

Voice Controlled Wheelchair with Health Monitoring System using Cloud

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ABSTRACT: Disabilities in humans may be of any category like physical, sensory, cognitive, behavioral or even emotional, but all these categories are not provided with proper devices to assist the disabled. Many challenges need to be addressed. Our work is mainly based on providing a decent life for the physically disabled people. We used embedded systems as domain to build the project. We used an Arduino board to control the different operations of the wheelchair. Our project deals with the voice inputs given by the person for the movement of the wheelchair. Bluetooth is used to convert the voice signals and it helps in easy movement of the wheelchair and also monitors health condition of the person in the wheelchair like heartbeat and body temperature using sensors by saving the data on to the cloud so that others can monitor it through mobile or Personal Computer (PC). Most of the disabled people would isolate themselves from others as they feel uncomfortable. Our project provides a Global System for Mobile (GSM) module, which is used to send alert text messages to the emergency contact to build a communication with others. We also included switch control for additional movement of the wheelchair and there is an emergency button included in wheelchair in case of any emergencies. The motors are aligned to the wheels of the wheelchair for its forward, left and right movements. The embedded systems provide many options to build and support many sensors with less power backup. The proper working of the project is being tested using Arduino IDE tool and the results are analyzed.

I. INTRODUCTION

A disability is a medical condition that provokes a person to lead an independent life. These

impairments causing disability might present before the birth or may occur during a person's lifetime. Disabilities can be classified into different categories for example, physical, sensory, cognitive, behavioural, or even emotional. Disability might not only present physically but also even mentally. Every disability has unique problems or circumstances which may not allow a person to lead a peaceful life. And most of the population in India are facing disability problems i.e., In the 2001 census, it has been recorded that 0.6% of the country's population is facing problems in disability. Some people are not provided with any good medical assistance and few were not able to afford the treatment for their disability. Soon after, the government started to provide initiatives for physically handicapped people, which aided them to balance a few of their expenses for the treatment.

Furthermore, the greater part of our public foundation, public vehicle, and government structures are not disabled-friendly. There must be a purposeful effort to guarantee that the disabled have access to these places and not feel hampered in any case. Disabled people will isolate themselves from gatherings or any meetings as they feel uncomfortable to interact with. People are sometimes cruel and clueless, disabled persons are often made to feel 'different' by others. It is significant that people with handicaps make sure to deal with their emotional wellness needs just as their physical ones. They should change their mindset and accept them and integrate them into our society. Irrespective of disabilities, technology can help a person to lead a common life. In our day-to-day life, the technology is reaching to new levels, the low-cost effective techniques are being applied to design different disabled-friendly wheelchairs and few instruments

which aid them in understanding things in a better way and supports them to lead a simple and independent life.

Different wheelchairs were designed for disabled people but they have some of the other drawbacks with each design to deal with. In our project, we are designing a voice-controlled wheelchair with a health monitoring system using the cloud. Here, we not only design a wheelchair but also, we will be able to monitor patient's health conditions as their data is stored using the cloud. We also have different features for monitoring body temperature and heartbeat rate. Bluetooth module is used for the intake of voice inputs. GSM module in the wheelchair to message a person in case of any emergency. And an emergency button is provided in case of any emergencies. There are few manual buttons provided on the wheelchair as another option for movement of the wheelchair.

People use different devices or machines for the aid of disabilities faced by them, but not every prototype will be sufficient for their movement. Some people even learn different sign languages to communicate with people, but there is no guarantee that the other person understands the same sign language. It is also one of the difficulties faced by the disabled people. Arduino plays a vital role in our project which helps in monitoring the movement of the wheelchair. Here we use Bluetooth to convert voice signals into analog signals and a WiFi module is used to store the patient's health information on the cloud.

II. PROBLEM DEFINITION

We came across many difficulties and issues faced by different disabled people while using the assistive devices provided, where they faced difficulty in using the device due to the complexity of usage. Few devices with less complexity does not support features like GSM, emergency button etc. People often get to deal with the blisters by manual usage of the wheelchair. They face issues while getting into the elevators, public places etc. So, to aid disabled people to get through the issues we came up with the voice controlled wheelchair with health monitoring system using cloud.

III. OBJECTIVES

The objectives of our project that have helped us to accomplish the Wheelchair by considering the problems in the previous models are listed as follows:

- Capture the voice instructions properly via Bluetooth.
- Move the wheelchair according to the voice inputs given.

- Take proper reading of Heartbeat and Temperature sensors.
- Process the readings and display it on LCD.
- Store the data continuously in the cloud.
- Have control switches for manual control of wheelchair.
- Induce an Emergency Button in case of immediate assistance.

I. SCOPE OF THE WORK

The project we are making has a wide range of scope in terms of usability. We are aiming to create a wheelchair that can be operated through voice inputs as well as through joystick. The patient's parameter is being continuously being monitored by the various sensors attached and is being displayed on LCD as well as stored in the cloud. All the patients requiring assistance can have a use of it but the condition is they should have a functional limb or have ability to speak for providing instructions. We are making it such that the patient's condition can be continuously monitored by the data stored in the cloud. It has an emergency button feature along with it that when pressed lets the emergency contact know that the patient is in need of immediate assistance through SMS sent directly to their number.

IV. IMPLEMENTATION

In our project, Arduino plays a major role as we control the wheelchair using the microcontroller board. Temperature and heart beat sensors were connected to the board for proper output values, which will be displayed on the LCD connected to the arduino. Bluetooth and WiFi modules were connected for intake of voice inputs and for connecting to the cloud services respectively. GSM module was implemented for sending a message to guardian contact. Relays were implemented for proper movement of the wheels connected to the DC motors. An emergency button is connected and regulated power supply is given for proper functioning of the Arduino board. Arduino IDE tool is used to implement the mentioned features on the Arduino board.

V. BLOCK DIAGRAM

As shown in the Figure -1, our project we are going to use a wheelchair as a base frame in which the wheels on the back are fitted with DC motors. The armrest is fitted with remote as well as the sensors for heart beat and temperature sensing as well as a 16x2 LCD Display for displaying all the results.

The power for driving the motor is taken from the battery. The receiver circuit is fixed inside the

vehicle. The receiver having two relays. These relays output is connected to the D.C motor.

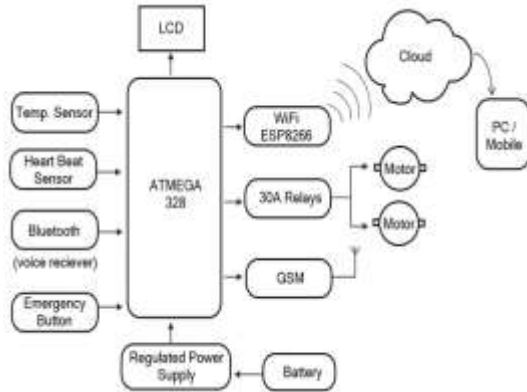


Figure 1- Project Block Diagram

- As soon as connects power supply to the system controller peripherals, timer, LCD, Arduino Board will get initialize.
- There are separate commands for every action like forward, left, right, stop.
- The Wheelchair can be controlled by giving voice signals directly to a Bluetooth module attached in the wheelchair.
- The Sensors present in the wheelchair provide a continuous monitoring of patient and the result of the scan is displayed in the LCD as well as stored in the cloud as well. When the parameters go out of prementioned range an alert is sent to the emergency contact stating that the patient is in need of medical assistance.
- There is an emergency button function as well, when pressed send the signal to emergency contacts through SMS displaying that the patient is in need of some assistance.

II. EXPERIMENTAL RESULTS AND ANALYSIS

Wheelchair Model

The final implementation of the project has been done and all the components have been assembled together to make the working of the wheel chair as shown in Figure – 2. And the wheelchair is operating necessarily as expected.



Figure 2- Project Model

- The circuit board of the wheelchair has been attached to the wheel chair in the bottom for the

comfortability as shown in Figure –3, as it is close to the wheels and the motors can be attached easily.



Figure 3- Wooden Base for Components

- The armrests have been fitted with the manual controller on the left had side and with the Temperature and the Heart Beat sensor on the right-hand side as shown in the Figure –4.



Figure 4- Placement of Components on the arm rest

- The manual control which is present on the left-hand side is used to move the wheelchair manually. There are four buttons present on the board of the armrest as shown in Figure –5.



Figure 5- Control Switches

As the figure shows the functions of each button from left to right are as follows:

F = Forward

L = Left

R = Right

E = Emergency Stop Button

On the press of F the wheel chair moves forward, on the press L the wheel chair turns left, on the press of R the chair turns right and on the press of E the all the movement functions of the wheelchair get stopped. And a text message is sent to the guardian's phone saying "Emergency Switch Activated Please Take Care!!" as shown in the Figure –6.



Figure 6- Emergency Text

- The Heartbeat sensor and the Temperature sensor are present on the right-hand side of the chair as shown in Figure –7. These capture vitals of the patients and send data to the Arduino board which sends the data into the LCD board for the display.



Figure 7- Sensors Placement

Representing Data on Cloud

The data collected will be fed into the cloud which keeps the record of all the data so that anyone who has the authorization can access the patient's data anytime when needed.

The cloud shows the data and the below Figure –8 shows the working of the cloud.



Figure 8- Displaying Results on Cloud

- The figure shows the outputs of the temperature sensor and the heart beat sensors when given the values of 32°C and 84 beats per sec.
- As observed the light in the temperature column is off as it didn't cross the critical temperature.
- In the Figure –9 we observe that as the temperature crosses the critical temperature that is 38°C to indicate that the patient's temperature is has raised.



Figure 9- LED Activate on crossing threshold

III. CONCLUSION AND FUTURE SCOPE

As our main objective is to design a voice-controlled wheelchair and make it available to the people at low-cost effective prices. We have designed an easily accessible voice-controlled wheelchair with health monitoring system using cloud. Where we successfully converted the voice signals to analog through the Bluetooth module, which made ease in movement of the wheelchair. And we also attached a manual controller of the wheelchair as another option for its movement. The motors attached to the wheelchair move in the appropriate direction according to the commands given to the wheelchair by using 30Amps relays. The emergency button is working properly which can be used during any emergency. For future work they can add different features to the wheelchair using Internet of things or Artificial Intelligence. They can also add google maps navigation to the wheelchair to track the wheelchair, so that the wheelchair can be used autonomously. Also, people can use custom cloud in place of the public cloud used by us and can display result as they wish and also can set various parameters and functions according to their requirement.

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