

BOLTOVID

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Abstract—This paper illustrates the increasing need of robots in healthcare to manage and control the spread of the novel coronavirus disease. The main purpose of our robot is to reduce physical contact and to ensure the safety of the healthcare workers and patients as well as to alleviate the workload of the medical personnel. The objective of our research is to emphasize on the importance of robots in medical field and then to relate its utilization with the management of COVID-19. This paper also describes various modes in which the robot car operates as well as the many advantages and features of this robot car.

Keywords: COVID-19, Robot, Healthcare, Management, Workload, Modes, Safety, Wi-Fi controlled

I. INTRODUCTION

The coronavirus disease (COVID-19) was declared as a “global emergency” by the The World Health Organization (WHO) on January 30, 2020. The virus was originated in the city of Wuhan, China, in December 2019 and has quickly spread across the world. A total of 15.8 Cr cases and 32.9L deaths have been reported as of 10th May 2021. In view of this ongoing disastrous situation, robots are convenient for providing medical support in hospitals by replacing or at least sharing the workload of the medical staff under oversaturated conditions. The International Federation of Robots (IFR) has forecasted an increasing demand of medical robots in future with an estimation of 9.1 billion USD market by 2022. In many countries, robots are assigned various tasks such as utilizing them for cleaning and food preparation jobs in infected areas hazardous for humans in order to minimize the spread of COVID-19. This paper highlights the significance of robots in hospital and healthcare facilities especially concerned with the COVID-19 outbreak.

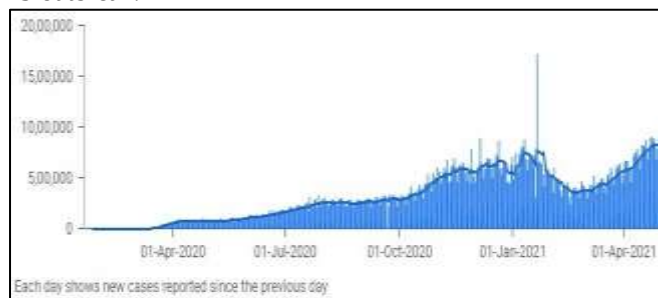


Fig. 1: The rise and fall of COVID in 2020 and 2021

II. COMPONENTS

A. Arduino Uno

Arduino Uno is an electronics platform based on Atmega328 microcontroller. It consists of 14 digital input/output, 6 analog pins, USB interface and Atmega328 microcontroller. It has Tx and Rx pins to support serial communication.

B. L293D Motor Driver Shield

The L293D is a two-channel H-Bridge motor driver. It is capable of driving two DC motors or single stepper motor. The shield comes with two L293D motor driver chipsets that is it can drive up to four DC motors making it suitable for 4-wheel robots. It consists of 4 H-Bridges which are each used to deliver up to 0.6A to the motor. It also contains a 74HC595 shift register.

C. Bolt IoT

Bolt is an IoT platform to build products and services easily and quickly. It connects your devices and sensors to the Internet with the help of a Wi-Fi/GSM chip and a cloud platform. Bolt Cloud is the cloud platform which can control your devices over the web and can help you to develop personalized dashboards to visualize the data, run machine learning algorithms and lot more.

D. Ultrasonic sensor

The HC-SR04 Ultrasonic sensor is a popular sensor used in various applications to sense objects and calculate the distance. The sensor has two eyes like projection in the front, known as the Ultrasonic transmitter and Receiver. The sensor has 4 pins namely Vcc, Trigger, Echo and Ground. The formula on which the sensor works is Distance = Speed*Time

E. 4WD chassis kit

The chassis frame is meant to hold four geared DC motors with wheels and therefore the ability to drive around with bulky goods such as batteries, electronics, mounting supports, and more. The plastic profiles provide slots on each side of the frame to place the drive system, sensors, microcontrollers and other components.

F. Servo Motor

Servo motors have geared output shaft which can be controlled electrically to rotate one degree at a time. It has an additional pin along with Vcc and GND, called the signal pin, which is used to control the servo motor by turning its shaft to any angle.

G. Batteries, Switch, Wires

We need various types of switches and wires to complete the circuit. Along with it we need power supply in form of 9V batteries.

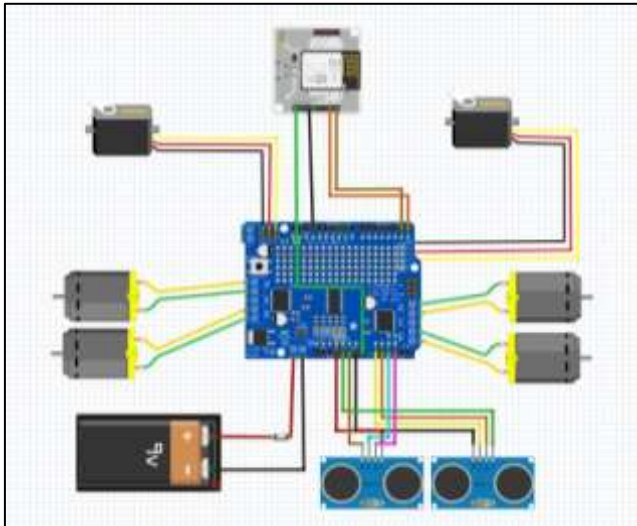


Fig. 2: Circuit Diagram of the robot

III. PURPOSE

The need of robots in healthcare and medical fields is increasing day by Day. Due to the COVID-19 surge, the hospitals and medical facilities are making use of robots to perform a range of tasks which helps to reduce the spread of virus through physical contact. Thus, our robot car will help the medical personnel to perform their routine tasks which in turn will save their time, that take their time away from more pressing responsibilities. It also makes the medical procedures safer and easier for healthcare workers by transporting supplies and linens. It will prove to be helpful in offering value in many areas by enhancing operational efficiencies and reducing the risk of the spread of disease.

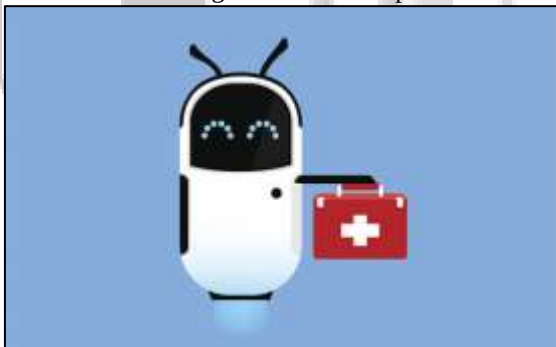


Fig. 3: Robots in healthcare industry

IV. FEATURES

A. Wi-Fi Controlled

It provides Wi-Fi facility for wireless communication with the machine.

B. Obstacle Avoidance

The sensors provided in the machine detects the obstacles on the path and try to avoid them.

C. Gripper mechanism to pick and drop essentials

The gripper adds mechanical functionalities to the Arduino car. With it the car can easily pick up and drop objects from one place to another. It uses mechanical arms, gears, a servo

motor, Arduino and bolt IoT to operate. Upon clicking a button in the interface, the arms open and close.

D. Modes of Operation

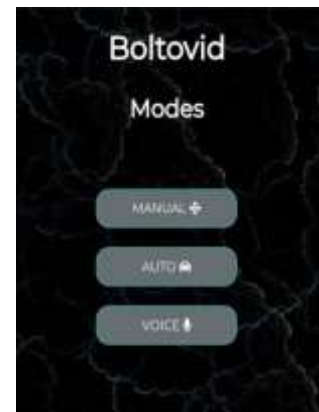


Fig. 4: Main page of the interface

1) Voice Controlled through Google Assistant

Voice Controlled Mode allows hands-free operation of the robot car. It requires the functionalities of bolt IoT, Arduino, Google Assistant and IFTTT. IFTTT is an event response handler which associates custom commands from google assistant to bolt iot cloud using Webhooks.

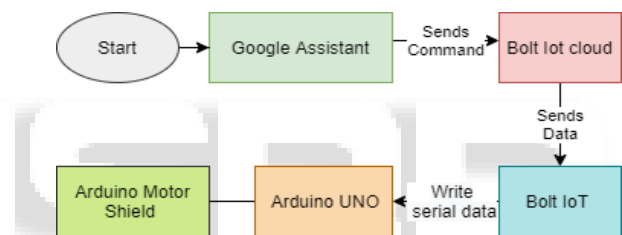


Fig. 5: Flowchart of the working of voice control mode

To create the associations for each command (forward, backward, right, left, stop), IFTTT allows to register an applet. Within this applet, one must write specific sentences for google assistant to read and connect command specific URLs through Webhooks.



Fig. 6: Controlling the robot via Google Assistant

2) Manually controlled through web interface

Manual mode allows the operation of the robot car through the controls on the interface. It uses the functionalities of Arduino and bolt IoT. The interface is a customized webpage that implements HTML, CSS and JavaScript.

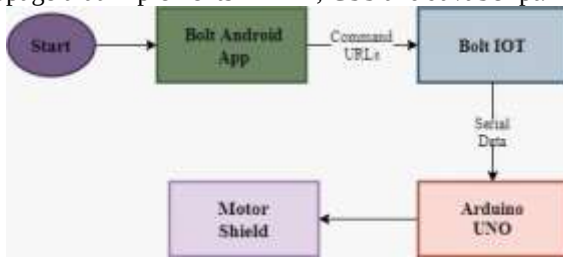


Fig. 7: Fig: Flowchart of the working of manual mode

The buttons on the webpage each leads to a script which in turn sends URLs to bolt iot cloud which contains data related to the commands which is to be executed. The bolt iot receives the data and serially writes it to the Arduino interface. Arduino reads the data and executes the specific function [forward(), backward(), right(), left(), stop()].

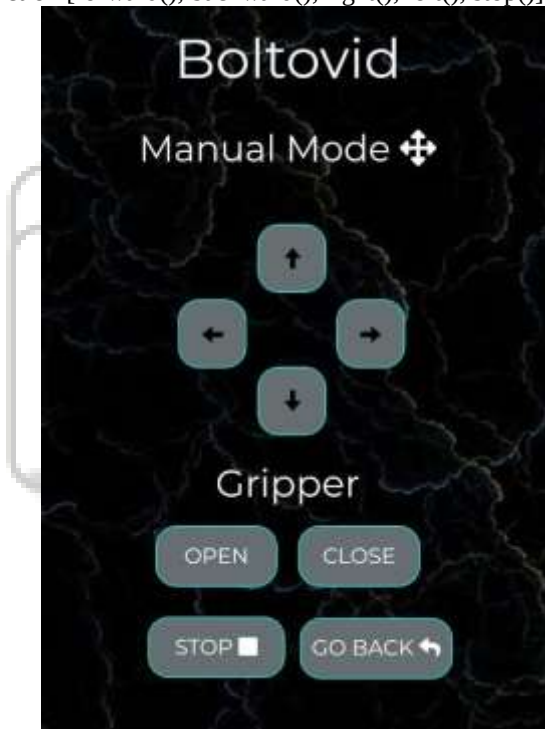


Fig. 8: Manual mode interface

3) Automatic Mode

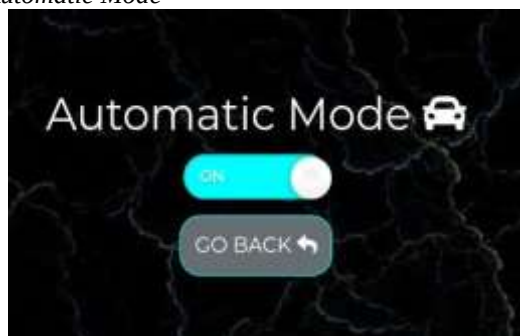


Fig. 9: Automatic mode interface

Automatic mode allows the operation of the robot car without the need of a human to control it. It doesn't require

any input from the user to operate. It uses the functionalities of Ultrasonic sensor (HC-SR04), Arduino and bolt IoT.

Using the bolt interface, one must enter the automatic mode after which the robot car will not require any controls to move safely. The ultrasonic sensors sense its environment and calculate the distance between the car and the obstacle in its path. If any obstacle is too close to the car, the car will stop and calculate the distance of any obstacle on its left and right.

Arduino will then compare the distances and choose the path where the obstacle is farther. Like this the car can automatically navigate its way around a plain field.

V. ADVANTAGES

- (1) The robot car can be controlled in 4 modes.
- (2) The robot can be accessed from the distance of meters as we are using WIFI to control it.
- (3) It has a bigger range as compared to Bluetooth.
- (4) The Robot is small in size, therefore less space required.
- (5) It is easy to use.
- (6) It works on simple voice command when controlled in the voice mode.
- (7) It works without the human control when operated in automatic mode.
- (8) The size of this robot is small.
- (9) It is user friendly.
- (10) It reduces man power.
- (11) Low power consumption.
- (12) It is cost effective.

VI. FUTURE SCOPE

A predefined path following program can be introduced in our car such that it can travel and transport medicines and supplies to COVID patients via an efficient contactless delivery system.

A camera can be installed atop the robot hull such that the manual operator can view a live stream of the robots field of vision and provide better operability.

Our project can be used in other such similar cases of communicable diseases where contact with the patients can prove to be fatal to humans.

A portable sanitizer dispenser can be added so that the environment can be constantly cleansed of any germs or viruses.

VII. CONCLUSION

This research presents a detailed study of the potential of robots in medicine and healthcare facilities especially in the current pandemic. It is witnessed that effective regulation of COVID-19 can notably lessen the number of infected patients and deaths. This paper substantiates that the introduction of robots in medical will considerably augment the safety and quality of health management systems compared to manual systems due to healthcare digitization.

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