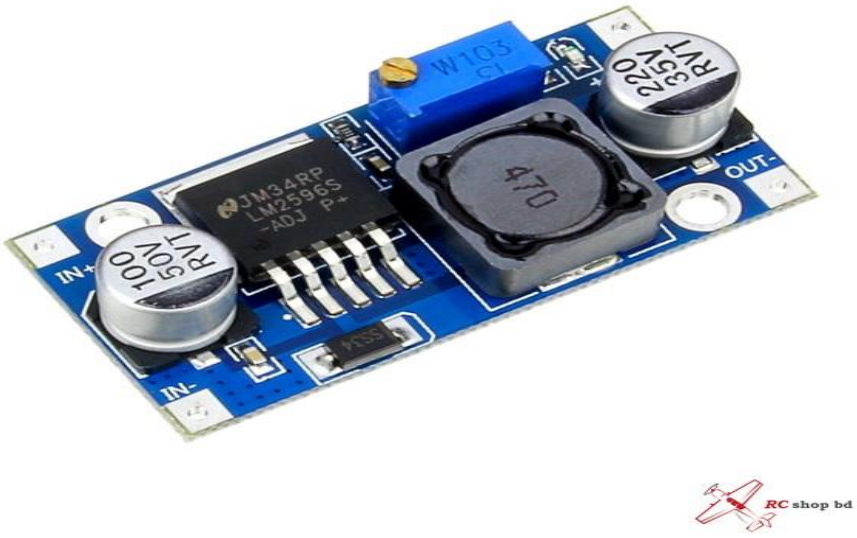


Figure 4.5: Buck Module

The step-down (buck) switching regulators in the LM2596 series of regulators are monolithic integrated circuits that can drive a 3-A load with excellent line and load regulation. These devices come with 3.3 V, 5 V, and 12 V fixed output voltages as well as an adjustable output version. Simple High-Efficiency Step-Down (Buck) Regulator, On-Card Switching Regulators, and Positive to Negative Converter are examples of applications.

4.4.1 Specifications

- Module property: Non-isolation buck
- Rectification mode: Non-synchronous rectification
- Type: LM2596 Adjustable Power Supply Module
- Short Circuit Protection: Current limiting, since the recovery
- Input Voltage: DC 4V-35V
- Output Voltage: DC 1.23V-30V
- Output Current:3A (Maximum)
- Conversion Efficiency:92%(Highest)
- Output Ripple:30mv(Maximum)
- Switching Frequency:150KHz
- Load regulation:0.5%
- Voltage regulation:2.5%
- Work temperature:-40?- +85?
- Dimension: 43x20x14mm

4.5 Power Supply-12V DC

A power supply is an electrical device that supplies electric power to an electrical load.

Figure 4.6: Power Supply 12V

The primary function of a power supply is to convert electric current from a source to Correct Voltage, current, and frequency to power the load. Also called a power supply unit or PSU, the component that supplies power to a computer. Most personal computers can be plugged into standard electrical outlets. The power supply then pulls the required amount of electricity and converts the AC to the DC. One purpose of a power supply is to convert AC to DC so the computer has proper power to run its components. Another purpose of a power supply is to distribute proper DC voltage to each component. Several cables with connectors come out of the power supply.

4.5.1 Specifications

- Input: 100~240V AC, 50/60Hz
- Output: 12V DC, 2000mA
- Plug: US plug
- Cable length: 100cm
- Net weight: 128g
- Package size: 9.5 * 7 * 6cm
- Package weight: 144g

4.6 Sonar Sensor (Ultrasonic Sensor)

The Ultrasonic HC-SR04 Sensor Module is a widely used sensor for measuring distance and detecting objects in a variety of applications. It is shown in Figure 6. It works in the same way that a radar system does. Ultrasonic sensors operate by producing high-frequency sound waves that humans can't hear. The transmitter emits a high-frequency sound pulse, which is received by the receiver when it reflects from any object's surface.

The sensors detect objects in this manner. It can detect objects or measure distances between 2cm and 400cm. The ultrasonic sensor works in the same way that a bat's object detecting system does. We can also claim that it works in the same way that a radar system does. The Transmitter (TX) and Receiver (RX) are the two primary components of the ultrasonic or HC-SR04 module (RX) [17].

Figure 4.7: Ultrasonic Sensor

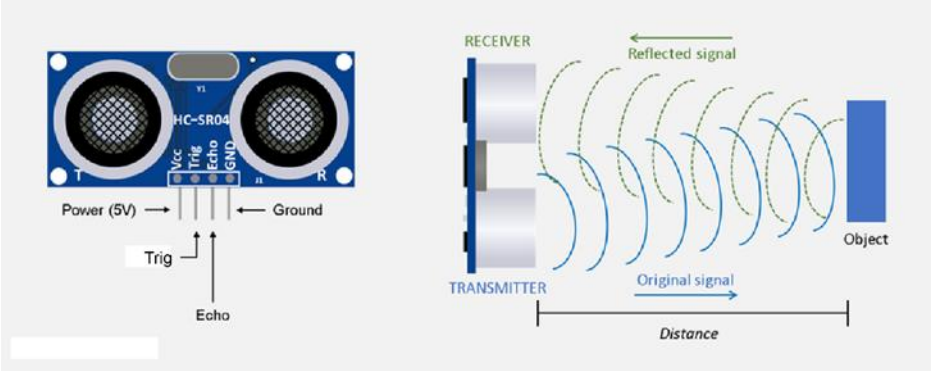


Figure 4.8: Distance Measured by using Ultrasonic Sound

Echo and Trig pin of the ultrasonic sensor at storage tank connected with D5 and D6 pin of NodeMCU. Again Echo and Trig pin of the ultrasonic sensor at the feed water tank are connected with the D7 and D8 pin of NodeMCU. The trig pin emits ultrasonic sound, which is received by the echo pin. To make the ultrasonic sound, we must first set the Trig pin to a High State for 10 seconds (microseconds). Where the distance between the sensor and the object is denoted by s. The sound speed in air is v = 0.034cm/s or 340 m/s. The time it takes for sound waves to bounce back from an object's surface is called t. Because time will be doubled when the waves travel and bounce back from the originating point, we must divide the distance value by two Power Supply − +5V DC.

4.6.1 Operating Condition

• Quiescent Current: <2mA

• Working Current: 15mA

• Effectual Angle: <15°

• Ranging Distance: 2cm – 400 cm/1″ – 13ft

• Resolution: 0.3 cm

4.7 Mini Gear Motor

These tiny brushed DC metal gear motors feature output shafts that are 3 mm in diameter, making them compatible with most 1/8-inch output devices, such as the Solarbotics RW2 high-traction rubber wheels. Alternately, you may attach unique wheels and mechanisms to the output shaft of the tiny metal gear motor using the Pololu universal mounting hub. The Mini Metal Gear Motor N20 (High Torque) is a small, powerful motor with a low rotational speed. It has a gearbox component installed to boost the motor's torque. The D-shaped gearbox output shaft is 9 mm long and 3 mm in diameter, with a cross-section of 10 12 mm.

Figure 4.9: Mini Gear Motor

They are therefore incredibly compact in order to fit in intricate places for small-scale applications. To move wheels with heavy weights from one location to another, one can attach this micro gear motor to the wheels.

There are four models of the Mini Metal Gear Motor N20: 35RPM at 3V, 70RPM at 6V, 105RPM at 9V, and 140RPM at 12V.

4.7.1 Specification

- Operating Voltage: 3V~9VDC.
- Speed: 600 ± rpm.
- The Load Current: 82mah.
- Maximum Torque: 850gf cm min (3V)
- Size: approx. 12mm Diameter & 35 mm Length (Including Shaft)
- Shaft Size : 3 x 10mm(D*L)
- Operating Temperature Range: -20℃~+60℃
- Material: Copper and Steel.

4.8 Limit Switch

A simple switch may be used to detect the presence or absence of an object utilizing a contact or non-contact sensing device. These devices will provide an electrical signal after the object is identified, which is utilized to operate various pieces of machinery and procedures across several sectors. Limit switches are one example. It has also developed into a crucial component of the control and sensing community across several industries, including transportation, agriculture, industrial, and commercial. Therefore, limit switches are utilized in a variety of industrial equipment, control systems, and construction or agricultural machinery worldwide. The overview of a limit switch and how it interacts with applications is covered in this article.

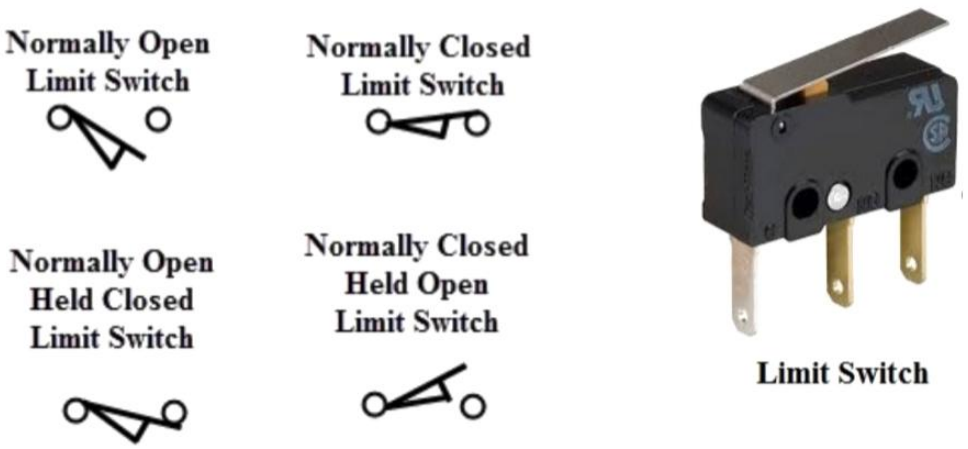


Figure 4.10: Limit Switch With Switching Symbol

4.9 Push Button Switch

CUI Devices' micro push button switches are particularly suited for a range of space-constrained consumer electronics and industrial control applications since they may be housed in packages as small as 9 mm x 6 mm with a profile as low as 5 mm. These push button switches include SPST, SPDT, or DPDT circuit types, 2.54 mm or 5.08 mm pitches, and off-(on) or on-(on) switch functions. Surface-mount or through-hole mounting choices are available, as well as straight, vertical, straight with a bracket, and right angle termination options. The versions also come with flush, 3.3 mm, or 5.4 mm actuator heights, as well as red, white, black, or no cap actuator caps.

Figure 4.11: Push Button Switch

4.10 Toggle Switch

A switch is an electrical component that is used in electrical engineering to connect or disconnect the conducting path or stop the passage of current inside an electrical circuit. When there is a light load, this switch comes in quite handy for opening and closing various electrical connections. Switches are employed in industrial equipment, consumer goods, and commercial devices and come in a variety of sorts depending on its qualities, size, environmental resistance, robustness, and more. Tactile, rocker, push button, thumb wheel, and DIP switches are employed in industries, whilst small detection, toggle, limit, and basic switches are utilized in consumer and commercial devices. The workings of a toggle switch, one of the switch kinds, are discussed in this article.

Figure 4.12: Toggle Switch

4.11 JST Connector

Basically this cable is use to connect the devices.

Figure 4.13: JST Connector

4.12 QR Code Display

The QR code are attached in the lift wall.

\

Figure 4.14: QR Code

4.13 PCB Board

The printed circuit board is the most common name but may also be called "printed wiring boards" or "printed wiring cards". Before the advent of the PCB circuits were constructed through a laborious process of point-to-point wiring. This led to frequent failures at wire junctions and short circuits when wire insulation began to age and crack. A very basic printed circuit board is a flat, rigid, insulating material that has thin conductive structures adhering to one side. These conductive structures create geometric patterns consisting of, for example, rectangles, circles, and squares. Long, thin rectangles function as interconnections, and various shapes function as connection points for components.

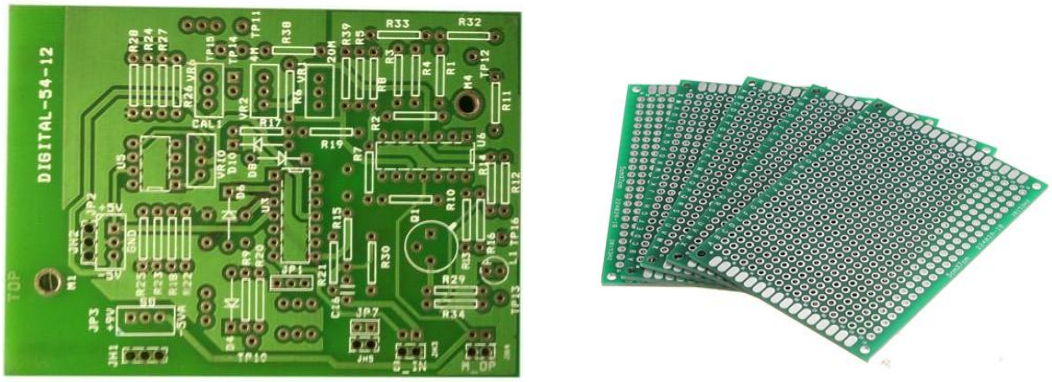


Figure 4.15: PCB Board

CHAPTER 5

TECHNOLOGY AND TOOLS

5.1 Software Development

For this Project, software development is yet another crucial subject. This device for monitoring Automatic lift required some programming or coding to operate the microcontroller. ESP-8266 serves as a microcontroller for the project. The ESP-8266 controller was then managed using the Arduino IDE. The App Controlled Lift system performed this step flawlessly.

5.1.1 Arduino IDE

Now that we've learned about the components of the Arduino IDE, let's take a closer look at them. Some menus let you carry out different actions, including creating new files, saving them, and other things, near the top of the program interface. These button icons provide you quick access to some of the most frequently used tasks. You may check that your code is error-free by selecting the verify button. Your code is sent from your laptop to your Arduino by selecting Upload, enabling it to run on your board. You may input your software in the window, and there are message locations where you can acquire information about it. When we work with the IDE, we'll go through messages in more depth, but for now, just know that they let you know if your code has errors and include details like how much memory it uses on the Arduino. For the time being, don't worry about how much memory your code consumes; we'll discuss this later in the book.

Figure 5.1: Arduino IDE

Examine the buttons in the code editor's top row in more detail. You may quickly access the actions in the code window with the help of these buttons. These activities include creating a new file, opening an existing file, and saving it, as well as validating your code for errors and uploading it to the Arduino board. In a minute, we'll use each of these buttons, but first, let's discuss what it means to draw a sketch.

A text editor for writing code, a message box, a text terminal, a toolbar with buttons for common activities, and several menus are all included in the Arduino Software (IDE). It connects to the Arduino hardware, enabling program upload and communication.

Programs created using the Arduino Software are called sketches (IDE). These images were produced using a text editor, and they were saved without a file extension. With the editor, you have the option to search for and replace text as well as cut and paste. While storing and exporting, the message section gives feedback and flags errors.

The text that the Arduino Software (IDE) delivers to the terminal contains information such as thorough error messages. The bottom right corner of the window shows the configured board and serial port. With the toolbar buttons, you may verify and upload programs, create, save, and save drawings, and activate the serial monitor.

The five menus File, Edit, Sketch, Tools, and Help provide more commands. The menus are context-sensitive, which means they only show things that are relevant to the job being done at the time.

5.1.2 Arduino Variable Declaration and Library Include

At first in the coding, all the libraries are included in Arduino ide mane space. The different project has different component that is used so different component need a different library. After all, the needed library is included then we choose some variable to our choice anything we declare as a variable. Here we put some int type variables, some character type variables, and some string type variable.

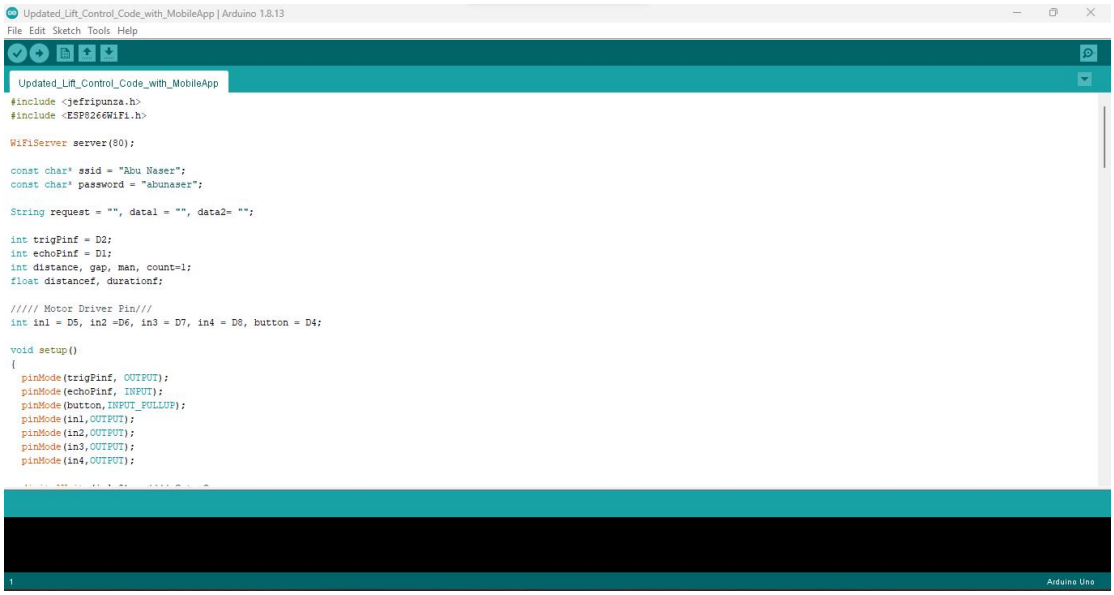


Figure 5.2: Arduino IDE Screen Void Setup and Library Include

5.1.3 Void Setup Function

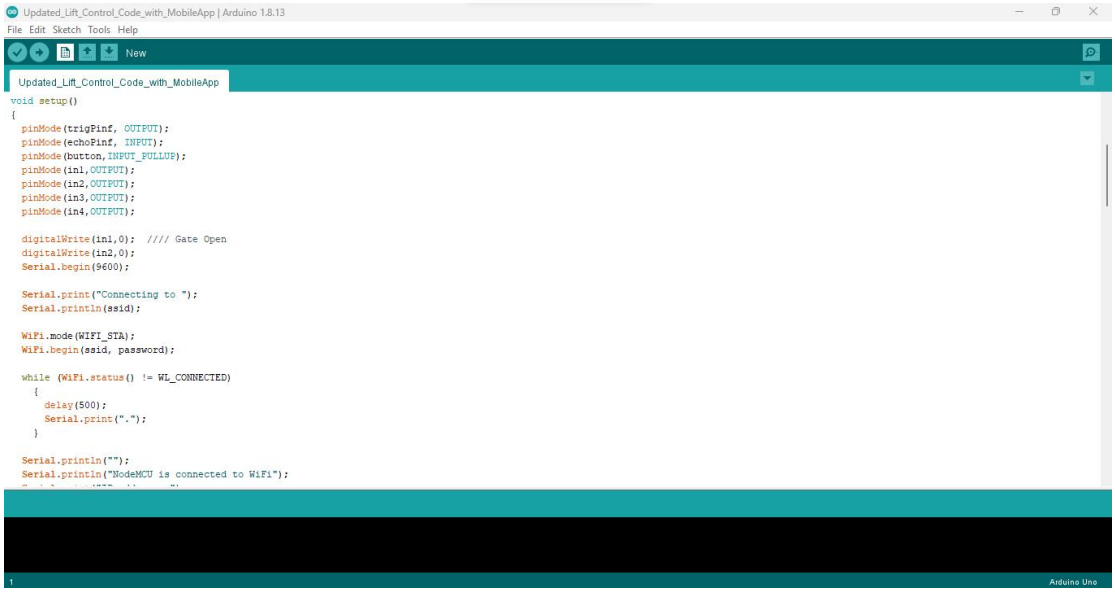


Figure 5.3: Void Setup Function

5.1.4 Void Loop Function

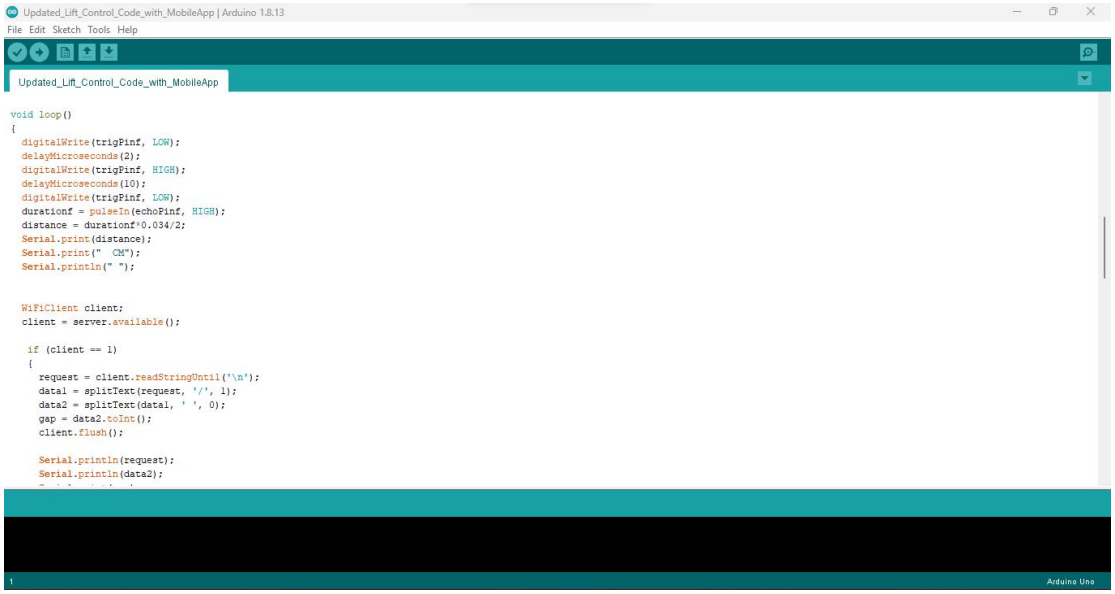


Figure 5.4: Void Loop Function

5.2 Internet of Things (IoT)

The Internet of Things (IoT) is a brand-new paradigm that has modified the conventional manner of dwelling right into an excessive-tech existence fashion. Smart cities, clever houses, pollutants control, strength saving, clever transportation, clever industries, and clever libraries are such changes because of IoT. A lot of vital studies research and investigations had been executed so that it will decorate the era via IoT. However, there are nonetheless numerous demanding situations and troubles that want to be addressed to reap the overall capacity of IoT. These demanding situations and troubles ought to be taken into consideration from diverse factors of IoT including applications, demanding situations, allowing technologies, social and environmental effects, etc. The most important aim of this overview article is to offer an in-depth dialogue from each technological and social perspective. The article discusses exclusive demanding situations and key troubles of IoT, structure, and essential software domains. Also, the object brings into mild the present literature and illustrates their contribution to exclusive factors of IoT. Moreover, the significance of massive information and its evaluation with appreciation to IoT has been discussed.

This article might assist readers and researchers to recognize the IoT and its applicability to the actual world [14]. IoT is regularly turning into an essential thing of our existence that may be sensed anywhere around us. On the whole, IoT is an innovation that places collectively good-sized sort of clever systems, frameworks, and wise gadgets and sensors. Moreover, it takes gain of quantum and nanotechnology in phrases of storage, sensing, and processing pace which had been no longer achievable beforehand [15]. A splendid transformation may be located in each day's ordinary existence at the side of the growing involvement of IoT gadgets and the era. One such improvement of IoT is the idea of Smart Home Systems (SHS) and home equipment that include internet-primarily based gadgets, automation gadgets for houses, and dependable strength control gadgets. Besides, every other essential fulfillment of IoT is a Smart Health Sensing gadget (SHSS). SHSS consists of a small wise system and gadgets to aid the fitness of the human being. These gadgets may be used in each interior and exterior to test and screen the exclusive fitness troubles and health degree or the quantity of energy burned withinside the health club etc. Also, it's far getting used to screening the important fitness situations withinside the hospitals and trauma

facilities as well. Hence, it has modified the complete situation of the scientific area with the aid of facilitating it with the excessive era and clever gadgets. Moreover, IoT builders and researchers are actively concerned to uplift the existing fashion of the disabled and senior age organization human beings. IoT has proven a drastic overall performance in this place and has supplied a brand-new path for the everyday existence of such human beings. As those gadgets and systems are very fees powerful in phrases of improvement fees and without problems to be had inside an everyday fee range, for this reason, a maximum of human beings are availing them [16].

5.3 Firebase

5.3.1 Using Firebase Features in Android Application

Using all features of Firebase in the Android application is very easy and is just a few lines of code. The features like authentication, database, and storage have been discussed in the section. The other more detail about the features is available on the Google Firebase guide link listed in the reference section. The methodology to use some features is as follows

5.3.2 Authentication

After adding Firebase and authentication dependency to the Android application, the user can create a login id by the following code-

```
FirebaseAuthauth=FirebaseAuth.getInstance();
auth.signInWithEmailAndPassword(email, password)
.addOnCompleteListener(new OnCompleteListener())
{
@Override
 public void onComplete (Task task)
{ if(task.isSuccessful()) { FirebaseUser user=task.getResult().getUser();
String email=user.getEmail();
 //…
 } }
 });
```

5.3.3 Storage of Firebase, Insertion, Read/Write

The files like images, audio, video etc can be stored in the app. The data stored is highly secured and robust in nature means it resumes from the last point if any network error occurs. The steps below are to be followed to use the storage feature in the Android application-

Once the Firebase and storage dependency are added to the application, create an instance of

FirebaseStorage storageobject =FirebaseStorage.getInstance();

Second, create the reference to the location by:

StorageReference FileRef = storageRef.child("filePath");

The file can be uploaded by using one of

putBytes(), putFile(), putData() or putStream()

method which returns to UploadTask.

Once the object is created, navigate the Firebase reference to the position where a child can be added. If a list is created and does not have a specific name for each child, the push() method can be used before the setValue() is called.

Call: ref.push().setValue(object) or ref.setValue(object).

Navigate the Firebase reference to the parent of the item that one wants to update Then a map containing the update values can be created.

Call ref.updateChildren(map).

Navigate the Firebase reference to the item that one wants to remove

Call ref.removeValue(object).

CHAPTER 6
METHODOLOGY

6.1 Apps Development

We developed an app for monitoring this project. It is an Android app. It is a user-friendly app. This app is built with the help of the MIT app inventor platform. It is an intuitive, visual programming environment that allows everyone to build fully functional apps for Android phones, iPhone, and Android/iOS tablets. Blocks-based coding programs inspire intellectual and creative empowerment. In this app, four parking slots are shown here.

6.1.1 MIT App Inventor

MIT App Inventor is a drag-and-drop visible programming device for designing and constructing completely useful cell apps for Android. App Inventor promotes a brand-new technology of private cell computing wherein human beings are empowered to design, create, and use in my view significant cell generation answers for his or her each day lives, in ad infinitum precise situations. App Inventor's intuitive programming metaphor and incremental improvement skills permit the developer to be cognizant of he good judgment for programming an app instead of the syntax of the coding language, fostering virtual literacy for all. Since it became moved from Google to MIT, some upgrades were added, and studies tasks are underway.

6.1.2 Drag and Drop Setup of App Inventor

Figure 6.1: Drag and Drop Code Window

We first performed some basic apps in App Inventor before entering our main project one of them is the compass whose code and output section is shown above.

This block program is developed to check or Create elevator buttons for the user. This is connected to the database via a microcontroller.

6.1.3 Front Page Design

Figure 6.2: Front Page Design Mobile App

This is the main front page of this project. This is built by block programming in MIT app inventor. Most of the information is given here. It is an IoT-based car parking and cloud monitoring app which is shown here in the title name of this app.

This is the mobile view of the front page. Go to Dashboard indicates to go to the next page of this app.

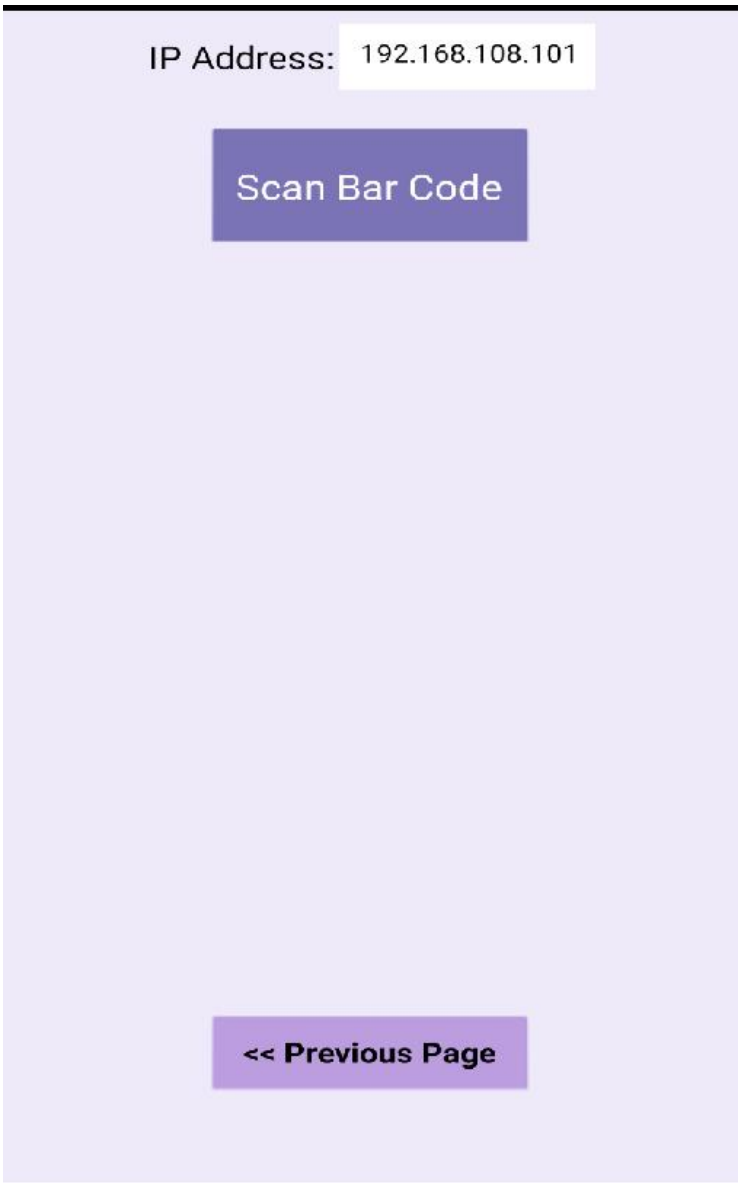


Figure 6.3: Mobile View of Front Page

6.1.4 Buttons Check

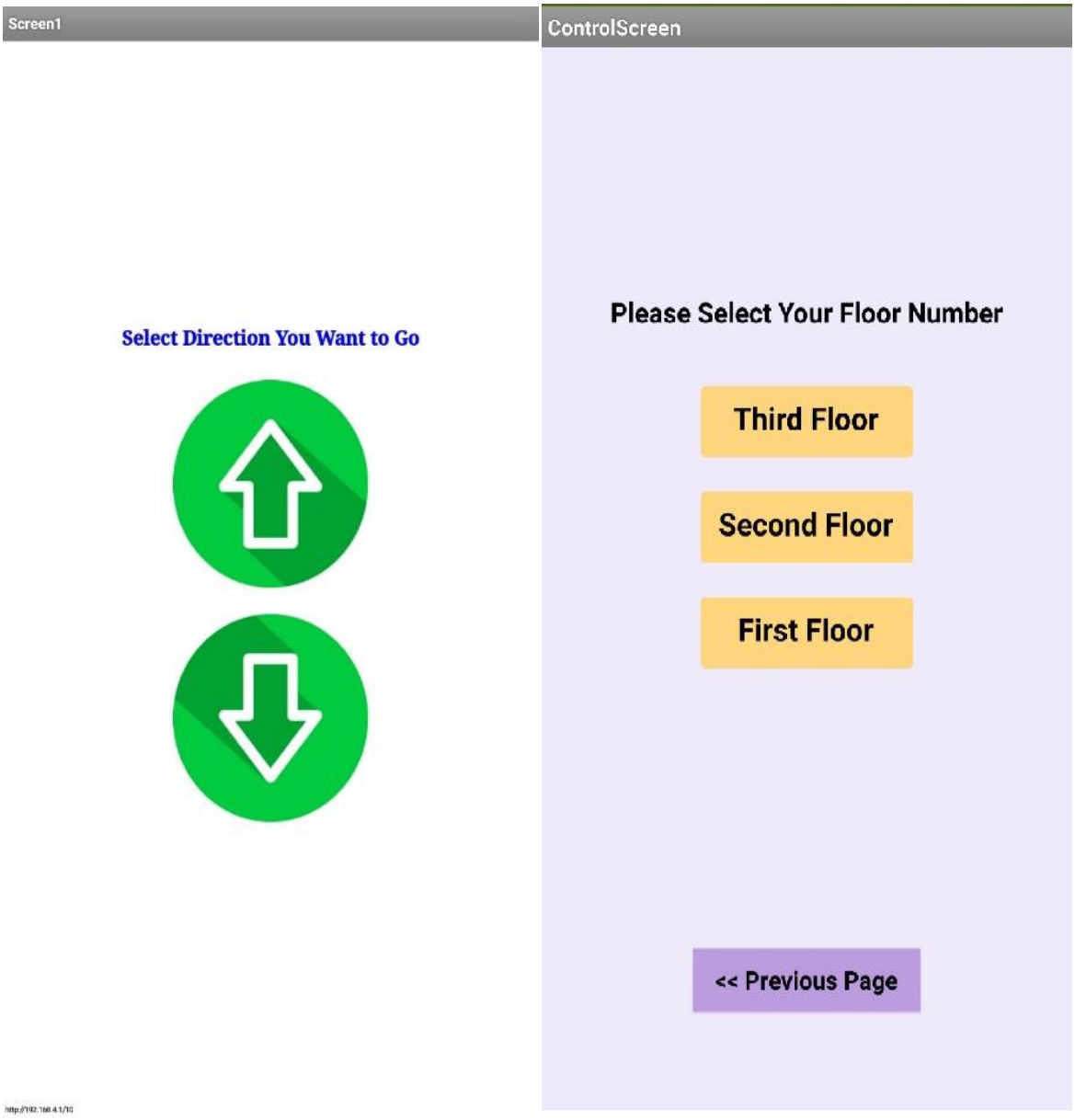


Figure 6.4: Creating Elevator Buttons using the Block Pro

6.2 Data Calculation

For the starting position second floor -

In the manual base, the lift takes a total of 26.97 & 34.41 sec to travel from the second floor to the first floor and then the second floor & third floor respectively. In this case, it takes about 7.5 sec to come from the second floor to the first floor and 7.5 & 15 sec to go from the first floor to the second floor & third floor.

When lift arrives, it takes approximately 1.5 seconds for its doors to open. After the doors have opened, the lift remains stationary for about 3 seconds, allowing passengers to enter or exit. Once this brief pause is over, the lift doors close again, taking another 1.5 seconds to do so.

In the case of the app's base, it takes about 7.5 seconds less than the manual base. Since when the lift is on the second floor or third floor, QR scanning saves the time it takes to reach the lift on the first floor.

STARTING POSITION 2ND FLOOR				
SL. NO.	2ND FLOOR TRIP TIME (SEC)		3RD FLOOR TRIP TIME (SEC)	
	MANUAL BASE	APPS BASE	MANUAL BASE	APPS BASE
1	26.96	19.58	34.43	27.06
2	26.95	19.53	34.35	26.78
3	26.99	19.48	34.45	26.91
AVERAGE	**26.97**	**19.53**	**34.41**	**26.92**
TIME SAVED	(26.97 – 19.53) = 7.44		(34.41 – 26.92) = 7.49	

For the starting position third floor-

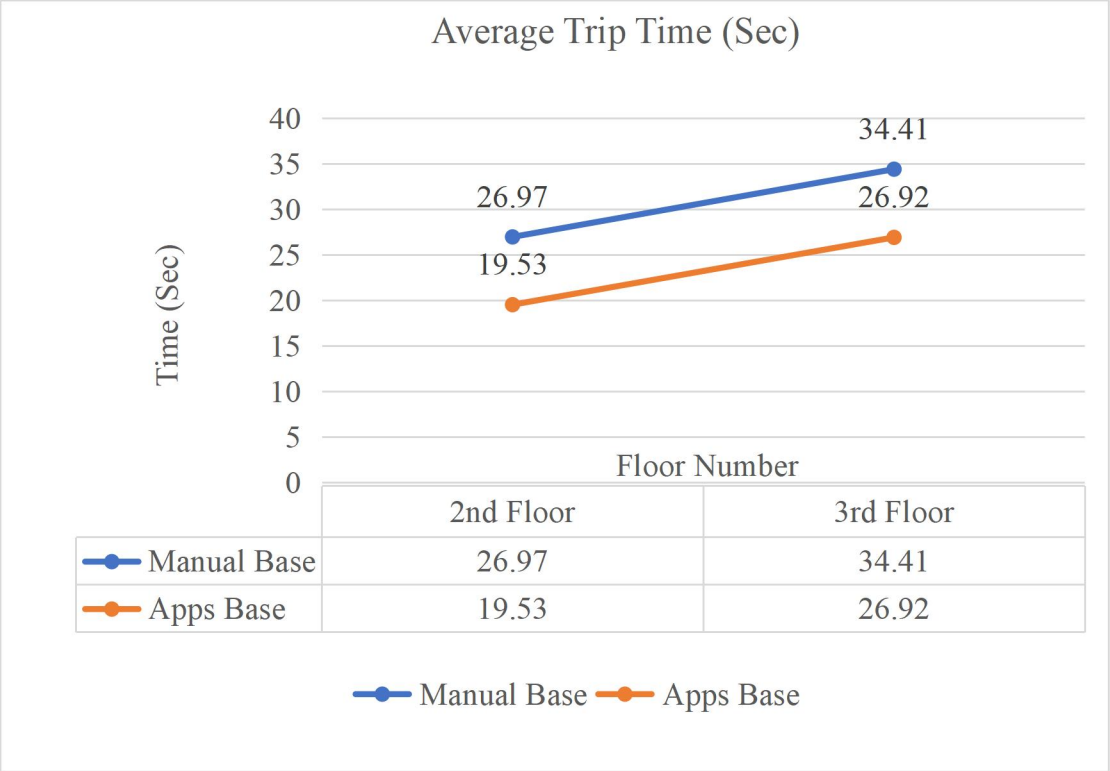
In the manual base, the lift takes a total of 34.40 & 41.88 sec to travel from the third floor to the first floor and then the second floor & third floor respectively. In this case, it takes about 15 sec to come from the third floor to the first floor and 7.5 & 15 sec to go from the first floor to the second floor & third floor.

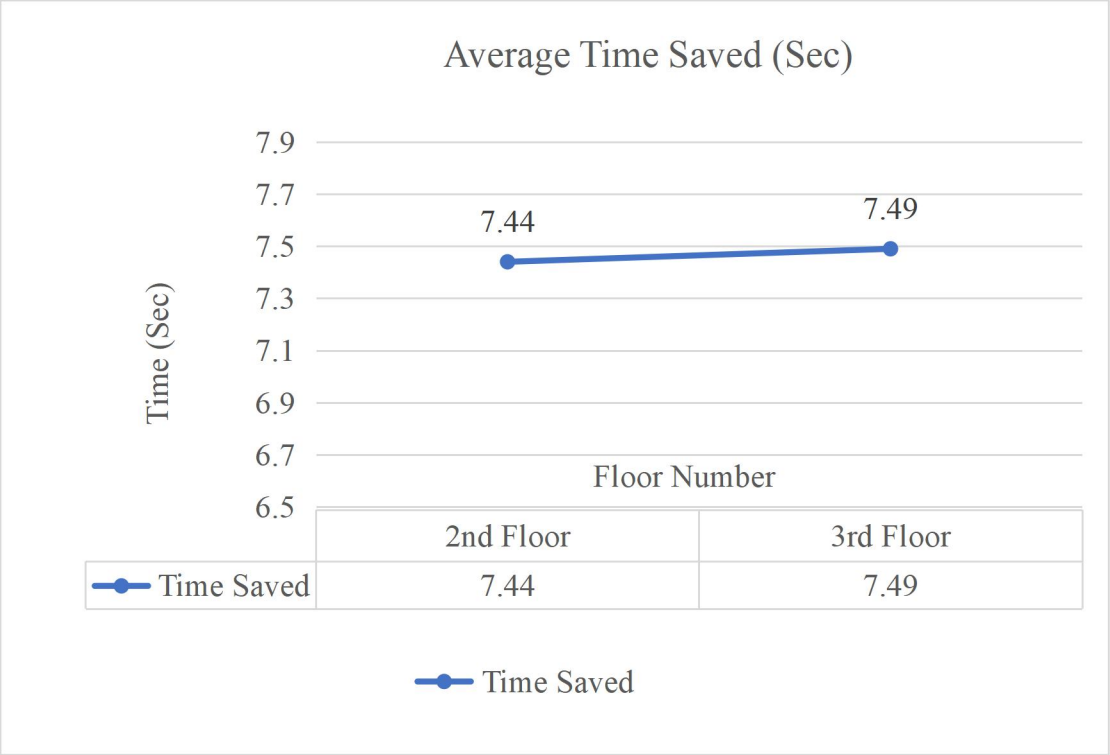
When lift arrives, it takes approximately 1.5 seconds for its doors to open. After the doors have opened, the lift remains stationary for about 3 seconds, allowing passengers to enter or exit. Once this brief pause is over, the lift doors close again, taking another 1.5 seconds to do so.

In the case of apps base, it takes about 15 seconds less than manual base. Since when the lift is on the second floor or third floor, QR scanning saves the time it takes to reach the lift on the first floor.

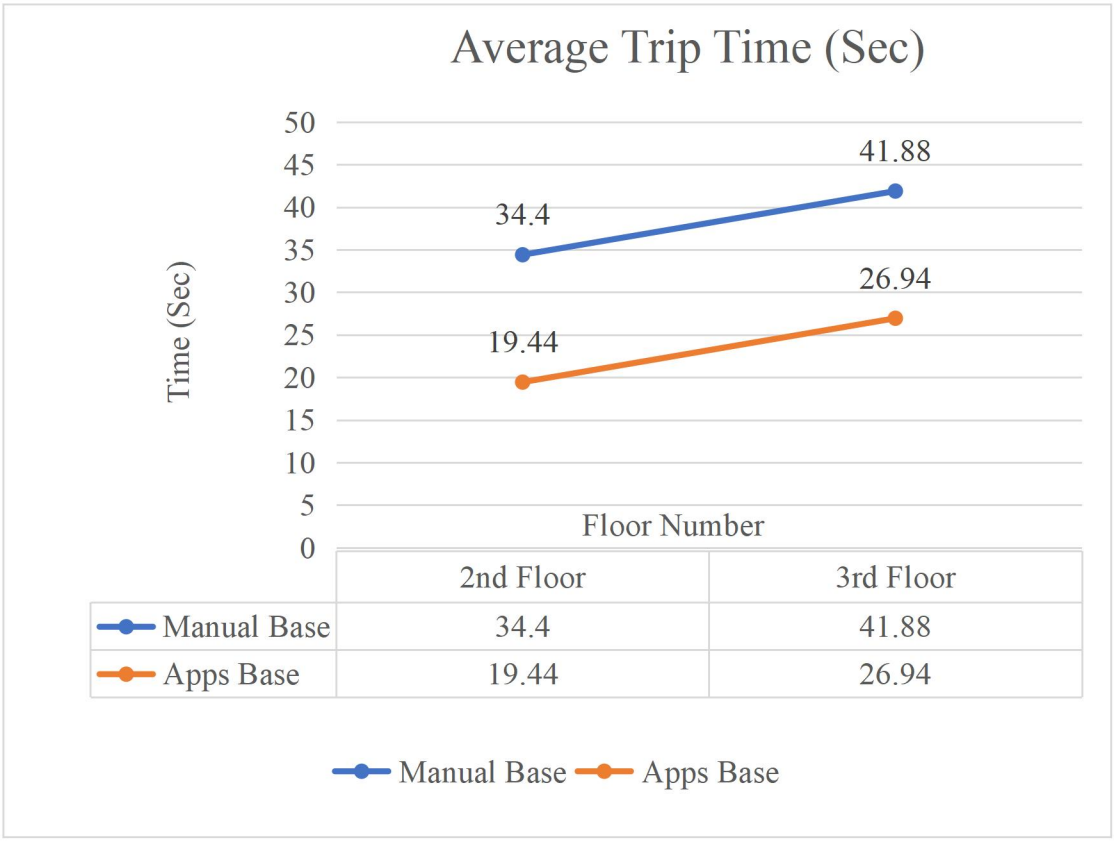
STARTING POSITION 3RD FLOOR				
SL. NO.	2ND FLOOR TRIP TIME (SEC)		3RD FLOOR TRIP TIME (SEC)	
	MANUAL BASE	APPS BASE	MANUAL BASE	APPS BASE
1	34.39	19.44	41.86	26.88
2	34.36	19.49	41.99	26.96
3	34.45	19.38	41.78	26.98
AVERAGE	34.40	19.44	41.88	26.94
TIME SAVED	(34.40 – 19.44) = 14.96		(41.88 – 26.94) = 14.94	

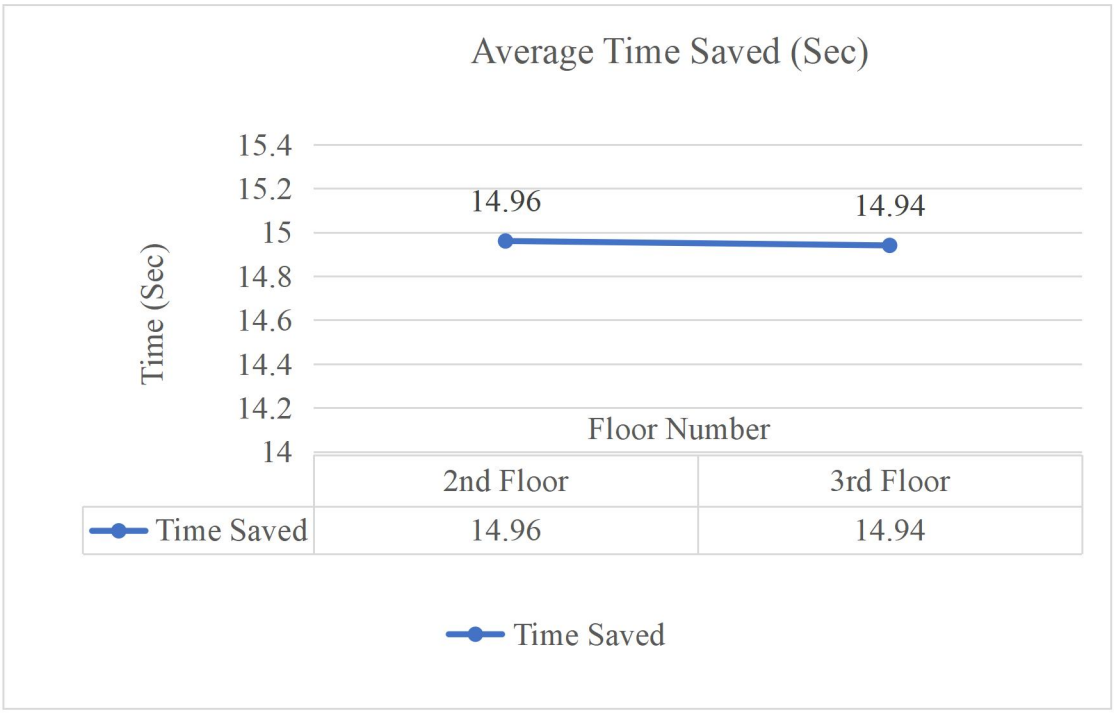
6.3 Graph





Graph-1: Starting Position 2nd Floor





Graph-2: Starting Position 3rd Floor

CHAPTER 7
WORKING PRINCIPLE

Our project main power source is a 12V AC to DC adapter. When we connect the adapter to the main circuit the system power turns on.

A non-contact lift control without touching the lift buttons using IoT operation are used to control the lift automatically by using mobile apps. In this process, lift position are measured by an ultrasonic sensor. The ultrasonic sensor calculates the lift level and on the basis of Arduino coding, the motor is operated. A servo motor is use tor open and closed the lift door. In this process, NodeMCU microcontroller are used to control the motor manual to automatic. A mobile app is developed by us when we scanned the QR code the process by NodeMCU the IoT system is working and it's connected to NodeMCU and show the working procedure on the mobile screen

Here buck module is used to convert or develop constant 5V output. Using this 5V output we operate ESP8266, Motor etc. When someone needs to go 2nd floor we scan the QR code then we select the 2nd floor command and when someone needs to go 3rd floor we select the 3rd floor option in the app. We command in the app and the big gear motor turns on the elevator and goes to the position. When the lift reaches the required floor the mini gear motor turns on and the door is open. the people were entering the elevator the mini gear motor again turned on but in this case, the motor rotated in reversed direction.

CHAPTER 8

CONCLUSION AND FUTURE RECOMMENDATIONS

8.1 Conclusion

Elevators are small enclosed places that are used in a variety of situations and frequently see a large number of people in a short amount of time. As a result, COVID-19 and other diseases with similar transmission patterns are at risk. The current epidemic emphasizes the need to update existing infrastructure, particularly elevators, to prevent disease spread. Current methods rely on manual cleaning and disinfection of elevator cabins, which takes a lot of time and effort. Elevator hygiene regulations, such as hand sanitization and mask use, need user compliance. This study describes a system for automatic elevator disinfection that does not require touching. This is done in such a way that it does not disrupt the elevator's normal operation, which is controlled by a microcontroller. To raise safety requirements even higher a mobile device and a QR code are used and the physical buttons are replaced with toughless ones.

8.2 Future Recommendations

In this system, we tried to build a prototype of a non-contact lift system that can prevent the spreading of infection due to direct contact. We use the mobile application to get the elevator buttons on our phones so that we can avoid using the lift buttons. In the future, some necessary features can be added to the existing system-

- ✧ A Personal University ID card can be used to get into the elevator by avoiding direct contact with the buttons by the RFID module.
- ✧ A Voice recognition system can be added for more sophisticated use of the mobile application.
- ✧ IR sensor can be used for detecting a particular floor.
- ✧ To connect various IP address Raspberry Pi microcontroller can be used.
- ✧ Door sensor or photoelectric sensor can be used to detects a passenger or a object on the doorway.

APPENDIX

```
#include <jefripunza.h>

#include <ESP8266WiFi.h>


WiFiServer server(80);

const char* ssid = "Abu Naser";

const char* password = "abunaser";

String request = "", data1 = "", data2= "";


int trigPinf = D2;

int echoPinf = D1;

int distance, gap, man, count=1;

float distancef, durationf;


///// Motor Driver Pin///

int in1 = D5, in2 =D6, in3 = D7, in4 = D8, button = D4;


void setup()

{

  pinMode(trigPinf, OUTPUT);

  pinMode(echoPinf, INPUT);

  pinMode(button,INPUT_PULLUP);
```

```
pinMode(in1,OUTPUT);

pinMode(in2,OUTPUT);

pinMode(in3,OUTPUT);

pinMode(in4,OUTPUT);

digitalWrite(in1,0);  //// Gate Open

digitalWrite(in2,0);

Serial.begin(9600);


Serial.print("Connecting to ");

Serial.println(ssid);


WiFi.mode(WIFI_STA);

WiFi.begin(ssid, password);


while (WiFi.status() != WL_CONNECTED)

  {

    delay(500);

    Serial.print(".");

  }


Serial.println("");

Serial.println("NodeMCU is connected to WiFi");

Serial.print("IP address: ");
```

```
  Serial.println(WiFi.localIP());
  server.begin();
  delay(3000);
}

void loop()
{
  digitalWrite(trigPinf, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPinf, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPinf, LOW);
  durationf = pulseIn(echoPinf, HIGH);
  distance = durationf*0.034/2;
  Serial.print(distance);
  Serial.print("  CM");
  Serial.println(" ");

  WiFiClient client;
  client = server.available();
```

```
  if (client == 1)
  {
    request = client.readStringUntil('\n');
    data1 = splitText(request, '/', 1);
    data2 = splitText(data1, ' ', 0);
    gap = data2.toInt();
    client.flush();

    Serial.println(request);
    Serial.println(data2);
    Serial.print(gap);
    Serial.println(" cmsd");
    count=1;
    }

if( gap == 65)
 {
   if (digitalRead(button) == 0)
     {
       digitalWrite(in3, 0);
       digitalWrite(in4, 0);
```

```
        if (count==1)
         {
          analogWrite(in1, 200);  //// Gate Open
          analogWrite(in2,0);
          delay(1000);
          analogWrite(in1,0);  //// Gate Stop
          analogWrite(in2,0);
          delay(3000);
          analogWrite(in1,0);  //// Gate Close
          analogWrite(in2,200);
          delay(1000);
          analogWrite(in1,0);  //// Gate Stop
          analogWrite(in2,0);
          count=2;
         }
      }
else
    {
      digitalWrite(in3, 0);
      digitalWrite(in4, 1);
      Serial.println("Going Down by Command");
    }
 }
```

```
else if (gap == 0)
{
   digitalWrite(in3, 0);
   digitalWrite(in4, 0);
   Serial.println("Stop Position");

   if (count==1)
    {
     analogWrite(in1, 200);  //// Gate Open
     analogWrite(in2,0);
     delay(1000);
     analogWrite(in1,0);  //// Gate Open
     analogWrite(in2,0);
     delay(3000);
     analogWrite(in1,0);  //// Gate Close
     analogWrite(in2,200);
     delay(1000);
     analogWrite(in1,0);  //// Gate Stop
     analogWrite(in2,0);
     count=2;
    }
}
```

```
else if ( distance == gap)
{
  gap=0;
  Serial.println("Gap=0");
}

else if ( distance > gap)   //// Motor Up ///
{
  if (digitalRead(button) == 0)
    {
    digitalWrite(in3, 1);
    digitalWrite(in4, 0);
    delay(5000);
    }

else
    {
    digitalWrite(in3, 1);
    digitalWrite(in4, 0);
    Serial.println("Going Up");
      //delay(1000);
    }
}
```

```
else if ( distance < gap)   //// Motor Down ///
{
  digitalWrite(in3, 0);
  digitalWrite(in4, 1);
  Serial.println("Going Down");
}
}
```

REFERENCES

[1] Pokhrel, S. and Chhetri, R., 2021. A literature review on impact of COVID-19 pandemic on teaching and learning. *Higher Education for the Future*, *8*(1), pp.133-141.

[2] Cho, C.Y., Kwon, S.W., Lee, J., You, S.J., Chin, S.Y. and Kim, Y.S., 2009. Basic study of smart robotic construction lift for increasing resource lifting efficiency in high-rise building construction. In *2009 26th International Symposium on Automation and Robotics in Construction, ISARC 2009*.

[3] Ciotti, M., Ciccozzi, M., Terrinoni, A., Jiang, W.C., Wang, C.B. and Bernardini, S., 2020. The COVID-19 pandemic. *Critical reviews in clinical laboratory sciences*, *57*(6), pp.365-388.

[4] Lin, S., Fu, Y., Jia, X., Ding, S., Wu, Y. and Huang, Z., 2020. Discovering correlations between the COVID-19 epidemic spread and climate. *International Journal of Environmental Research and Public Health*, *17*(21), p.7958.

[5] Taipale, J., Romer, P. and Linnarsson, S., 2020. Population-scale testing can suppress the spread of COVID-19. *MedRxiv*.

[6] Dadras, O., Alinaghi, S.A.S., Karimi, A., MohsseniPour, M., Barzegary, A., Vahedi, F., Pashaei, Z., Mirzapour, P., Fakhfouri, A., Zargari, G. and Saeidi, S., 2021. Effects of COVID-19 prevention procedures on other common infections: a systematic review. *European journal of medical research*, *26*(1), pp.1-13.

[7] Tian, H., Liu, Y., Li, Y., Wu, C.H., Chen, B., Kraemer, M.U., Li, B., Cai, J., Xu, B., Yang, Q. and Wang, B., 2020. An investigation of transmission control measures during the first 50 days of the COVID-19 epidemic in China. *Science*, *368*(6491), pp.638-642.

[8] Khonjun, S., Pitakaso, R., Sethanan, K., Nanthasamroeng, N., Pranet, K., Kaewta, C. and Sangkaphet, P., 2022. Differential Evolution Algorithm for Optimizing the Energy Usage of Vertical Transportation in an Elevator (VTE), Taking into Consideration Rush Hour Management and COVID-19 Prevention. *Sustainability*, *14*(5), p.2581.

[9] Lewis, D., 2021. COVID-19 rarely spreads through surfaces. So why are we still deep cleaning. *Nature*, *590*(7844), pp.26-28.