Introduction

Large numbers of healthcare workers were affected in hospitals across the world, with the initial wave of Corona virus managing to infect 80% of the staff working in the medical wards. The magnitude with which this virus has taken a toll on the health workforce has taken lives of several health care workers. It is possible to avoid direct contact with COVID patients to some extent by using Bluetooth car to provide services to patients. In this pandemic it will act as a boon to hospital staff members and also to common man. Wireless Bluetooth Controlled Robot Car Using Arduino can be controlled wirelessly via a Smartphone. The smart phone has an Android app through which the user can send commands directly to Robot. The wireless communication techniques used to control the robot is Bluetooth Technology. Specific voice/button commands are given to the robot through an Android application. Health care workers can use various commands like move forward, reverse, stop, move left, and move right to reach out the patient to deliver food, water and medicines time to time without directly coming in close proximity to them. Thus, our aim is to use robot car and this helps us to maintain social distancing and thus save other people to get infected with viral patient.

Problem Statement

This project mainly aims to eradicate issues which might probably occur during treating patients in quarantine chambers. The developed robotic car can be controlled easily through android Application which works on Bluetooth communication. And also, the robotic car can be controlled through a common remote with the help of IR Remote sensor. We have also implemented the voice control feature too for controlling the robot effectively.

Motivation

To limit possible transmission to or from others, as healthcare organizations struggle to implement technology while maintaining efficient operations, their workers may be suffering. It appears to be important to develop alternative and appropriate means to satisfy people's social needs during the pandemic so by using Bluetooth controlled bot car the health care workers can get a relief, the staff can use it to serve the patient. The controlling device of the

whole system is a Microcontroller. Bluetooth module, DC motors are interfaced to the Microcontroller. The data received by the Bluetooth module from Android smart phone is fed as input to the controller. The controller acts accordingly on the DC motors of the Robot.

The exposure to the virus causes debility, morbidity and mortality but to a significant extent, also leads to immense physical and psychological exhaustion. This bot can be used in the material handling process. This process is improving the customer service, reducing the delivery time and physical hard work. To minimize the material handling issues through robotics, the Bluetooth-controlled robot car is an emerging technique which is cheap, user-friendly, and effective.

Objectives

Through this project we are aiming to provide different solutions for the patients trapped inside quarantine stations, such as:

- We have developed a compatible Mobile Application, which is capable of providing access to that concerned user of controlling the robotic vehicle which is also equipped with an ESP32 Camera module which at the same time displays the path and the surroundings through which the bot travels through a separate web portal provide us a clear view of whatever happens inside the quarantine stations.

- The application is provided with different buttons which enables the user to control it accordingly to traverse in any direction.
- It also has the feature of Voice controlled operation.

- In case (Worst case Scenario) if the user is not able to establish connectivity between Bluetooth (HC-05) module and the mobile application, we have also attached an IR remote receiver sensor into the robotic vehicle which enables us to control the robot through any kind of Remote which is capable of Generating Hex codes.
- Also, the user can easily control the speed according to his needs.

Literature survey

1. Arduino Based Voice Controlled Robot

A. Chaudhry, M. Batra, P. Gupta, S. Lamba and S. Gupta, "Arduino Based Voice Controlled Robot," *2019 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS)*, 2019, pp. 415-417.

In this research paper, a system is being proposed, which focuses on the concept of how a robot can be controlled by the human voice. Voice control robot is just a practical example of controlling motions of a simple robot by giving daily used voice commands. In this system, an android app is used as a medium for the transmission of human commands to microcontroller. A controller can be interfaced with the Bluetooth module through the UART protocol. The speech is received by the android app and processed by the voice module. Voice is then converted to text. The microcontroller will further process this text, which will take suitable action to regulate the robot. The objective is to design a robotic car whose basic movements such as moving forward, turning to left or right can be controlled by the human voice. The Hardware Development board used here is the AT-mega Arduino board. The software part is done in Arduino IDE using Embedded C. Hardware is implemented, and software porting is done. Generally, recognition of human voice using some kind of module cost way too much. After performing an ample number of studies on controlling robots, we came to the conclusion that yes, there exists a simple and very efficient way to manipulate robots through our voice. This is an ergonomic approach for the ease of robotic application. Such types of robots will provide great helping hands while performing multiple tasks. The result of our studies also shows that there still exists plenty of space for further research and development.

2. Bluetooth controlled spy robot

A. Singh, T. Gupta and M. Korde, "*Bluetooth controlled spy robot*," 2017 International Conference on Information, Communication, Instrumentation and Control (ICICIC), 2017.

A robot is usually an electro-mechanical machine that is guided by computer and electronic programming. Many robots have been built for manufacturing purpose and can be found in factories around the world. The design of the robot is such that it is controlled by a mobile app. Bluetooth communication is used to interface Arduino UNO and android. Arduino can be interfaced to the Bluetooth module though UART protocol. According to commands received

from android the robot motion can be controlled. The consistent output of a robotic system along with quality and repeatability are unmatched. This robot is capable of spying using a wireless camera. This robot can be reprogrammable and can be interchanged to provide multiple applications.

3. Remote control robot using Android mobile device

J. Nádvorník and P. Smutný, "*Remote control robot using Android mobile device*," Proceedings of the 2014 15th International Carpathian Control Conference (ICCC), 2014.

The paper describes the design and realization of the mobile application for the Android operating system which is focused on manual control of mobile robot using wireless Bluetooth technology. The application allows the robot control interaction with the display, or voice. A graphical interface is used to monitor the current distance of the robot from obstacles. The measurement of distance is carried out by ultrasonic sensor placed in front of the robot. It was necessary to build a prototype of a mobile robot for the development of the application. The prototype of the mobile robot is based on the differential gear.

4. Android application-based monitoring and controlling of movement of a remotely controlled robotic car mounted with various sensors via Bluetooth

D. Chakraborty, K. Sharma, R. K. Roy, H. Singh and T. Bezboruah, "Android application-based monitoring and controlling of movement of a remotely controlled robotic car mounted with various sensors via Bluetooth," 2016 International Conference on Advances in Electrical, Electronic and Systems Engineering (ICAEES), 2016.

Designed and developed a robotic car with simple architecture by assembling open-source hardware, Bluetooth module and advanced sensors. Also developed an android application running on a smart phone which monitors and controls the operation of the robot via Bluetooth and can also access the sensors data. The digital one wire temperature and humidity sensors are mounted to monitor real time temperature and humidity of the surrounding medium. The data of these parameters are displayed on the android application running remotely. In addition to this, the car is capable of transmitting live streaming video through an IP based Webcam, which helps in remotely monitoring and controlling the movement.

Methodology

- Block Diagram:

  Medical Assistance and Surveillance robot car make use of an Android mobile phone for robotic control with the help of HC-05 Bluetooth technology. An Android based robot has a HC-05 Bluetooth receiver unit which receives the commands and gives it to the microcontroller circuit to control the motors.

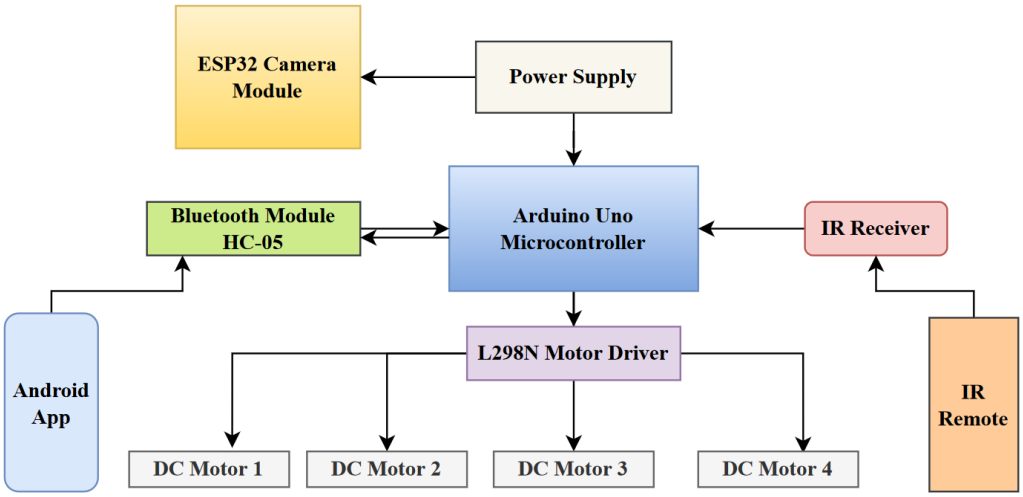

Figure 1: Block Diagram

The microcontroller then transmits the signal to the motor driver ICs to operate the motors. For this the android mobile user has to install an application on her/his mobile. A robot can be controlled using Bluetooth module HC-05 and Arduino Uno microcontroller with android smartphone device. The controlling devices of the whole system are a microcontroller. Bluetooth module, DC motors are interfaced to the microcontroller. The data received by the Bluetooth module from an android smart phone is fed input to the controller. The controller acts accordingly on the DC motor of the robot. The robot can move in all the four directions using the android phone. These commands are sent from the Android mobile to the Bluetooth receiver which is interfaced with the Arduino robot. At the receiving side, a Bluetooth transceiver module receives the commands and forwards them to the Arduino and thus the robotic car is controlled. And also, a web portal is built to monitor the situation inside the quarantine stations through live video streaming with the help of ESP32 Camera module. The robot can also be controlled by the help of an IR Remote in case we are not able to establish the Bluetooth connectivity between the android app and the Robotic vehicle.

Software Used

I. Arduino IDE:

- The Arduino Integrated Development Environment - or Arduino Software (IDE) – is an open-source software which contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. The Arduino Integrated Development Environment - the piece of software we use to program our Arduino uno - is written in C.
- The IDE translates and compiles our sketches into code that Arduino UNO can understand. Once our Arduino code is compiled it's then uploaded to the board's memory.

II. MIT APP Inventor:

- MIT App Inventor is a web application integrated development environment originally provided by Google, and now maintained by the Massachusetts Institute of Technology.
- **App Inventor is a free, cloud-based service** that allows us to make our own mobile apps using a blocks-based programming language.
- It uses a graphical user interface (GUI) very similar to the programming languages Scratch (programming language) and the StarLogo, which allows users to drag and drop visual objects to create an application that can run on Android devices.

Hardware Components Used

i. Arduino Uno
ii. Bluetooth Module HC-05
iii. Power Supply – Lithium-Ion Batteries (3.7v x 2)
iv. IR Receiver and Remote
v. L298N Motor Driver
vi. DC Motors and wheels (4)
vii. Esp32 Camera Module
viii. Jumper Wires and Micro Bread Board
ix. Switch

i. Arduino Uno:

Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 Analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button as shown in figure 2.

Figure 2: Arduino Uno

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your Uno without worrying too much about doing something wrong, Worst-case scenario you can replace the chip for a few dollars and start over again. “Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

Table 1: Arduino Uno Specifications Table:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (Recommended)	7-12V
Input Voltage (Limit)	6-20V
Digital I/O Pins	14(of which 6 provide PWM output)
Pwm Digital I/O Pins	6 Digital I/O Pins
Analog Input Pins	6 Analog Input Pins
Dc Current Per I/O Pin	20mA
Dc Current For 3.3v Pin	50mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
Sram	2 KB (ATmega328P)
Eeprom	1 KB (ATmega328P)
Clock Speed	16 MHz
Led_Builtin	Pin 13
Length	68.6 mm
Width	53.4 mm
Weight	25g

ii. Bluetooth module HC-05

It is a class-2 Bluetooth module (as shown in figure 3) with Serial Port Profile, which can configure as either Master or slave. a Drop-in replacement for wired serial connections, transparent usage. You can use it simply for a serial port replacement to establish connection between MCU, PC to your embedded project and etc.

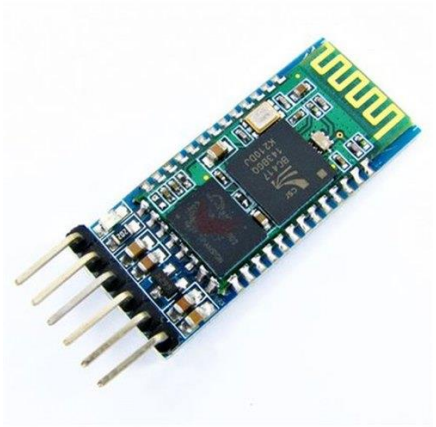

Figure 3: Bluetooth module HC-05

Table 2: HC – 05 Specifications Table

Bluetooth protocal	Bluetooth Specification v2.0+EDR
Frequency	2.4GHz ISM band
Modulation	GFSK(Gaussian Frequency Shift Keying)
Emission power	≤4dBm, Class 2
Sensitivity	≤-84dBm at 0.1% BER
Speed	Asynchronous: 2.1Mbps(Max) / 160 kbps, Synchronous: 1Mbps/1Mbps
Security	Authentication and encryption
Profiles	Bluetooth serial port
Power supply	+3.3VDC 50mA
Working temperature	-20 ~ +75Centigrade
Dimension	26.9mm x 13mm x 2.2 mm

iii. TSOP38238 IR Receiver and Remote:

The TSOP382 (as shown in figure 4) is a miniaturized IR Receiver diode that is widely used by engineers and hobbyist due to its low power consumption and an easy-to-use package.

Figure 4: IR Receiver and Remote

TSOP382 is compatible with all common IR remote control data formats so it can be used with common IR remotes. The operating voltage is from 2.5V to 5.5v so it can be used with both 3.3V and 5V power supplies. The TSOP38238 is similar to a normal plastic-packaged transistor in size and suitable for all kinds of infrared remote control and infrared transmission.

Table 3: IR Receiver Specifications

Operating Voltage	2.5V to 5.5V
Operating Current	350µA
Output Current	5mA
Carrier Frequency	38 kHz
Transmission Distance	45 m
Operating Temperature Range	-25 to 85 C
Pd - Power Dissipation: 10mW	10mW

iv. L298N Motor Driver:

This L298N Motor Driver Module (as shown in figure 5) is a high-power motor driver module for driving DC and Stepper Motors.

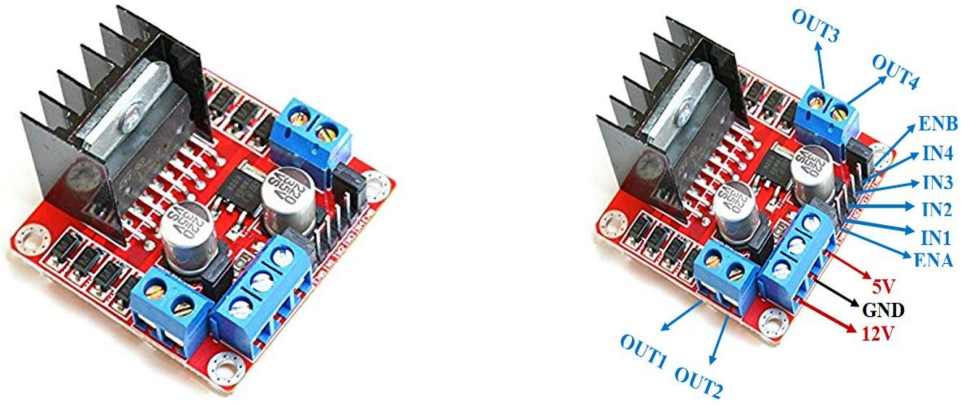

Figure 5: L298N Motor Driver

This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control.

Table 4: L298N Motor Driver Specifications

Motor Supply Voltage (Maximum)	46 V
Motor Supply Current (Maximum)	2A
Logic Voltage	5V
Driver Voltage	5-35V
Driver Current	2A
Logical Current	0-36mA
Maximum Power (W)	25W

v. DC Motors and wheels (4):

These motors are light weight, high torque and low RPM (60 - 170 RMP). They can climb hills and have excellent traction, plus you can mount the wheel on either side of the motor (as shown in figure 6).

Figure 6: DC Motors and wheel

Table 5: DC Motors Specifications

Motor Voltage	3 – 12 V
Motor Current	70 mA (typical) – 250 mA (max)
Speed	up to 170 RPM
Torque	up to 0.8 Kg
Gear Ration	1:48
Wheel Diameter	66 mm
Wheel Width	27 mm

vi. Esp32 Camera module:

ESP32-CAM (as shown in figure 7) is a WIFI+ Bluetooth dual-mode development board that uses PCB on-board antennas and cores based on ESP32 chips. It can work independently as a minimum system.
ESP integrates Wi-Fi, traditional Bluetooth and BLE Beacon, with 2 high-performance 32-bit LX6 CPUs, 7-stage pipeline architecture, main frequency adjustment range 80MHz to 240MHz, on-chip sensor, Hall sensor, temperature sensor, etc.

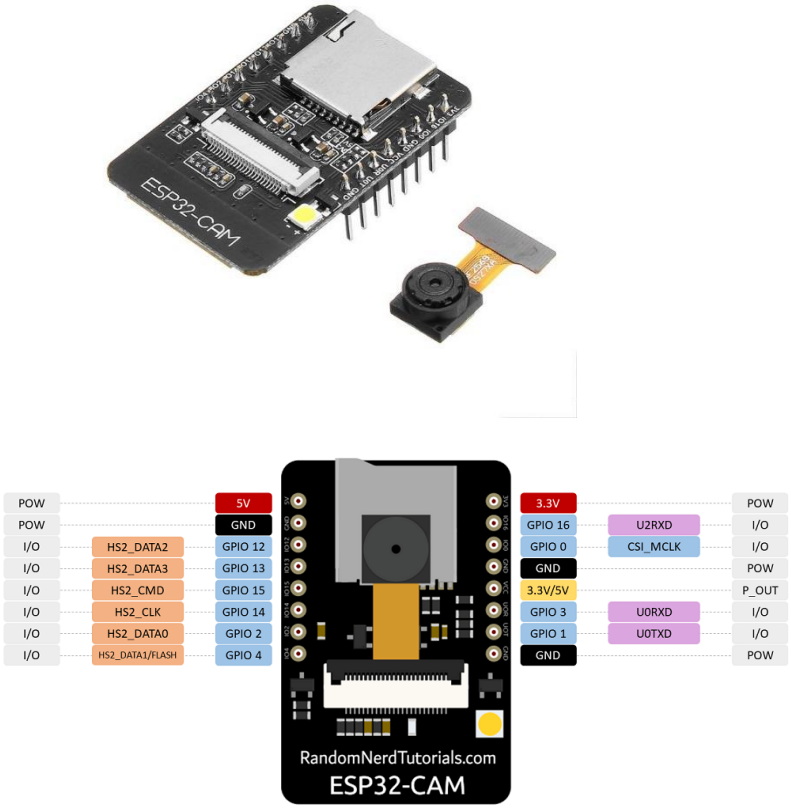

Figure 7: Esp32 Camera module

Fully compliant with Wi-Fi 802.11b/g/n/e/i and Bluetooth 4.2 standards, it can be used as a master mode to build an independent network controller, or as a slave to other host MCUs to add networking capabilities to existing devices.

ESP32-CAM can be widely used in various IoT applications. It is suitable for home smart devices, industrial wireless control, wireless monitoring, QR wireless identification, wireless positioning system signals and other IoT applications. It is an ideal solution for IoT applications.

Table 6: Esp32 Camera module Specifications

Package	DIP-16
Size	27*40.5*4.5(±0.2) mm
SPI Flash	default 32Mbit
RAM	internal520KB+external 4M PSRAM
bluetooth	bluetooth4.2BR/EDR and BLE standards
Wi-Fi	802.11 b/g/n/e/i
Support interface	UART, SPI, I2C, PWM
Support TF card	Maximum support 4G
IO port	9 IO Ports
Serial port rate	default 115200 bps
Image output format	JPEG (only supported by OV2640), BMP, GRAYSCALE
Spectrum range	2412 ~ 2484MHz
Antenna form	onboard PCB antenna, gain 2dBi
Transmit power	802.11b: 17±2 dBm (@11Mbps) 802.11g: 14±2 dBm (@54Mbps) 802.11n: 13±2 dBm (@MCS7)
Receiving sensitivity	CCK, 1 Mbps: -90dBm CCK, 11 Mbps: -85dBm 6 Mbps (1/2 BPSK): -88dBm 54 Mbps (3/4 64-QAM): -70dBm MCS7 (65 Mbps, 72.2 Mbps): -67dBm
Power consumption	Turn off the flash: 180mA@5V Turn on the flash and adjust the brightness to the maximum: 310mA@5V Deep-sleep: The lowest power consumption can reach 6mA@5V Moderm-sleep: up to 20mA@5V Light-sleep: up to 6.7mA@5V
Security	WPA/WPA2/WPA2-Enterprise/WPS
Power supply range	5V
Operating temperature	-20 °C ~ 85 °C
Storage environment	-40 °C ~ 90 °C, < 90%RH

vii. Power Supply – Lithium-Ion Batteries (3.7v x 2)

This is 18650 battery (as shown in figure 8) with the typical capacity of 2000mAh. It is Lithium-Ion based and rechargeable battery (Need proper charger) in cylindrical shape. 18650 batteries have become very popular nowadays, many power bank is using it as storage (when being charged) and power source (when being discharged).

Figure 8:Power Supply – Lithium-Ion Batteries

Even electrical vehicle like Tesla is using 18650 battery particularly to build their battery pack.

And since this single-cell battery has higher voltage and capacity, rechargeable; it is a very economical solution in electronic or robotic projects. In some cases, this battery has been used for IoT devices powered by Solar or renewable energy. The battery becomes an energy storage device. And of course, it can be series up to get higher voltage, for example, connecting 2 units in series (2 x 18650 battery holder) to get 7.4V.

viii. SPST ON-OFF Rocker Switch:

ix. A Single Pole Single Throw (SPST) switch (as shown in figure 8) is a switch that only has a single input and can connect only to one output. This means it only has one input terminal and only one output terminal.

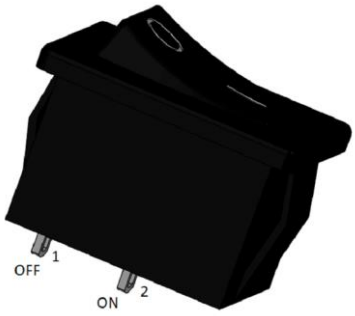

Figure 9 : SPST ON-OFF Rocker Switch

x. Jumper Wires and Micro Bread Board:

A breadboard is used to build and test circuits quickly before finalizing any circuit design. The breadboard has many holes into which circuit components like ICs and resistors can be inserted.

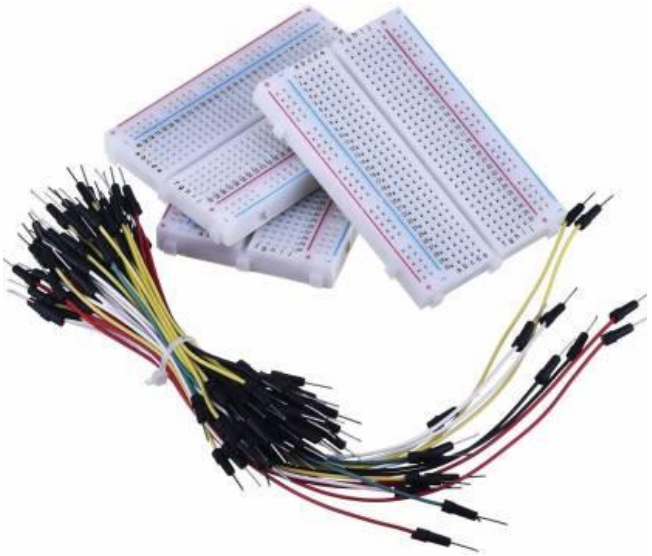

Figure 10:Jumper Wires and Micro Bread Board

The bread board has strips of metal which run underneath the board and connect the holes on the top of the board. The metal strips are laid out as shown below. Note that the top and bottom rows of holes are connected horizontally while the remaining holes are connected vertically.

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires. Though jumper wires come in a variety of colours, the colours don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colours can be used to your advantage in order to differentiate between types of connections, such as ground or power.

Android App Development

The android application is developed through MIT App inventor online platform through block-based programming language. It allows users to drag and drop visual objects to create an application that can run on Android devices (figure 11).

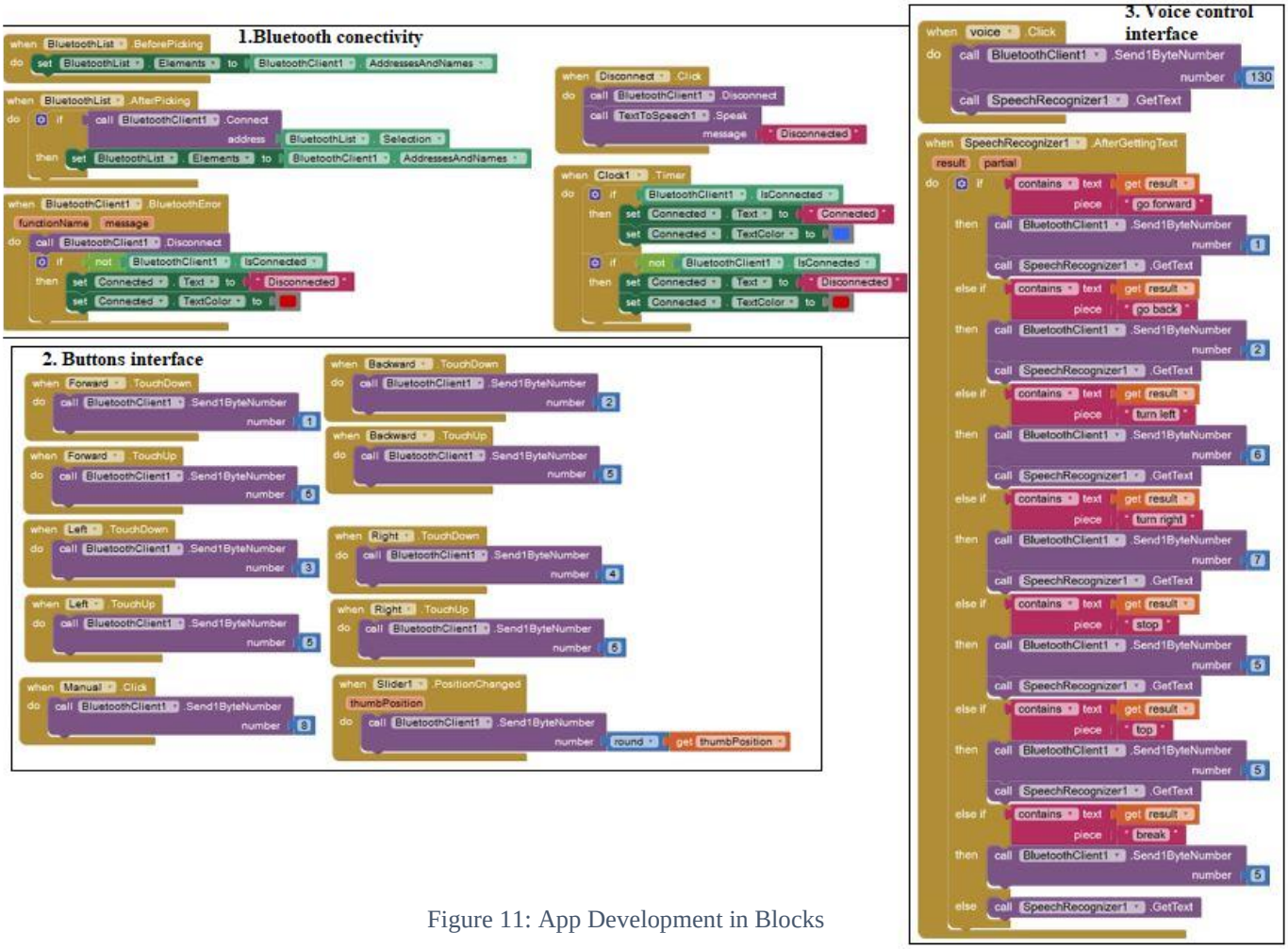

Figure 11: App Development in Blocks

- The top left part of the blocks provides Bluetooth connectivity with HC-05 module and the user's android phone.
- The second Block sections provide buttons interface:
  i. Up Arrow Button: Forward
  ii. Down Arrow Button: Backward
  iii. Left Arrow Button: Turn left
  iv. Right Arrow Button: Turn Right
  v. Slider to control speed of the bot.
- The Third vertical Block section deals with Voice control interface which uses google voice recognition feature.

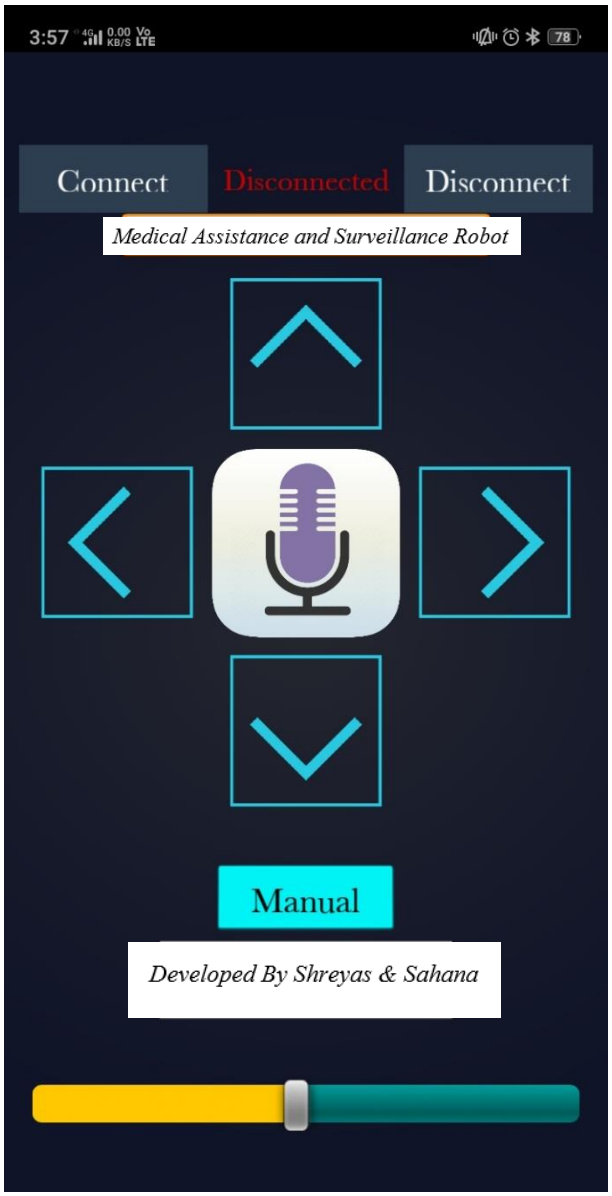

Figure 12:Android Application

Here the arrow mark Cleary indicates the direction of mobility of robot. Manual will switch over the control to IR Remote. The slider below gives the user speed controllability (as shown in figure 12).

The connect button on top left corner provides access to available Bluetooth networks, out of which we have to select HC-05 Bluetooth connectivity. Once connected the ‘disconnected’ changes to ‘Connected’. To unpair Bluetooth connection a disconnect option is also been provided.

The middle microphone depicts the Voice command control interface.

Circuit Design Schematic

The overall circuit to be mounted on the robot chassis is as shown below:

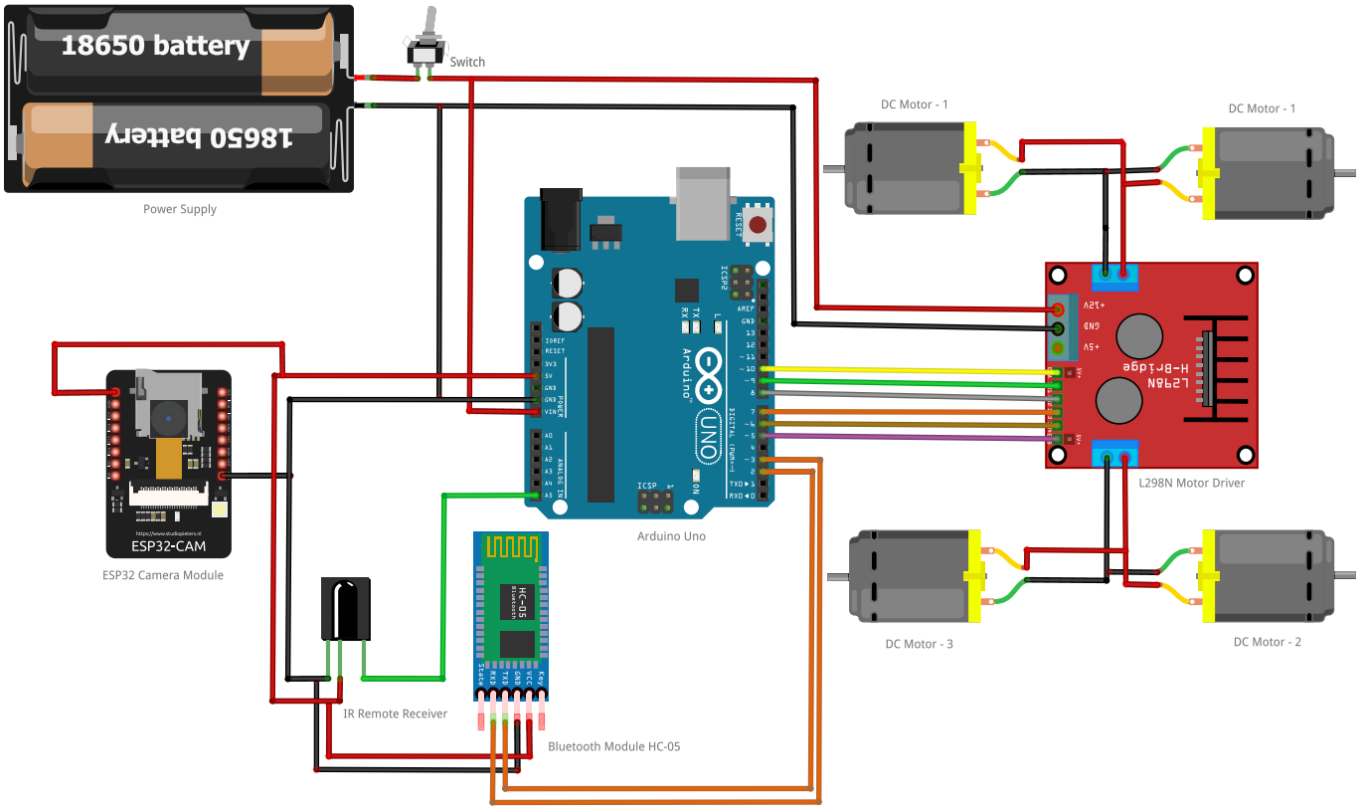

Figure 13: Circuit Schematic Designed Using Fritzing

The final Circuit design is shown above (figure 13), where Analog pin A5 is connected as data pin for IR Remote Receiver. Pin number 10 of Arduino uno is connected with enable pin of L298N Motor driver, then pin numbers 9, 8, 7, 6, 5 are connected to Motor drivers next consecutive pins. The ESP32 Camera module is just connected to power supply and ground connection after dumping code separately. The HC-05 Bluetooth module's RX pin and TX pin is connected to Arduino uno's Pin number 3 and 2 respectively.

Final Hardware Implemented Structure

A Small medicine carrier is attached in front so that the patients inside the quarantine station can access to medicines through it (figure 14).

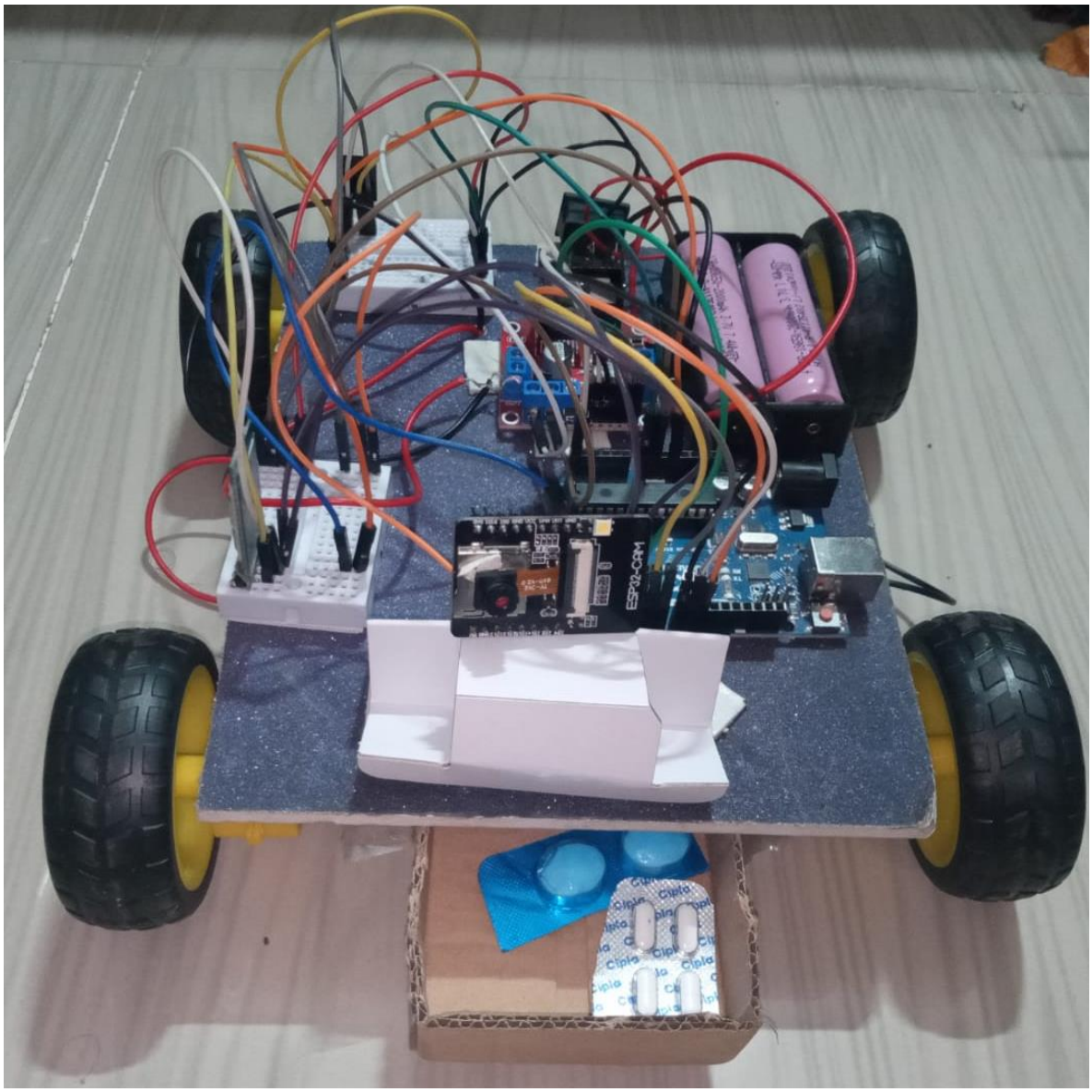

Figure 14: Hardware Implementation

Working

On turning on the switch, the bot turns on and is ready to get connected through Bluetooth with users' android application.

Bot mobility through Button and voice command interface follow the same mechanism:

Up directed button, 'Go Forward' Voice command: All motors move in Forward direction.

Down directed button, 'Go backward' Voice command: All motors move in backward direction.

Right directed button, 'Turn Right' Voice command: Motor 4 in Forward direction and Motor 1 in Backward direction.

Left directed button, 'Turn Left' Voice command: Motor 2 in Forward direction and Motor 3 in Backward direction.

The mechanism applies to IR Remote mode too but there is also a provision for stop button in IR Remote (Middle button).

Results and Discussions

Once the bot is switched on the Bluetooth connection becomes visible (figure 15), when user tries to connect on hitting connect button inside Android application(figure 16).

Figure 15:HC-05 Bluetooth connection

Figure 16: After Bluetooth Connection

Then according to the Whichever commands or tasks given we get the results.

- **Voice commands:**

  "Turn Left" = The bot turns 80 degrees Left

  "Turn Right" = The bot turns 80 degrees Right

  "Go Forward" = The bot Moves in Forward Direction

  "Go Backward" = The bot Moves in Backward Direction

  "Stop" = The bot Stops its Motion.

- When slider is moved to max position.

  Max speed achieved: 150-155 Rpm

- **Web Server:** On entering the generated Ip address from Arduino Com Port, the server opens and provider output in the following manner in figure 17:

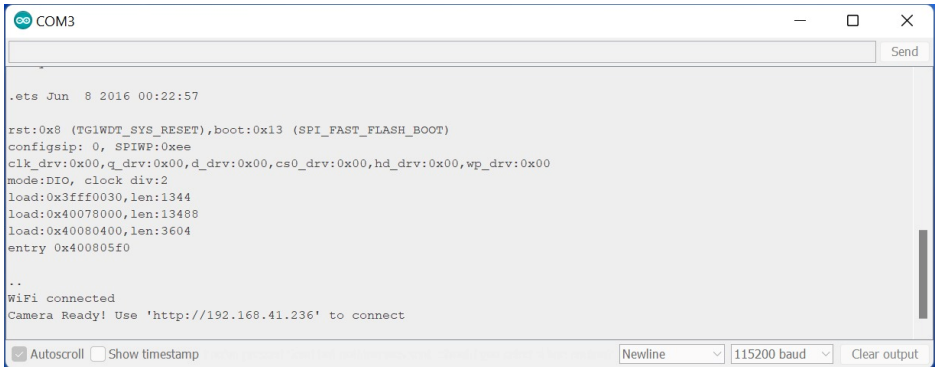

Figure 17:Arduino IDE Com port WIFI connectivity output

Figure 18: Web server output Live Video Streaming

The web server clearly shows the live activity of the patient inside the quarantine room as depicted in Figure 18 above.

Applications

i. As a medical assistance (Medicine delivery, Patient Condition Surveillance) Bot in Quarantine Stations.
ii. Low range Mobile Surveillance Devices
iii. Military Applications (no human intervention.
iv. Assistive devices (like wheelchairs)
v. Home automation
vi. The robot is small in size so can be used for spying.
vii. With few additions and modifications, this robot can be used in the borders for detecting and disposing hidden land mines.
viii. The robot can be used for reconnaissance or surveillance.
ix. Can be used by construction engineers for exploring tunnels.
x. Cave explorers
xi. Can also be used in Mining activities.
xii. For food and luggage delivery assistance in hotels and lodges.

Advantages

- Wireless control is one of the most important basic needs for all the people all over the world in all the fields. Here the Bluetooth controlled BOT is used to provide a solution to the health care workers to avoid the problem of being infected by Corona virus by coming in contact with the patients.
- This is indeed a cost-effective and efficient project. The novelty lies in the fact that it is a cost-effective project with a simple and easy to use interface.
- The BOT can deliver medicines, food and water to the patient within a limited range successfully.
- The IR Receiver and Remote is another effective way of traversing the robot which is bot user friendly and cost effective.
- The ESP32 Camera module is cheap (Compared to Raspberry Pi camera module) and is commonly available in the market.

Conclusion

The operating system of smart phone is android which can develop effective remote-control program. At the same time, this program uses blue-tooth connection to communicate with robot. It has proven to allow for meaningful two-way communication between the Android phone and the robot which would allow a non-expert to interact with and adjust the functionality of a system which uses Arduino Uno controller, a single board micro-controller intended to make the application of interactive objects or environments more accessible. The medical assistance and surveillance of quarantine stations is always has been a quite sensitive and dangerous task. And it includes so many risks. So, it's better to use robot for this job instead of people. And if you are able to control the robots with efficiency and accuracy then you can guarantee yourself with good results and success. This system is a good step for medical surveillance using robots. Wireless control is one of the most important basic needs for all the people all over the world. But unfortunately, the technology is not fully utilized due to a huge amount of data and communication overheads. Generally, many of the wireless-controlled robots use RF modules. But our project for robotic control makes use of Android mobile phone which is very cheap and easily available. The available control commands are more than RF modules. For this purpose, the android mobile user has to install a designed application (MIT AI2 Companion) on her/his mobile.

Future Scope

Even though the robot satisfies the needs of the patients inside quarantine room without any normal person getting infected still it requires a small amount of control from outside (Through Mobile application panel). So in order to make the bot completely automatic we need a bigger and better microcontroller when compared with Arduino uno and to cover a wide range of area we have to drop the idea of Bluetooth and stick on to WIFI controllability. These can be achieved by using Micro controllers like Raspberry pi and Pi cameras, etc. The project which we have worked on is still a prototype it satisfies the mentioned need on a small scale. This application can also be extended to Broder security defense system as a spy bot.

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