Final Year Design Project
Final Report
[EEE 400C]

Project Title: IoT BASED COVID-19 ASSISTANT ROBOT

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Chapter 1

1.1 Introduction

Our project Title is IoT Based Covid-19 Assistant Robot.

1.1.1 Problem Statement

● A big challenge for Covid-19 is its high contagiousness and infection fatality rate. Serious drawbacks were found in hospitals regarding the availability of nurses and doctors to treat the Covid-19 positive patients [8].
● Patient care facilities are especially at risk of heavy breakouts because of relatively enclosed spaces with an intrinsically vulnerable population [8],[9].
● Healthy residents in these (Patient Care) facilities face much higher chances of getting infected by others, e.g., an asymptomatic nurse, and then spreading it to more at-risk individuals [8], [9].
● Inadequacy of Covid-19 & in-person body temperature and oxygen saturation testing facilities [10].
● Disinfecting the surface and area of the covid-19 patient [11].

1.1.2 Background Research & Survey

The novel coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is considered a once-in-a-century pandemic [1],[2]. From a technical perspective, people have started deploying robots to deal with the current difficulties brought by COVID-19, such as stopping this highly contagious virus from further spreading, improving efficiency within specific industries, and continuing necessary social functions.[3],[4]. As a result of the difficulties brought by Covid 19 and its associated lockdowns, many individuals and companies have turned to robots to overcome the challenges of the pandemic. Regarding the health sector, all levels and stakeholders of the world's health systems have been mainly committed to providing medical care during the pandemic [5],[6],[7]. Several challenges to guarantee medical care have been exposed during the current COVID-19 pandemic. So, we have decided to work on an IoT Based Covid 19 assistant robot that will serve the Covid-19 positive patients in the hospital.

Our covid assistant robot can provide a perfect solution since the virus cannot replicate itself inside it; robots heavily reduce person-to-person contact, which means fewer health care workers get sick [8],[12]. This also reduces community transmission while consuming fewer supplies of PPE. At the same time, the use of telemedicine to allow doctors and nurses to communicate with patients without the risk of infection is rising sharply. The trend toward increased use of robotics and telemedicine in healthcare is accelerating. Both technologies can aid in social distancing, which reduces the rate of healthcare-acquired infections for patients and personnel [12].

1.2. Objectives, Requirements, Specification and Constraints

1.2.1 Objectives

- As in the pandemic time, the availability of doctors and nurses is not enough. Also, human interaction in this pandemic period is dangerous for our front liners. So, our goal is to reduce the shortage of Doctor & Nurse and Human Interaction with our Assistant Bot. At the same time, our Assistant Bot can provide Food, Medicine & Water to our COVID-19 patients.
- As we know, the oxygen level of COVID patients can drop at any moment. So, we also must track their oxygen level. But if our Doctors and Nurses frequently visit them physically. Then they also can be affected by COVID. So, our goal is to build a robot that can replace human interaction and help us measure the Body Temperature & Oxygen Level of Covid-19 patients.
- We know during COVID, Hand Sanitizing & Room Disinfecting is a significant thing to do. As we know, after being expelled from the body, coronaviruses can survive on surfaces for hours to days. If a person touches the dirty surface, they may deposit the virus at the eyes, nose, or mouth, entering the body causing infection. So, our goal is to build a multi-functional assistant bot that can provide a Hand Sanitizer and disinfect the whole room by Using UV-C Light.

Figure 1: The exhibited characteristics refer to the main advantages of using robots of the corresponding category (i.e., the yellow section for TEL, orange for DIS, and gray for ASL) in clinic environments.

This pie chart covers the overall objective of our assistant bot. We will combine all these options in our covid assistant robot to serve patients in the hospital.

1.2.2 Functional and Non-functional Requirements

	System Level	Component Level
Functional	Our Robotic System (Full Body)	• LiPo Battery + Charger • DC Motors (4x) • Motor Driver (BTS) • 30A RC Brushless Motor Electric Speed Controller (4x)" • Intel Nuc PC • USB Wifi Adapter
	Image Processing	• Real Time Image Analysis Software (E.g. Security Eye or ManyCam) • IP Camera
	Data Processing	• NodeMCU • Cloud server (We'll build it with the coding

	System Level	Component Level
Non-Functional	IR Thermometer	• Infrared thermometer sensor
	Pulse Oximetry	• Non-Pure Light Sensor
	Ultraviolet Sterilizer Disinfection	• UVC Sensors
	Real Time Communication Device	• BOYABY-MI Omnidirectional Lavalier Microphone

1.2.2 Specifications

First, we need a metallic body for our robot which dimension will be 61cm*61cm*122cm. The robot has to move from one patient to another, so we are using 4 DC motors and wheels. At first, for communication purposes from another computer, we use a remote desktop application, an internet-based software, which provides platform-independent remote access to personal computers and other devices running the host application. We are using an Intel NUC PC here on board. We are using two internet protocol cameras for getting real-time video feedback from our robot. To measure body temperature, we are using an IR thermometer which is based on a sensor. To check the oxygen saturation level, we are using an oximeter sensor. The sensors will read data from the patients, and then the microcontroller will process them, redirect the data to our server, and store them individually. The doctors will analyze those data and prescribe medicines for that patient, and then we drive the robot to collect those medicines, food & water, and in the same way, we will drive out a robot to the patient and serve the materials in a tray. At first, the microcontroller will get the command from GUI. Then it will send the signal to the motor driver L298N, and the motor driver will power up the motors using the pulse width modulation (PWM) method.

Mechanical Unit:

In this part the important thing is building the outside body. It is because, based on its measurements we must measure remaining parts. And the weight of all other parts including the payload will have a great effect on this part since it is the base of this robotic arm. This part is an assembly of two different parts. Part 1 must rotate on its axis and other parts are connected to this. So, it is the main source of transportation. The two sub parts in this assembly are the upper part and a wrist part.

Software Unit:

So here first we have a remote-control system. From our remote will pass signals to a control box. From the control box it will translate radio frequency and digital on/off signals to extend, stop, and retract the linear actuator. The remote, together with the control box, make up the linear actuator remote control system. The remote is activated by a user with the press of a button. Using a HC-06 Bluetooth Module to Get Inputs from an Android Phone. It will allow us to control Arduino right from our smartphones. Getting Signal from Microcontroller to motor driver. From HC-06 We will send a signal to the Arduino and our Arduino will send this signal to the motor driver & it will turn on our motors.

1.2.3 Constraints

For our project, we faced several incompetency where we had other ways to overcome them;

a) Firstly, as we are planning to make this device in our home because we are not in a situation where we could implement the objectives of our robot, we must provide direction to our robots to provide food, medicine, water, measure our body temperature and experience it in our own house. Therefore, it is a big constraint because we cannot find out the issues, we can modify without experiencing every objective in our specified area like hospital, COVID affected area. Moreover, practical implementation is important.

b) For creating our robot, we must use different types of devices and materials. Choosing the proper materials for the device has been a big challenge as we are just preparing the concept of our robot. As we assume every step of our project, it would be tough if practical experience and our assumptions made a huge difference.

c) The cost for our project is quite a significant amount. So, to reduce the price, we will be using our computer.

d) For the coding part (ALGORITHM), we had to learn a new programming language, "PYTHON". As at university level, we just knew the comparatively more straightforward programming language like the c language. Python is a new language for us that is why we faced a little challenge while learning it.

1.2.4 Applicable compliance, standards, and codes

Maintaining the protocol of internet connection range and transmission of bits we decided to use WIFI. We followed this only for connecting our pc with any internet connection.

WIFI: We followed the available standards of WIFI which stands for wireless fidelity. It follows IEEE802.11 standard which was released in 1997 having a frequency of 2.4 GHz.

Maintaining the protocol of measuring temperature in a specific range we thought of using IR Thermometer.

IR Thermometer: We are going to use the IR Thermometer which is CE (Conformité Européenne) and RoHs (Restriction of Certain Hazardous Substances).

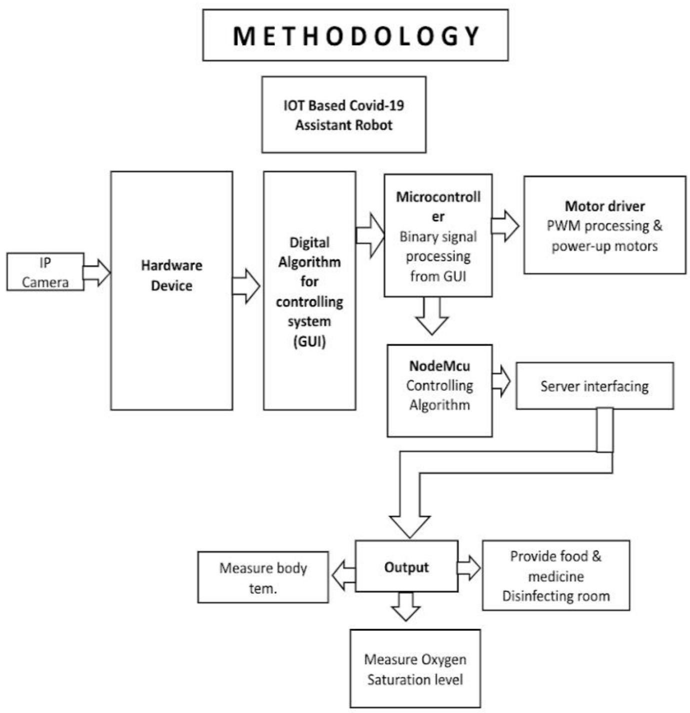
For measuring the oxygen level, we thought of using an Oximeter.

Oximeter: We will be using Oximeter which is also CE (Conformité Européenne) certified.

Maintaining the protocol of frequency, we decided to work with a remote controller.

Remote controller: The most used protocol is the NEC protocol, which specifies a carrier frequency of 38 kHz. The NEC protocol is used by most Japanese-manufactured consumer electronics.

1.3 Summary of the Project



As our robot is an IoT device, we must first establish a stable internet connection with the NUC PC. For communication with the robot, we'll use a program called "Anydesk" from another computer to connect to the onboard NUC PC.We're using the 'GUI' Graphical User Interface to send commands to the wheels, which allows users to interact with electronic devices via a graphical icon. To get real-time video feedback, we're using onboard IP cameras.The wheels of our robot will be driven by an Arduino-Mega board and an L298 motor driver. To collect all sensor data, all of the sensors will be connected to the onboard NUC PC. After that, it will be uploaded to our server, where data will be stored and any patient's physical condition will be monitored.The doctor will then write a prescription in a Google Doc. Then we'll drive our robot to the storage room and retrieve the medicine, food, and water, before returning to the patient.

1.5 Conclusion

Because the virus cannot replicate inside our covid assistant robot, it is an ideal solution; robots also reduce person-to-person contact, resulting in fewer health-care workers becoming ill. This also cuts down on community transmission while using up fewer PPE supplies. Simultaneously, the use of telemedicine, which allows doctors and nurses to communicate with patients without risk of infection, is rapidly increasing. The use of robotics and telemedicine in healthcare is becoming more prevalent. Both technologies can help with social distancing, which lowers the rate of hospital-acquired infections for both patients and staff.

Chapter 2: Project Design Approach

2.1 Introduction

Multiple methods, or multi-method design, is when two or more research projects are conducted, each complete in itself, to address research questions and/or hypotheses, a topic, or a program

2.2 Identify multiple design approach

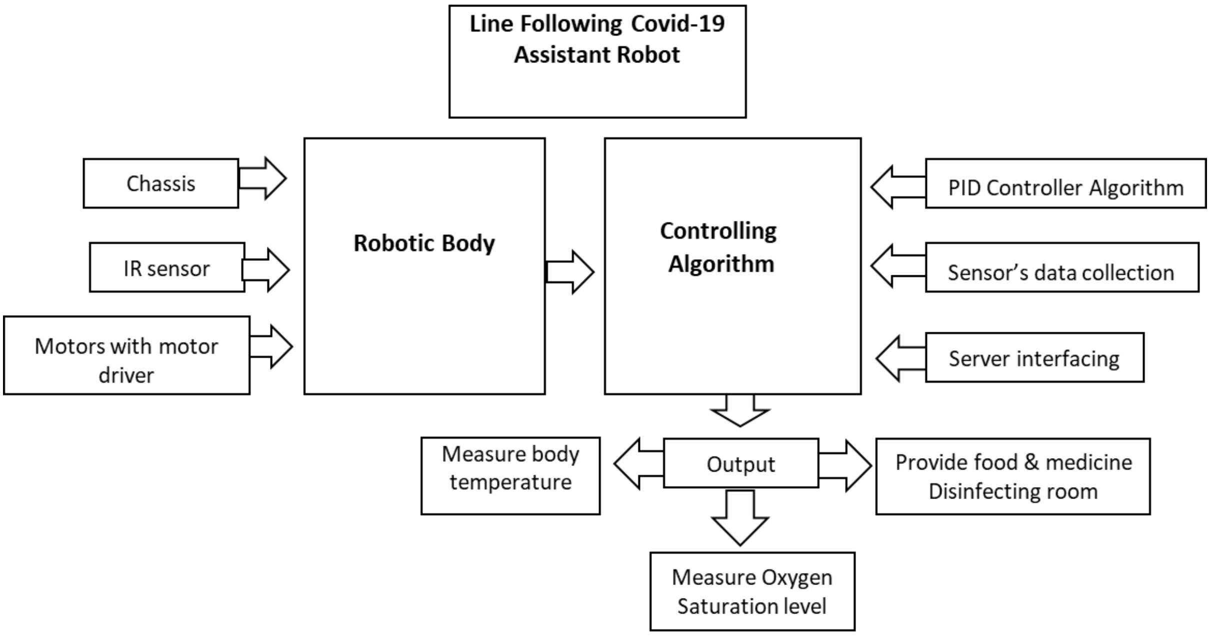
We have two multiple design approaches,

1) Line Following Robot
2) IoT Based Robot

2.3 Describe multiple design approach

Line Following Robot (Multiple design 01):

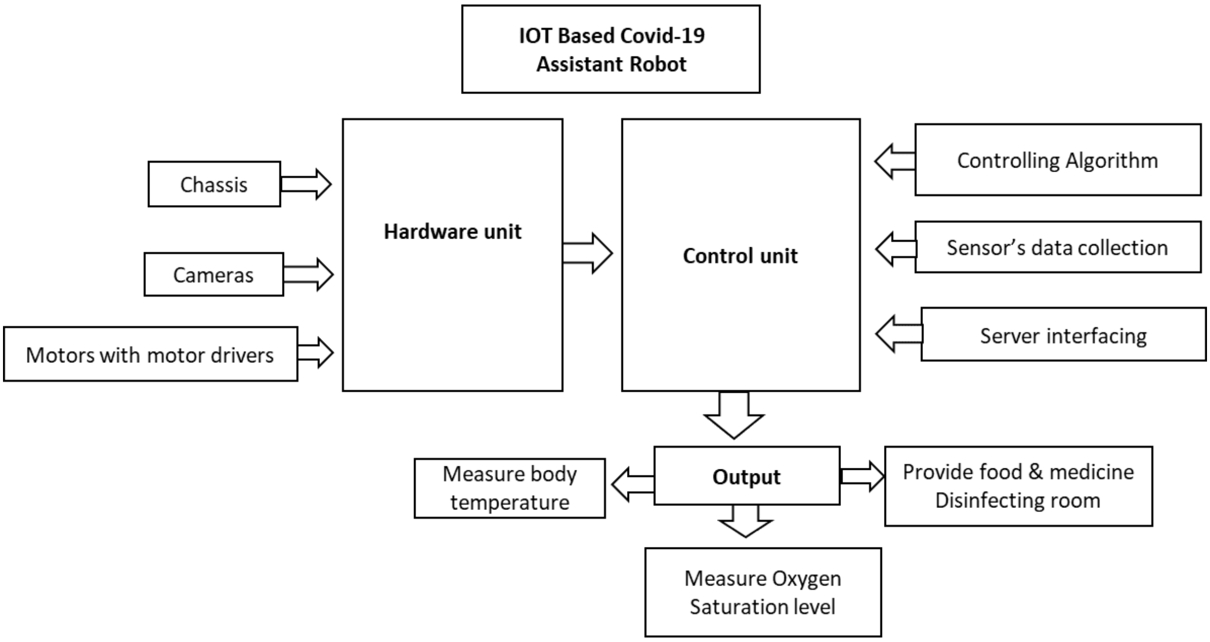
System level block diagram



Here we can have a look (**Multiple Design 01)** Chassis, cameras, motors are included in the hardware unit. The control algorithm includes PID algorithm, sensor data collection, server interfacing. The outputs are for all the multiple design approaches. Here we find a difference between IoT based robots with the line following robots in terms of controlling algorithms. In IoT we used GUI controlling algorithm and in line following we used PID controller algorithm. PID basically stands for proportional, integral, derivative controller algorithm. Array of multiple sensors detect the black surface and travel along the line.Arduino uno continuously monitors signals from sensors and turns the robot as the line gets detected. Obstacle detection is performed by ultrasonic sensors. These activities are not found in Iot based covid-19 assistant robots.

IoT Based Covid-19 Assistant Robot (Multiple design 02):

System level block diagram



Here, we can see our (**Multiple Design 02)**, we must first establish a stable internet connection with the NUC PC. For communication with the robot, we'll use a program called "Anydesk" from another computer to connect to the onboard NUC PC. We're using the 'GUI' Graphical User Interface to send commands to the wheels, which allows users to interact with electronic devices via a graphical icon. To get real-time video feedback, we're using onboard IP cameras. The wheels of our robot will be driven by an Arduino-Mega board and an L298 motor driver. To collect all sensor data, all of the sensors will be connected to the onboard NUC PC. After that, it will be uploaded to our server, where data will be stored and any patient's physical condition will be monitored. The doctor will then write a prescription in a Google Doc. Then we'll drive our robot to the storage room and retrieve the medicine, food, and water, before returning to the patient.

2.4 Analysis of multiple design approach

Here is the comparison of the IoT Based Robot and Line Following Robot,

Basis	IoT based covid-19 assistant robot (Method-1)	Line Following covid-19 assistant robot (Method -2)
Movement Speed	High (PWM) Test 1- 3 m/s Test 2- 2.50 m/s Test 3- 2.72 m/s	Low (following line) Test 1- 1.25 m/s Test 2- 1.10 m/s Test 3- 1.32 m/s
Video Feedback	Real time	Not applicable
Processor	Intel NUC-PC + Arduino Mega	Only Arduino mega
Sense of Detection	Oximeter, Body temp. sensor	IR-Sensor, Oximeter, Body temp. sensor
Communication Range and Ability	Can communicate with Robot by using remote desktop software from anywhere	Not applicable (Autonomous)
Usage of Components	More	Less
Accuracy	More	Less
Problematic Characteristics	Connectivity problems may arise	Not applicable
Working Duration	Less	More
Technical Complexity	High	Low
Control	Easier	Herder
Sustainability	High	Low
User Comfortability and Level of Interaction	Higher	Lower
Cost-Effectiveness Analysis	Higher	Lower

2.5 Conclusion

Here in this chapter, we came to know briefly about the two multiple design approaches of Covid-19 Assistant Robot one is Iot Based and another is Line Following Robot. We also see the analysis of multiple design approaches in many cases.

Chapter 3: Use of Modern Engineering and IT Tool.

3.1 Introduction

Technology is included in modern engineering, but it is also concerned with the development and understanding of technological systems and the products, effects, and appropriateness of technology. At Microsoft, modern engineering fosters a culture, tools, and practices centered on developing high-quality, secure, and feature-rich services to enable digital transformation. In our project we used three different multiple designs and initiated to select suitable tools for the use of the simulation software, platform and hardware.

3.2 Select appropriate engineering and IT tools

We used Proteus as the simulation software for the three multiple designs. According to modern engineering or IT tools proteus is the suitable tool among all the software. Proteus is a full-stack development platform that takes you from product concept to design completion. Intelligent principal layout, hybrid circuit simulation and accurate analysis, single-chip software debugging, single-chip and peripheral circuit co-simulation, and PCB automatic layout and wiring are some of its benefits. The microcontroller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it. This enables its use in a broad spectrum of project prototyping in areas such as motor control, temperature control and user interface design. It also finds use in the general hobbyist community and, since no hardware is required, is convenient to use as a training or teaching tool. Support is available for co-simulation of:

=> Microchip Technologies PIC10, PIC12, PIC16, PIC18, PIC24, dsPIC33 microcontrollers.
=> Atmel AVR (and Arduino), 8051 and ARM Cortex-M3 microcontrollers.
=> NXP 8051, ARM7, ARM Cortex-M0 and ARM Cortex-M3 microcontrollers.
=> Texas Instruments MSP430, PICCOLO DSP and ARM Cortex-M3 microcontrollers Parallax Basic Stamp, Freescale HC11, 8086 microcontrollers.

3.3 Use of modern engineering and IT tools

For all our three designs we used microprocessors, sensors, NodeMcu, motors, motor drivers. These are the hardwares we use for the designs that act according to modern engineering because these provide the most modern output fulfilling our visions of robots. We use the sensors for the perfection of touch communication developing high quality, secure and feature rich services to enable digital transformation. Moreover, we used NodeMcu for interfacing sensor datas with the server and it certainly shows the indication of modern technology. Rather than using it no other devices would fulfill the requirements accordingly. We used motors for the movements and modern engineering also has similarities. In the ultra-modern robots for different purposes motor drivers and motors are being used for the movement purpose. In one of our designs (IOT based) we used the Nuc pc and IP cameras following modern engineering and these are the suitable tools. Nuc pc and IP camera are the best possible and feasible solution for the outputs of our functions.

Intel NUC PC

Pulse Oximeter and Heart Rate Sensor

IR Thermometer

3.4 Conclusion

In our project to meet our desired needs we use modern engineering tools like NodeMcu, Arduino Uno, Relay module, IP camera and other devices. These devices help us to complete our project perfectly.

Chapter 4: Optimization of Multiple Design and Finding the Optimal Solution.

4.1 Introduction

For any design to be judged as a good design, it must be proven that it is useful for the purpose it is made for. In our case, we have analyzed our model by creating a simulation environment which is mostly close to the actual working conditions and we have obtained some results. Now to check whether these results are satisfactory, we are considering these factors to judge a design as an optimal solution. Even some of the optimization or calculations are going to be added below.

4.2 Optimization of multiple design approach

Many parallels may be seen between the IoT-based covid-19 assistant robot and the line following assistant robot. The IoT-based covid-19 assistant robot is our best answer. We discovered that an IoT-based robot is the best answer we can have based on movement speed, visual feedback, sustainability, working time, and other factors. We also made some calculations. We evaluated the speed of an IoT-based robot three times, and each time it was adequate for reaching the patient from the start. However, the line that followed the robot produced production that was slower than intended. As a result, we believe that IoT-based robots are more applicable and efficient than line-following robots. For implementation, accuracy is crucial. Despite the fact that IoT-based solutions have a greater level of technical complexity, we chose IoT as our best option since it allows us to operate for longer periods of time and has a wider range of communication capabilities.

Basis	**IoT based covid-19 assistant robot (Method-1)**	**Line Following covid-19 assistant robot (Method -2)**
Movement Speed	High (PWM) Test 1- 3 m/s Test 2- 2.50 m/s Test 3- 2.72 m/s	Low (following line) Test 1- 1.25 m/s Test 2- 1.10 m/s Test 3- 1.32 m/s
Video Feedback	Real time	Not applicable
Processor	Intel NUC-PC + Arduino Mega	Only Arduino mega
Sense of Detection	Oximeter, Body temp. sensor	IR-Sensor, Oximeter, Body temp. sensor
Communication Range and Ability	Can communicate with Robot by using remote desktop software from anywhere	Not applicable (Autonomous)

Usage of Components	More	Less
Accuracy	More	Less
Problematic Characteristics	Connectivity problems may arise	Not applicable
Working Duration	Less	More
Technical Complexity	High	Low
Control	Easier	Herder
Sustainability	High	Low
User Comfortability and Level of Interaction	Higher	Lower
Cost-Effectiveness Analysis	Higher	Lower

Cost Analysis:

Line Following Robot

Line Following Robot			
Component Name	Per Unit Price	Quantity	Total Price
Digital IR Sensors	1,000	1	1,000
Arduino Mega + UNO	600	2	1,200
Motor Driver (BTS)	1200	2	2,400
DC Motor	1100	4	4,400
Lipo Battery + Charger	6000	1	6,000
Chassis	10,000	1	10,000
Soldering Iron + Led + Regin	1000	1	1,000
Jumper wire + Connectors + Switches	-	-	500
Oximeter sensor	2000	1	2,000
IR Thermometer	1500	1	1,500
UVC light	4000	1	4,000

NodeMcu	600	1	600
Other costs	-	-	3,000
		Total	37,600/=

IoT Based COVID-19 Assistant Robot:

IoT Based COVID-19 Assistant Robot:			
Component Name	Per Unit Price	Quantity	Total Price
Intel Nuc PC	35,000	1	35,000
Arduino Mega + UNO	1,200	1	1,200
IP Cameras	4,000	1	4,000
Motor Driver (BTS)	1,200	2	2,400
BOYABY-MI Omnidirectional Lavalier Microphone	1,200	1	1,200
DC Motors	1,100	4	4,400
Lipo Battery + Charger	6,000	1	6,000
Chassis & Wheels	15,000	1	15,000
Soldering Iron + Led + Regin	1,000	1	1,000
Jumper wire + Connectors + Switches	500	1	500
Oximeter sensor	2,000	1	2,000
IR Thermometer	1,500	1	1,500
UVC light	2,000	2	4,000
NodeMcu	600	1	600

IoT Based COVID-19 Assistant Robot:			
Component Name	Per Unit Price	Quantity	Total Price
Intel Nuc PC	35,000	1	35,000
Arduino Mega + UNO	1,200	1	1,200
IP Cameras	4,000	1	4,000
Motor Driver (BTS)	1,200	2	2,400
BOYABY-MI Omnidirectional Lavalier Microphone	1,200	1	1,200
DC Motors	1,100	4	4,400
Lipo Battery + Charger	6,000	1	6,000
Chassis & Wheels	15,000	1	15,000
Soldering Iron + Led + Regin	1,000	1	1,000
Jumper wire + Connectors + Switches	500	1	500
Oximeter sensor	2,000	1	2,000
IR Thermometer	1,500	1	1,500
Other costs	N/A	1	3,000
PCB	1,000	1	1,000
		Total	82,800/=

So number one we have cost analysis. Our study shows that the "Line Following Robot" is less expensive but if we think about the efficiency & durability then "IoT Based COVID-19 Assistant Robot" is the best option here.

Efficiency:

The fee for the medical practitioners depends on the service, medicine, capitation and the salary of the personnel. And also it is very difficult to continuously monitor the patients. The line following robot can be very efficient to continuous monitoring to the patients, whenever they need any help or medicine.

One the other hand, giving medicine , food & disinfecting rooms properly a robotic arm is very efficient . But it can have some disadvantages at the same time. Robotic arm needs frequent servicing .

IoT Based COVID-19 Assistant Robot is very efficient as we can operate this robot from anywhere around the glove. It is more safe in the treatment of our covid patients because we don’t need to go physically to the patient that is why there is no chance to get infected. Rather, we can see patients' real time video and can communicate with them and can check their physical condition through the sensors which are directly interfaced with our server. Moreover, we can also provide food, medicine and water for the patient.

Usability:

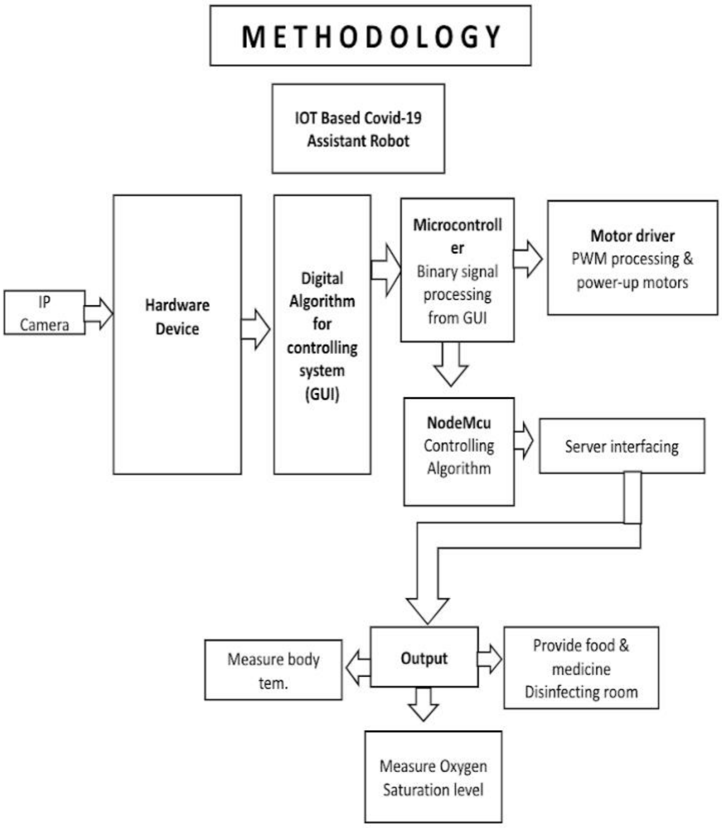
Elaborating an efficient and usable mapping between input commands and output movements is still a key challenge for the design of robotics. In order to address this issue, we present and compare three different control modes, by assessing them in terms of performance as well as general usability. So, first we tried to control our robots with a remote control system . As a result we observe some differences between these robots. Our line following robot performs well at the very beginning but if any obstacle crosses in our black tap then sometimes it is facing a laser emitting problem and as a result we see some lag during controlling our line following robot. When we apply this to our robotic arm. Sometimes it is moving fast. But it can create problems sometimes when serving a patient. Patient is not a robot and they will definitely try to move and if the robotic arm moves so fast it can create accidents in some cases. After that, we ran this experiment on our IoT Base “Covid-19 Assistant Bot”. In this case it ran smoothly and it didn't face any light emitting problem as well as lagging. After that, we perform a different test. Where we try to control our robots manually from our laptops from a long distance. But it was not possible for Line Following & Robotic Arm. Because these robots don't have any IoT based intelligence step up inside. So we can only perform this experiment for the “IoT Based COVID-19 Assistant Robot”.

So from Our study shows that the “Line Following Robot” is less expensive but if we think about the efficiency & usability then “IoT Based COVID-19 Assistant Robot” is the best option here. As this project will be used in the medical field and everything should be very precise & perfect. So we are selecting the “IoT Based COVID-19 Assistant Robot” as our optimal design.

4.3 Identify optimal design approach

As our robot is an IoT device, we must first establish a stable internet connection with the NUC PC. For communication with the robot, we'll use a program called "Anydesk" from another computer to connect to the onboard NUC PC.We're using the 'GUI' Graphical User Interface to send commands to the wheels, which allows users to interact with electronic devices via a graphical icon. To get real-time video feedback, we're using onboard IP cameras.The wheels of our robot will be driven by an Arduino-Mega board and an L298 motor driver. To collect all sensor data, all of the sensors will be connected to the onboard NUC PC. After that, it will be uploaded to our server, where data will be stored and any patient's physical condition will be monitored.The doctor will then write a prescription in a Google Doc. Then we'll drive our robot to the storage room and retrieve the medicine, food, and water, before returning to the patient.

Methodology of IoT based covid-19 assistant robot

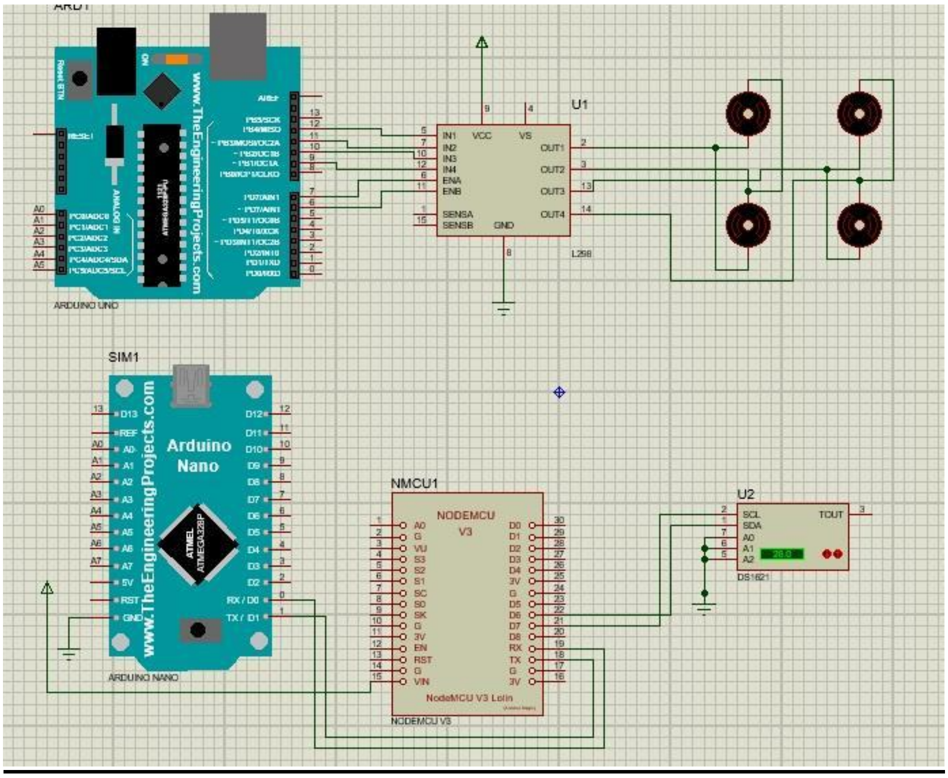


4.4 Performance evaluation of developed solution

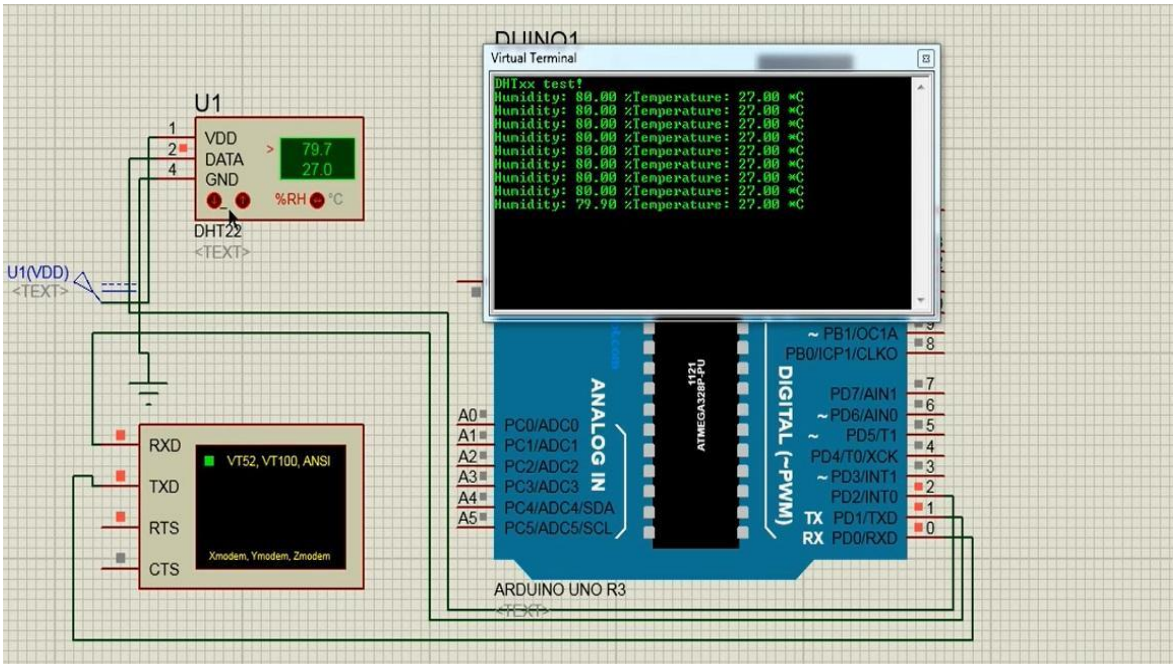
In IoT based covid-19 assistant robot and line following assistant robot we find many comparisons. Our optimal solution is IoT based covid-19 assistant robot. On the basis of movement speed, video feedback, sustainability, working duration and others as well we observed that an IoT based robot is the best solution we can have. We did some calculations as well. We tested the movement speed of an IoT based robot thrice and each time the speed was quite good for reaching the patient from the initial point. But the line following the robot provided the output which was less than the speed we expected. Thus we find IoT based more applicable and efficient rather than line following robots. Accuracy is very important for implementation. Although technical complexity is higher in IoT based, we selected our optimal solution as IoT for having quick working duration and communication range and ability.

Proteus Simulation of IoT Based COVID-19 Assistant Robot:

Take 01:



Take02:



Observation:

Here we can see the reading of the temperature sensor in the serial monitor.

4.5 Conclusion

To be considered as a good design, it must be demonstrated that it is beneficial for the reason for which it was created. In our situation, we examined our model by establishing a simulation environment that is largely representative of actual working settings, and we achieved some results. We are now examining these elements to determine a design as an ideal solution to see whether the outcomes are satisfactory.

Chapter 5: Completion of Final Design and Validation.

5.1 Introduction

After performing multiple designs, we have decided to work on IoT based design.

5.2 Completion of final design

Our final design is an IoT based Covid-19 assistant robot. Our robot's design is mainly patient focused. It has the ability to provide food & medicine, measuring temperature, measuring oxygen and heart rate and disinfecting rooms.

Figure 2: Final Design (IoT Based Covid-19 Assistant Robot)

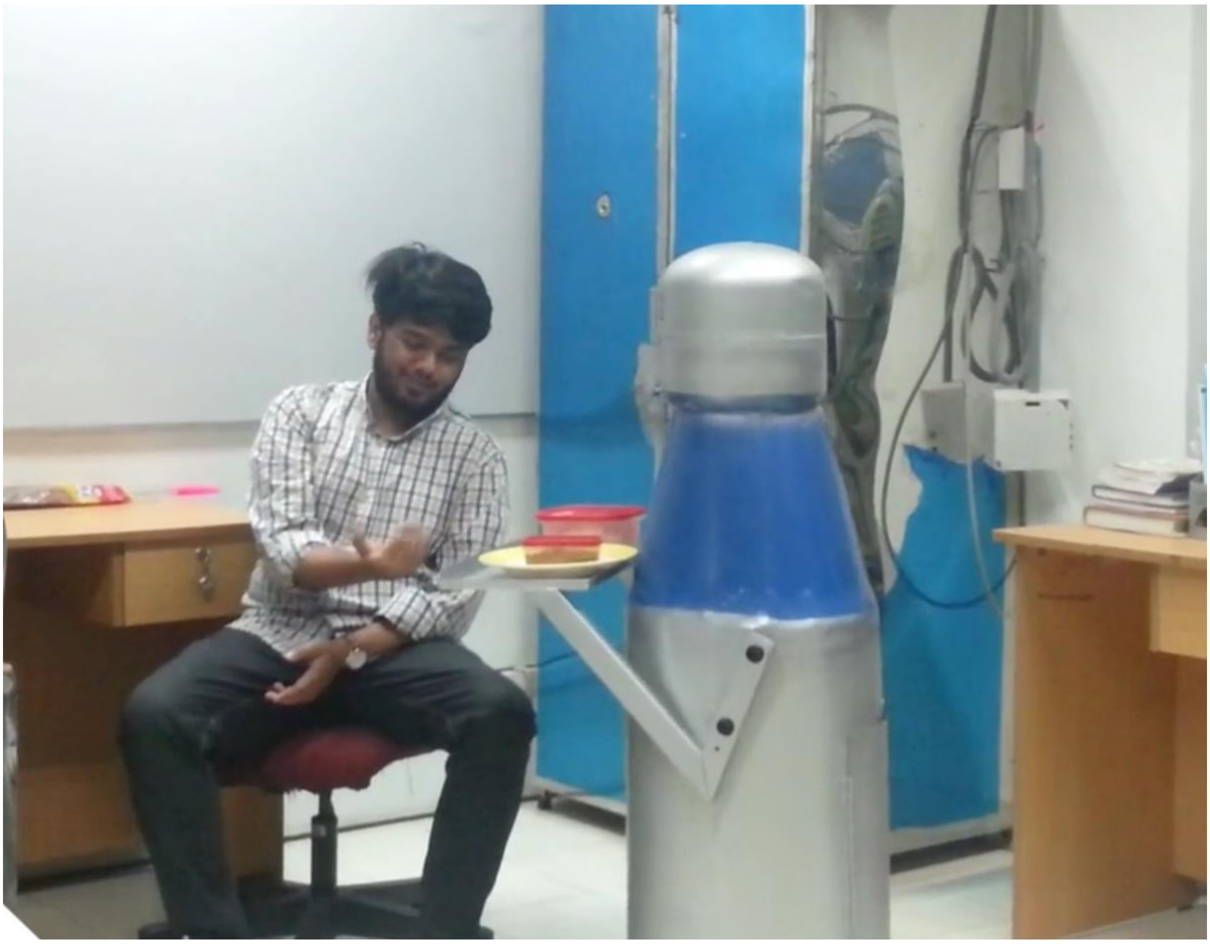


Figure 3: Providing Food & Medicine

Providing Food & Medicine: Our robot distributes meals and medicines to COVID-19 patients or those affected with the disease in order to prevent doctors and medical workers from becoming infected with the virus. It has remained difficult to provide meals and medicines to coronavirus positive patients in hospitals. This is why our IoT-based Covid-19 Assistant Bot is being used by humans. The robot's arms hold a fixed tray on which food and medicine may be delivered to a specific location, and the equipment can be controlled remotely.

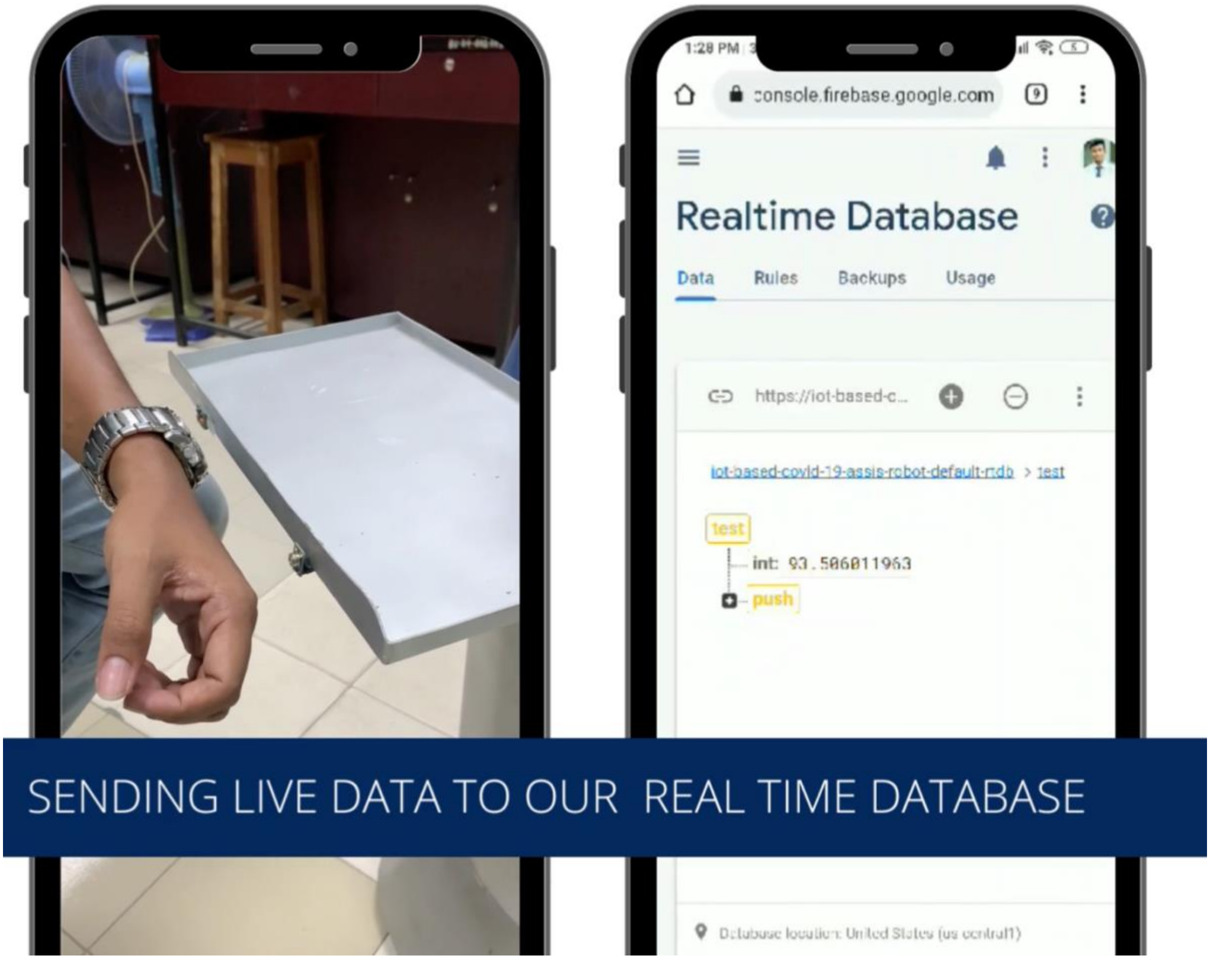


Figure 4: Measuring Temperature

Measuring Temperature: Coronavirus infection 2019 screening will be able to assess a huge number of people while reducing healthcare exposures and restricting the virus's transmission. Because it is one of the earliest and most commonly reported signs of the illness, temperature screening has been a focus point of case discovery during the pandemic. We discuss key considerations for screened persons, as well as the measurement process and recent results. Individual and contextual factors, as well as a rethinking of the present fever threshold, all play a role in optimal temperature-based screening.

Our covid-19 helper robot can monitor temperature in real time and communicate the information to our server.

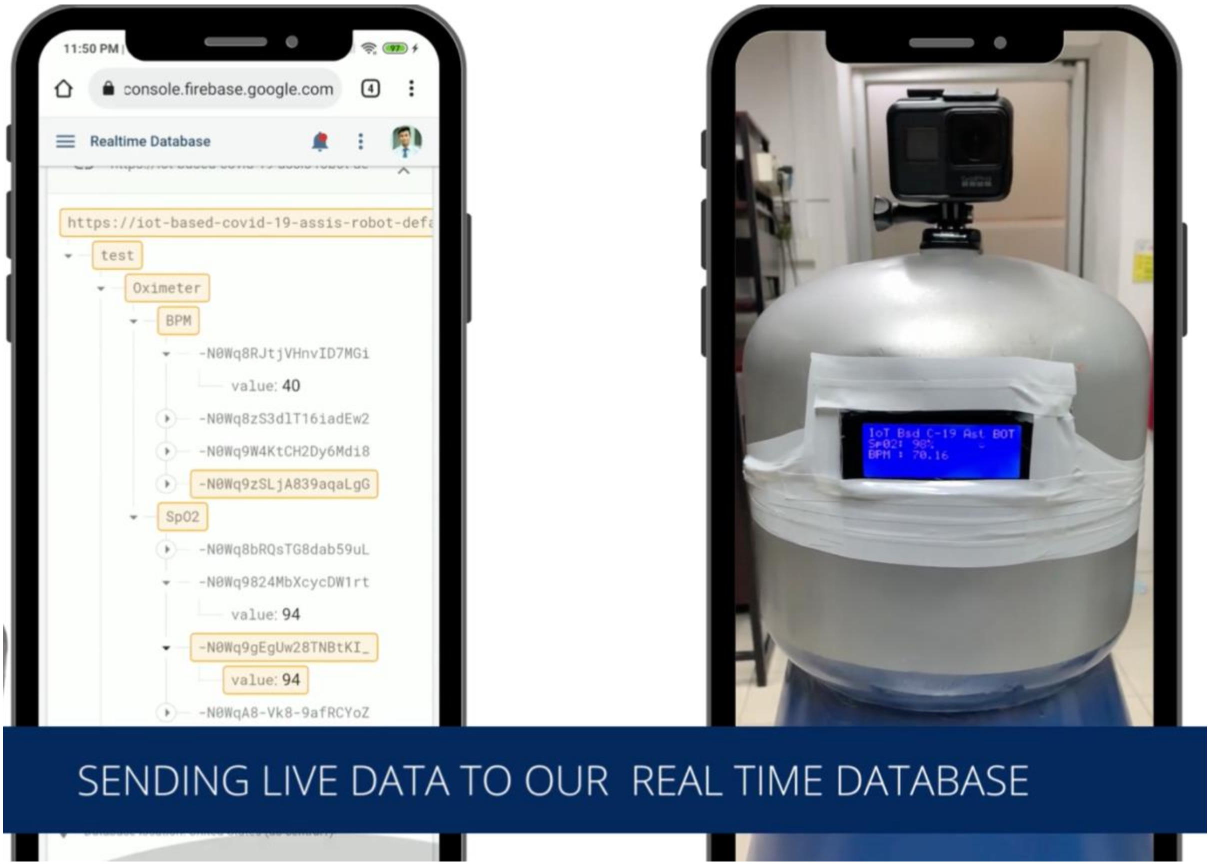


Figure 5: Measuring Oxygen Level and BPM (Pulse Rate)

Measuring Oxygen Level and BPM (Pulse Rate): COVID-19, according to the same study app's researchers, can produce an irregular or fast heart rate of exceeding 100 beats per minute. If someone has COVID-19, a pulse oximeter can help them monitor their health and determine whether they require medical attention. A pulse oximeter, however, can make someone feel like they have some control over their health, but it does not convey the complete story. A pulse oximeter reading isn't the only technique to determine how unwell someone is. Some people may feel ill but have good oxygen levels, while others may feel OK but have low oxygen levels. Even if a pulse oximeter shows normal oxygen levels, if someone feels short of breath, breathes faster than usual, or feels too unwell to accomplish their normal daily activities, their oxygen levels may be low.

Our covid-19 helper robot can monitor oxygen levels and heart rate in real time and communicate the information to our server.

5.3 Evaluate the solution to meet desired need

We have performed multiple test cases to get the most appropriate result from our robot. Those test cases result are given below:

Case 01: Measuring Temperature
Device: IR Thermometer
Model: GY906

Person	Date	Case No.	IR Thermometer Reading (Fahrenheit) Device: GY906	IR Thermometer Reading (Average) Device: GY906	Conventional Thermometer Reading (Fahrenheit) (University Entrance)	Conventional Thermometer Reading (Average) (University Entrance)	Error % (Average)
	23rd April 2022	1	91.34F		97.00F		
1	23rd April 2022	2	89.01F		96.05F		
	23rd April 2022	3	89.98F		97.50F		
	24th April 2022	4	91.06F		95.30F		
2	24th April 2022	5	91.24F	**90.738F**	94.25F	**96.045F**	**±5.52%**
	24th April 2022	6	91.35F		96.25F		
	25th April 2022	7	90.34F		95.10F		
3	25th April 2022	8	91.24F		94.50F		
	25th April 2022	9	90.81F		95.35F		
	25th April 2022	10	90.48F		97.25F		
4	25th April 2022	11	90.67F		97.67F		
	25th April 2022	12	91.35F		96.33F		

Case 02: Measuring Oxygen Level (SpO2)
Device: Oximeter
Model: MAX30100

Person	Date	Case No.	Oximeter Reading SpO2% Device: MAX30100	Oximeter Reading SpO2% (Average) Device: MAX30100	Conventional Oximeter Reading SpO2% Device: JPD500D	Conventional Oximeter Reading SpO2% (Average) Device: JPD500D	Error % (Average)
1	23rd April 2022	**1**	98%	**98.25%**	99%	**97.66%**	**±0.60%**
	23rd April 2022	**2**	99%		96%		
	23rd April 2022	**3**	98%		96%		
2	24th April 2022	**4**	98%		95%		
	24th April 2022	**5**	99%		97%		
	24th April 2022	**6**	99%		99%		
3	25th April 2022	**7**	98%		98%		
	25th April 2022	**8**	99%		97%		
	25th April 2022	**9**	99%		99%		
4	25th April 2022	**10**	97%		98%		
	25th April 2022	**11**	96%		99%		
	25th April 2022	**12**	99%		99%		

Case 03: Measuring Heat Rate (BPM)
Device: Oximeter
Model: MAX30100

Person	Date	Case No.	Oximeter Reading BPM Device: MAX30100	Oximeter Reading BPM (Average) Device: MAX30100	Conventional Oximeter Reading BPM Device: JPD500D	Conventional Oximeter Reading BPM (Average) Device: JPD500D	Error % (Average)
1	23rd April 2022	**1**	60.50	**65.425**	61.50	**65.560**	**±0.20%**
	23rd April 2022	**2**	58.20		59.25		
	23rd April 2022	**3**	58.79		58.10		
2	24th April 2022	**4**	61.64		63.65		
	24th April 2022	**5**	64.85		65.85		
	24th April 2022	**6**	66.78		66.60		
3	25th April 2022	**7**	67.07		65.07		
	25th April 2022	**8**	66.25		65.20		
	25th April 2022	**9**	67.31		67.00		
4	25th April 2022	**10**	69.87		68.00		
	25th April 2022	**11**	71.50		73.25		
	25th April 2022	**12**	72.35		73.25		

Case 04: Providing Food Medicine, Water & Hand Sanitizer

Person	Date	Case No.	Result	Pass %	Distance Covered (Meter)	Time (sec)	Time (sec) (Average)
1	23rd April 2022	1	Pass	**100%**	10	120	**110.83**
	23rd April 2022	2	Pass		10	130	
	23rd April 2022	3	Pass		10	110	
2	24th April 2022	4	Pass		10	105	
	24th April 2022	5	Pass		10	100	
	24th April 2022	6	Pass		10	105	
3	25th April 2022	7	Pass		10	110	
	25th April 2022	8	Pass		10	115	
	25th April 2022	9	Pass		10	105	
4	25th April 2022	10	Pass		10	100	
	25th April 2022	11	Pass		10	120	
	25th April 2022	12	Pass		10	110	

5.4 Conclusion

Our final design meets our desired needs. For providing food & medicine it has 100% efficiency, measuring temperature efficiency ±2.12%, measuring oxygen Spo2 efficiency ±1.64%, measuring heart rate BPM efficiency ±0.16%

Chapter 6: Impact Analysis and Project Sustainability.

6.1 Introduction

The impact of our COVID-19 assistant robot in terms of societal, health, safety, legal and cultural context and checking our IOT based robot about sustainability is a matter of criticism over the time.

6.2 Assess the impact of solution

For safety protocol we should make the robot's body out of non-conductive materials such as plastic. Because it is an electrical equipment, there is a risk of electric shock if it is connected. As a result, we shall use non-conducting materials. Where there is no touch connection there will be the least probability of the effect of COVID-19. As there is no touch connection between human beings by dint of this robot; so, it is strongly maintaining health protocol.

6.3 Evaluate the sustainability

Using robots is working a significant role in the need for social distance. So, it’s maintaining the safety protocol to a larger extent. There is also an issue that The human being is gradually being habituated with the advantages of robots or not. If the robot becomes habituated with human beings so easily and their demand in the medical sector increases statistically then human resources will have a less preference in this aspect. Manpower will decrease eventually. Moreover, the death rate will also decrease. Political force plays a significant role in any change of a country. If this robot becomes acquainted with the patients and doctor’s society, then it is certain that a number of human resources should be listened to. So gradually it will create an unemployment issue and with the change political threats may arise keeping pace with the rising issue. Eventually political unsustainability will exist, and it is going to lead a country towards least capital and development backwardness. If a robot creates a position which is equivalent to the position of a human being, then it will be a threat to any political team, even the whole people of that country, so it is also a perspective from the political leaders. The cost of our robot may not be handled by the people of every country. Developed countries can use it very easily. On the other hand, the undeveloped and poor countries cannot bear the expenses of it.

6.4 Conclusion

Finally, some modifications can be added to keep this robot at a reasonable cost with the assistance of the govt. and WHO. Moreover, it is very eco-friendly. It does not emit any gas which is harmful for the environment resulting in no environment pollution, which will have no impacts on global warming.

Chapter 7: Engineering Project Management.

7.1 Introduction

Project management is the process of managing a team's efforts to meet all project objectives while staying within budget restrictions. Typically, this data is described in project documentation, which is prepared at the start of the development process. It is critical for a team to keep a project management chart for any engineering project. It will assist a team in successfully completing a job. Our team has kept a chart for this Iot Based Covid -19 Assistant Robot since the beginning. Our project was separated into three important sections. EEE400P, EEE400D, and EE400C are three of them.

7.2 Define, plan and manage engineering project

Our project plan is divided into three sections. One is for the EEE400P, one for the EEE400D, and one for the 400C. So we began our 400P in Summer 2021. In this section, we began by conducting research on our topic. Following that, we held additional meetings with our ATC members. Then we conducted a literature review. This section has several multiple designs, gaps, and so forth. Then came our first Progress Presentation. In addition, we created concept notes. Budgeting and planning Following that, we held our second Progress Presentation, followed by our final Progress Presentation and concept note submission.

This semester in EEE400D, we begin by designing different designs for our projects. Following that, we went to our first presentation. Following that, we analyze a variety of aspects to choose the best solution for our tasks. Then we completed our draft design report, and finally, we attended our semester's final progress presentation.

For EEE400C, we had some plans. Like, within February we will design our robot chassis & then after we will go for the PCB designing wiring part. At the same time, we will work on GUI designing, coding, server making & connecting . and within April 1 we have a plan for the first test run of our project.

400P:

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	PCT OF TASK COMPLETE	EEE400P June 2021	July 2021	August 2021	September 2021
1	EEE400P								
1.1	Research About The Topic	Everyone	6/14/21	6/20/21	100%				
1.2	Selecting Topic	Everyone	6/21/21	6/23/21	100%				
1.3	Literature Review: Finding Gaps, Multiple Design, Specifications	Everyone	6/24/21	6/30/21	100%				
1.4	Preparing for Progress Presentation 1	Everyone	6/30/21	7/6/21	100%				
1.5	Concept Note Drafting	Everyone	7/8/21	9/9/21	100%				
1.6	Budget and Project Planning	Everyone	7/15/21	7/19/21	100%				
1.7	Preparing for Progress Presentation 2	Everyone	7/22/21	7/22/21	100%				
1.8	Preparing for Final Progress Presentation 3	Everyone	7/24/21	8/18/21	100%				
1.9	Project Proposal Report	Everyone	9/1/21	9/23/21	100%				

400D:

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	PCT OF TASK COMPLETE	EEE400D October 2021	November 2021	Decemeber 2021	January 20212
1	EEE400D								
2.1	Making Multiple Designs	Everyone	9/29/21	10/10/21	100%				
2.2	Preparing for Progress Presentation 1	Everyone	10/6/21	4/15/18	100%				
2.3	Select the optimal Design	Everyone	10/7/21	10/12/21	100%				
2.4	Concept Note Drafting	Everyone	11/4/21	12/30/21	100%				
2.5	Preparing for Final Progress Presentation	Everyone	12/24/21	1/6/22	100%				
2.6	Project Proposal Report	Everyone	12/7/21	1/8/22	100%				

400C:

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	PCT OF TASK COMPLETE	EEE400C February 2022	March 2022	April 2022	May 2022
3	EEE400C								
3.1	Robot Chassis Design	Everyone	12/1/21	1/30/22	100%				
3.2	Design our PCB & Equipment installations and Wiring	Everyone	1/19/22	1/27/22	100%				
3.3	-GUI designing -Coding -Connectivity Software selection -Server making -Sensor joining with equipment	Everyone	2/24/22	3/25/22	100%				
3.4	First Test 1	Everyone	4/1/22	4/5/22	100%				
3.5	First Test 2	Everyone	4/6/22	4/17/22	100%				
3.6	Project Ready	Everyone	4/17/22	5/3/22	100%				

7.3 Evaluate project progress

Our main goal for EEE400C was to build the robot chassis, complete the necessary coding, properly wire the robot, and develop a database. Following that, we'll take our first test drive. We started with the outside construction first, as planned. From December 2021, we have already begun market research and the search for acceptable vendors. However, there was always a budgeting issue. Vendors are charging much too much for the building alone. After that, we managed to find a vendor with our range and, after working in his workshop for 2-3 weeks, we were able to complete the chassis. Simultaneously, we work on building our database and procuring components for our project. We began working on the functioning of our robot and writing programming for it after obtaining the necessary equipment. After a lot of trial and error, we've figured out what we're looking for. After receiving the chassis, we begin designing connections and constructing the necessary circuits for our robot. We recommended 1st April, 2022 as our first test run at the start of the project, but with a lot of effort, we can do it by March 23, 2022. Our robot was able to complete both of its critical procedures on the initial run, allowing us to achieve both of our goals. We accomplished all circuit construction, coding, and database connection work by March 29, 2022. Our robot is now ready to go. Also now it can fulfill its four objectives at the same time.

7.4 Conclusion

Making a plan and keeping it up to date during each phase is a difficult effort for us. But, because of our complete dedication, hard effort, and teamwork, we were able to complete our job. We have already completed all of the tasks on our gantt chart. We learn a lot of new things during the project management process that will be useful in our future work.

Chapter 8: Economical Analysis.

8.1 Introduction

For every project it is important to do an economical analysis. Since freeway management systems are designed, constructed, and operated and maintained with public funding, it is critical that economic analyses are conducted to ensure that public funds are spent prudently. In addition to being used to determine which alternative system offers the most potential, economic analyses serve to justify the cost effectiveness of system installations to elected officials who oversee public funding, as well as to the public whom these elected officials serve.

8.2 Economic analysis (Next Page)

Per IoT Based COVID-19 Assistant Robot Cost			
Component Name	**Per Unit Price**	**Quantity**	**Total Price**
Intel Nuc PC	35,000	1	35,000
Arduino Mega + UNO	1,200	1	1,200
IP Cameras	4,000	1	4,000
Motor Driver (BTS)	1,200	2	2,400
BOYABY-MI Omnidirectional Lavalier Microphone	1,200	1	1,200
DC Motors	1,100	4	4,400
Lipo Battery + Charger	6,000	1	6,000
Chassis & Wheels	15,000	1	15,000
Soldering Iron + Led + Regin	1,000	1	1,000
Jumper wire + Connectors + Switches	500	1	500
Oximeter sensor	2,000	1	2,000
IR Thermometer	1,500	1	1,500
UVC light	2,000	2	4,000
NodeMcu	600	1	600
Other costs	N/A	1	3,000
PCB	1,000	1	1,000
		Total	**82,800/=**

5 Unit Making Cost Analysis		
Types Of Cost	**Per Unit Cost**	**Total Cost**
5 Robot Making Cost	82,800 BDT	414,000 BDT
Electricity Cost	50,000-60,000 Per Month BDT	50,000-60,000 BDT
Electrician Labor Cost	50,000 BDT	50,000 BDT
Workshop Rent	30,000 BDT	30,000 BDT
Others	50,000 BDT	50,000
Total:		**5,94,000 to 6,04,000 BDT**

Profit Analysis		
Types Of Cost	**Per Unit Cost**	**Total Cost**
5 Robot Selling Price	2,00,000-3,00,000 BDT	10,00,000-15,00,000 BDT
Electricity Cost	50,000-60,000 Per Month BDT	5,94,000 to 6,04,000 BDT
Expected Profit		**406,000 to 8,96,000 BDT**

8.3 Cost benefit analysis

Cost-benefit analysis (CBA) is a process or tool to support decision making in projects.CBA evaluates the cost versus the benefit of a project to determine project feasibility as well as provide a decision making metric when weighing up multiple options.

Yearly Spending On Doctor & Nurse (Where Covid Patient is around 50) 1 Hospital		
Types Of Cost	**Monthly Cost**	**Yearly Cost**
5 Doctor Yearly Cost	1,00,000-2,00,000 BDT (Per Person Part-time)	60,00,000 to 12,000,000 BDT (On-site)
15 Nurse Cost	25,000-40,000BDT(Per Person)	45,00,000 to 72,00,000BDT (On-site)
Food & Allowance Cost	4,00,000	36,00,000BDT

Medical Equipments (PPE,masks, gowns, gloves, sterilizers, and ventilators)	2,00,000 BDT	24,00,000 BDT
Others Cost	2,00,000 BDT	24,00,000 BDT
Total:		**18,900,000 to 24,900,000 BDT**

Yearly Spending On Our Robot (Where Covid Patient is around 50) 1 Hospital		
Types Of Cost	**Monthly Cost**	**Yearly Cost**
5 Robot Cost	1,00,000-2,00,000 BDT (Per Robot)	5,00,000 to 10,00,000 BDT (One Time Cost)
5 Operator Salary	25,000-40,000BDT(Per Person)	45,00,000 to 72,00,000 BDT (On-site)
Food & Allowance Cost	50,000 BDT	6,00,000 BDT
4 Part-time Doctors Online Support	2,00,000 BDT(4 Person)	24,00,000 BDT
Others Cost (Wifi Bill, Electricity bill, etc)	80,000 BDT	9,60,000 BDT
Total: (Only 1st Month)		**89,00,000 to13,900,000 BDT**
From 2nd Month		**84,00,000 to 12,900,000 BDT**

Cost Benefit Every Year	**12,900,000 to 11,000,000 BDT**

8.4 Evaluate economic and financial aspects

Here we can see our economical benefits from our Iot Based COVID-19 Assistant Robot. We can save up to **12,900,000 to 11,000,000 BDT** Per month from any hospital easily, Where the capacity of the patient is 50. If we think about the finance part, we need around **5,94,000 to 6,04,000 BDT** to make 5 robots for one hospital and we can sell it from **2,00,000 to 3,00,00** per robot which can make a **406,000 to 8,96,000 BDT** profit from 5 robots. If we expand commercially then the cost of robots can be decreased to **45,000 BDT**.

8.5 Conclusion

To summarize, economic analysis is a useful tool for planning and evaluating prospects in changing management practices, especially in a rural economy that is near to subsistence. We can get a comprehensive picture of our project from here, as well as understand the entire cost and economic benefits of our project. Overall, it has a significant impact on the economy of Bangladesh, particularly in the health sector.

Chapter 9: Ethics and Professional Responsibilities

9.1 Introduction

Engineering is a vital and well-studied field. Engineers are required to uphold the highest levels of honesty and integrity as members of this profession. Engineering has a direct and significant impact on everyone's quality of life. As a result, engineers' services must be based on honesty, impartiality, fairness, and equity, as well as a commitment to the public's health, safety, and welfare. Engineers must adhere to a professional code of conduct that compels them to follow the highest ethical standards.

9.2 Identify ethical issues and professional responsibility

We need the mechanisms in place to enable us to reflect on the ethical values, beliefs, and aspirations while we are developing and implementing our COVID assistant robot in practical life. While developing the robot, we will certainly face authority restrictions. Because if a robot gets all the human power and takes the position which is equivalent to human being, it will result in a drastic puzzle. So, authority's ethical consideration may arise resulting in a negative output while developing our robots. Are robots developing betterment or harm to society? Even religious ethical issues may arise in such development of our robot. Additionally creating robots for different purposes except doing household acts are prohibited in some countries.

9.3 Apply ethical issues and professional responsibility

When we are implementing our robot there may arise a lot of ethical consideration. For using the robot in real life, we need approval from the specific organization who provides the legal consideration of electronic devices. Confirmation of our robots after observing the impacts of our robot from the organizations is a very important part of ethical consideration because we cannot publish any sort of products or devices without permission and ethical consideration. Developing our robots does not require any ethical consideration but while implementing it is a must.

Before using our robot in the hospital we need to take legal approval from the hospital authority and other stakeholders who are related to the patient care service . We also need to prove that our robot is human friendly and it is not going to harm anyone. These are the basic ethical considerations we need to focus on but after implementation we might need to take approval from other government agencies so that it can be used in any hospital .

9.4 Conclusion

To summarize, as an Engineer, we must prioritize the public's safety, health, and welfare in the performance of our professional duties. We should only provide services in areas where we are experts. We should also make public declarations that are objective and truthful. To avoid deception, we should operate as faithful representatives or trustees for each employer or client. Finally, to behave oneself honestly, responsibly, ethically, and lawfully in order to promote the professional's honor, reputation, and utility.

Chapter 10: Conclusion and Future Work

10.1 Project summary/Conclusion

In times of extreme strain on the healthcare system, such as during the coronavirus pandemic, robotic systems can significantly reduce the risk of infectious disease transmission to frontline healthcare workers by enabling riage, evaluation, monitoring, and treatment of patients from a safe distance. Our IoT Based COVID-19 Assistant Robot specializes in digital health solutions & nursing such as taking time to time updates of our oxygen level, giving food & medicines & disinfecting the room , which we hope to adapt to the current health crisis in order to provide more effective and safer healthcare service delivery. In the present COVID-19 epidemic, we are able to develop our assistant bot technology solutions that enable for curbside screening of patients while healthcare personnel stay at a safe distance. Enabling remote patient screening will reduce interaction time between patients and frontline healthcare staff, which is especially important during the COVID-19 outbreak. Robots can also automate labor-intensive, time-consuming, and repetitive manual procedures, reducing the stress on frontline healthcare employees. Robots enable substantially higher productivity in collecting patient data and sample analysis, hospital equipment and environment sterilization/sanitization, and pharmaceutical services because they can deliver very precise, consistent, quick, and regulated operations. While our task-specific programming of robots is difficult and necessitates extensive computer programming knowledge, our lab specializes in rapid on-demand robotic automation based on easy graphical controlling system from laptop, in which any healthcare worker (e.g., a nurse or lab worker) can "demonstrate" a given task to the robot by physically guiding it through the desired commands, and the robot "learns" the ability to recall the task on its own. This is especially useful during the COVID-19 pandemic, when robotic systems must be highly adaptable and repurposed to best meet the healthcare system's highly dynamic day-to-day requirements.

10.2 Future work

IoT and robotics have a bright future ahead of them. To increase the quality, productivity, and predictability of the outputs generated, automation is at the top of everyone's agenda. Robotics and the Internet of Things (IoT) are critical components of automation. This will occur often in the supply chain and industrial industries.

These disciplines have a lot of potential in the healthcare industry. Humanless operations and treatments are increasingly commonplace, and we're seeing more and more acceptance as time goes on. We've heard that self-driving vehicles are on their way in a significant manner in transportation and logistics. Humans will be supplanted by technology in mining, construction, and risky field conditions, and these technologies will play a key part in that shift.

Chapter 11: Identification of Complex Engineering Problems and Activities.

11.1: Identify the attribute of complex engineering problem (EP)

A. Attributes of Complex Engineering Problems (EP)

	Attributes	**Put tick (√) as appropriate**
P1	Depth of knowledge required	√
P2	Range of conflicting requirements	
P3	Depth of analysis required	√
P4	Familiarity of issues	√
P5	Extent of applicable codes	
P6	Extent of stakeholder involvement and needs	
P7	Interdependence	√

Note: Must have P1, and some or all from P2-P7

11.2: Provide reasoning how the project address selected attribute (EP)

Here in Attributes of Complex Engineering problems. We need a great amount of Depth of knowledge to make this project. We had to read a lot of thesis paper , journals to get enough knowledge. After that, Depth of analysis. We have to go through experiments & research before starting our project. We figure out a lot of familiarity with issues like our project but we try our best to make it unique. Following that, interdependence . We always try to make a linear harmony to conduct any kind of work & task distribution.

11.3 Identify the attribute of complex engineering activities (EA)

B. Attributes of Complex Engineering Activities (EA)

	Attributes	**Put tick (√) as appropriate**
A1	Range of resource	√
A2	Level of interaction	
A3	Innovation	
A4	Consequences for society and the environment	√
A5	Familiarity	√

Note: Must have some or all of the characteristics from attributes A1 to A5

11.4 Provide reasoning how the project address selected attribute (EA)

Here in Attributes of Complex Engineering problems. We need a great amount of resources to make this project. After that , consequences for society and the environment. As we are working for the frontliner. So our project is definitely beneficial for society & also for the environment. Following that, familiarity of our project. During research work we figure out some similar project like ours but somehow we manage to make our project unique.

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Logbook:

	Final Year Design Project (C) Spring 2022		
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ATC 5			
Chair	Dr. Abu S. M. Mohsin, Assistant Professor, Department of EEE, BRAC University	asm.mohsin@bracu.ac.bd	
Member 1	Taiyeb Hasan Sakib, Lecturer, Department of EEE, BRAC University	taiyeb.sakib@bracu.ac.bd	

Date/Time/Place	**Attendee**	**Summary of Meeting Minutes**	**Responsible**	**Comment by ATC**
01.02.22	1.Amir 2.Mamun 3.Shoeb 4. Syeed	Our ATC discussed the overall EEE400C work & our progress regarding this semester work.	Task 1: Mamun Task 2: Amir Task 3: Shoeb Task 4: Syeed	N/A as it was an introductory meeting.
08.02.22	1.Shoeb 2.Syeed 3.Mamun 4.Nasir	Showed our coding & materials of our Robot	Task 1: Shoeb Task 2: Syeed Task 3: Mamun Task 4: Amir	We should start working on building soon
15.02.22	1.Amir 2.Mamun 3.Shoeb 4. Syeed	We build the GUI of our Robot	Task 1: Mamun Task 2: Amir Task 3: Shoeb Task 4: Syeed	We should focus also on the functional work
22.02.22	1.Mamun 2.Syeed 3.Amir 4.Shoeb	We should the coding we are doing	Task 1: Mamun Task 2: Amir Task 3: Shoeb Task 4: Syeed	We should present our Robot body

				within next meeting
01.03.22	1.Shoeb 2.Syeed 3.Mamun 4.Nasir	We build the Mechanical Part of our Robot	Task 1: Shoeb Task 2: Syeed Task 3: Mamun Task 4: Amir	We should focus also on the functional work
08.03.22	1.Shoeb 2.Syeed 3.Mamun 4.Nasir	Mid Week No Meeting	N/A	N/A
15.03.22	1.Mamun 2.Syeed 3.Amir 4.Shoeb	Mid Week No Meeting	N/A	N/A
22.03.22	1.Syeed 2.Shoeb 3.Amir 4.Mamun	Our Robot is Ready & went for the first test run	Task 1: Syeed Task 2: Mamun Task 3: Amir Task 4: Shoeb	We should focus on our Report writing & slides
29.03.22	1.Amir 2.Mamun	We showed our each & every coding related work submitted our files	Task 1: Amir Task 2: Mamun	We should focus on our Report writing & slides
05.04.22	1.Mamun 2.Syeed 3.Amir 4.Shoeb	Missed Our Meeting	N/A	N/A
12.04.22	1.Syeed 2.Shoeb 3.Amir 4.Mamun	We showed our Report Work	Task 1: Shoeb Task 2: Syeed Task 3: Mamun Task 4: Amir	We should focus on Slide
19.04.22	1.Amir 2.Mamun 3.Shoeb 4. Syeed	We showed our Draft report	Task 1: Mamun Task 2: Amir Task 3: Shoeb Task 4: Syeed	We should focus on Slide & mock presentation
26.04.22	1.Shoeb 2.Syeed 3.Mamun 4.Nasir	We showed our slide & gave mock presentation	Task 1: Shoeb Task 2: Syeed Task 3: Mamun Task 4: Amir	We should do some test analysis