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Implementation of A Multifunctional Smart Wheelchair

Pooja Raj[1], Neethu Skariya[2], Anikha Babu[3], Reshma Jacob[4], Neethu Jo Vavachan[5]
[1,2,3,4] *U G Scholars, ECE, HKCET, Pampakuda, Ernakulam, India*
[5]*Assistant Professor, ECE, HKCET, Pampakuda, Ernakulam, India*

ABSTRACT:- The project presents a multifunctional smart wheelchair for movement of disabled people along with patient monitoring using Arduino. The wheelchair can move in left, right, forward and backward directions. The movement is controlled by voice. Here voice is given to the mobile phone and it transmits the corresponding data to microcontroller using bluetooth module. Microcontroller controls the movement of wheelchair by controlling the DC motors interfaced with motor drivers. Patient monitoring is achieved by temperature sensor and data is given to microcontroller. Whenever the temperature rises above the threshold value, an alert message is sent to doctor's phone using GSM module. Along with this, obstacle detection is also implemented using Ultrasonic sensors.

Keywords: - Arduino Uno, Bluetooth module, Obstacle detection, Temperature sensor, Voice Recognition

I. INTRODUCTION

Now a days, more and more inventions and researches are carried out for giving aid to disabled persons using different strategies. In order to make them feel independent simple automation techniques have to be developed for movement of wheelchair and so on. Voice controlled systems are getting more attraction during these days as they are easy to handle and use. This paper deals with a voice controlled wheelchair where movement of wheelchair is controlled by voice given to android app in the phone. Along with this obstacle detection is also carried out using Ultrasonic sensor. Moreover, patient monitoring is achieved by using temperature sensor and an alert message is sent to the doctor if the temperature rises above threshold.

II. EXISTING SYSTEM

While going through the statistical records of health conditions and diseases, number of people with physical disability is much more. They have to depend on others for moving from one place to another. Manually operated wheelchair was the earliest form of wheelchair. It is operated manually and do not require any electrical systems. They are of various types namely self - propelled, attendant propelled and wheelbase. Electrical wheelchairs which are powered wheelchairs with functions like tilt, recline, leg elevation, seat elevation and so on were also be used [2]. Joystick controlled wheelchairs were common [3], but more force is to be exerted for controlling the same.

Later, Hand gesture controlled wheelchairs using accelerometer MEMS sensor came into existence [4]. Accuracy was less for these types. Message controlled wheel chairs were also developed which used android app in the phone to transmit the message to controller via bluetooth [5].Voice controlled wheel chairs uses voice recognition unit having a microphone and HM2007P chip [6]. But it requires more programming and cost is also high.

III. PROPOSED SYSTEM

In this project, a voice recognition app in the android phone is used to detect the voice commands and the converted text is transmitted to the Arduino microcontroller via bluetooth module. According to the commands, wheel chair moves and along with this obstacle detection using ultrasonic sensor is also included. Moreover, patient monitoring is achieved by temperature sensor and an alert message is sent to doctor using GSM module whenever it rises above the threshold value [1].

A. Block Diagram

The proposed system has three functions which are done in parallel, wheelchair movement based on voice commands, obstacle detection and temperature sensing. The voice recognition app in the android phone receives the voice input from the user and transmits the corresponding data to microcontroller using Bluetooth module. Arduino Uno is used as microcontroller which is the main part and is much simpler compared to other controllers. Microcontroller controls the movement of wheelchair by the motors interfaced with motor drivers. Patient monitoring is achieved by temperature sensor and the sensed value is given to microcontroller.

Whenever the temperature exceeds the threshold value, alert message is sent to doctor's phone using GSM module.

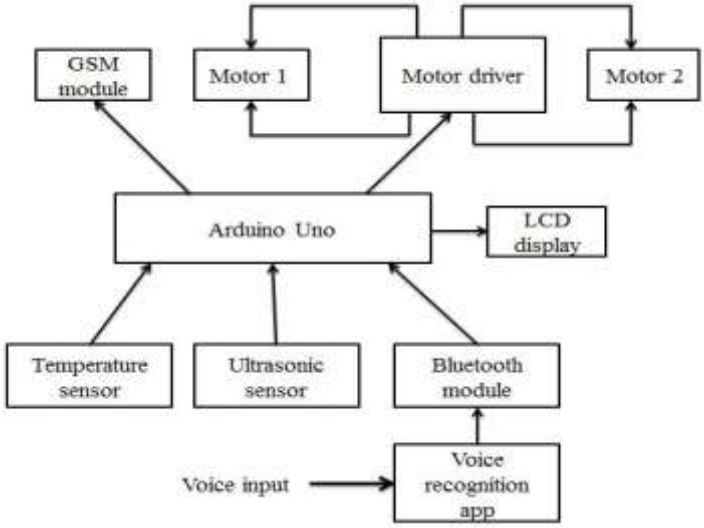

Fig.1: Block Diagram

IV. HARDWARE IMPLEMENTATION

A. Circuit Diagram

Here Arduino Uno board is interfaced with Bluetooth module HC-06, Ultrasonic sensor HC SR04, Temperature sensor LM 35 for taking inputs and motors are interfaced through L293D driver for movement. GSM SIM300 is also interfaced to send the alert message.

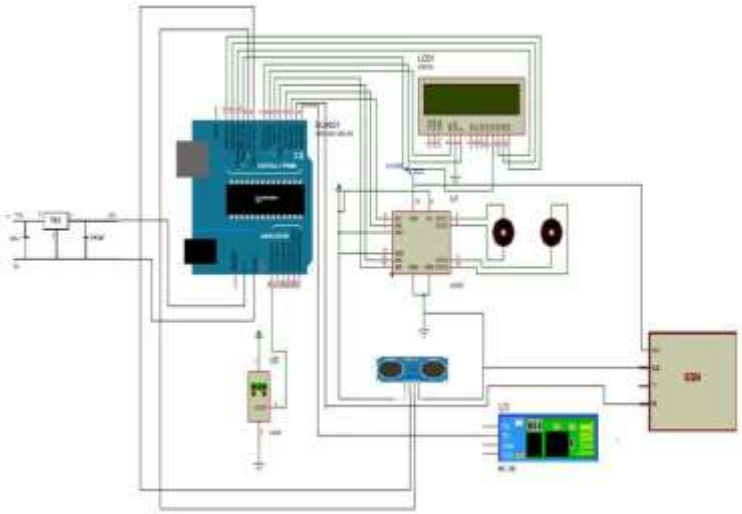

Fig.2: Circuit Diagram

In the system LM7805 is used as the voltage regulator. Power supply of 12 V is given by adapter and from LM7805 5V, 12V, and 0V are generated for giving power to all the interfaced components. Arduino Uno has 14 digital input-output pins and 6 analog input pins. It can be easily plugged to PC for loading programs using the USB port. The transmission pin of bluetooth module HC06 is connected to the receiver pin of microcontroller. The control voice codes given to the voice recognition app is converted into text and then given to microcontroller through the bluetooth module. Based on comparison with the programmed text and received text, the DC motors are moved which are driven by L293D. The distance calculated by the Ultrasonic sensor, HC SR04 is also given to the microcontroller for obstacle detection. Also LM 35 temperature sensor which has a temperature range from -55˚c to 150˚C, gives input to the controller continuously for temperature monitoring. The transmission pin of Arduino Uno is connected to the receiver pin of GSM module and by this alert message is given. Obstacle distance and temperature value is displayed in LCD LM016L.

B. Software

1) *Language Used:*

In this project, Arduino IDE (Integrated Development Environment) is used for programming. It contains text editor to write the code, many number of in built functions, series of menus for easy programming, a serial monitor and message area. Program is then uploaded to Arduino Uno.

2) Algorithm:

Here, three functions have to be done simultaneously and thus 3 different inputs are given to the microcontroller. Algorithms for the functions are given below.

Algorithm for voice recognition for wheelchair movement and obstacle detection

Step 1: Start
Step 2: Input voice control code to the phone which is converted to text and given to microcontroller.
Step 3: Check the text with programmed text. If it matches, go to step 4, otherwise go to step 2.
Step 4: Check for obstacle (distance< 100cm). If it is detected go to step 6, otherwise go to step 5.
Step 5: Move the motors according to the voice code given and go to step 2.
Step 6: Stop motors, move backward, come out of obstacle range and again stop, then go to step 2.
Step 7: Repeat steps from 2 to 7.
Step 8: Stop.

Algorithm for temperature monitoring

Step 1: Start
Step 2: Sense temperature of patient using temperature sensor continuously.
Step 3: Check whether it is above threshold (39˚C). If so go to step 4, else go to step 2.
Step 4: Alert message is given.
Step 5: Stop.

V. RESULTS AND DISCUSSIONS

The following table shows the observations and result for the proposed system when voice commands are given.

SL NO	GENERATED VOICE CODE	MOVT. OF MOTOR
1.	4	FORWARD
2.	5	REVERSE
3.	6	LEFT
4.	7	RIGHT
5.	8	STOP

Table 1: Observation Table

If obstacle distance <100 cm, wheelchair stops, moves backwards and then stops. When temperature rises above39˚C, message is sent to the doctor's number.

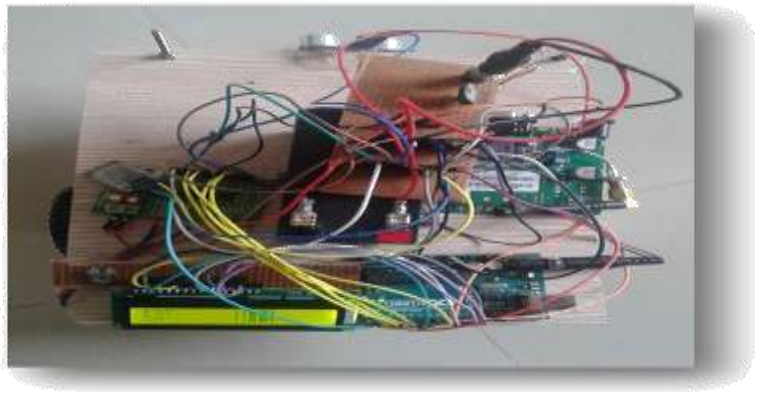

Fig.3: Final Prototype

VI. CONCLUSION

In our project we have implemented a voice controlled wheel chair whose movement is controlled by giving voice commands using Arduino. The wheel chair can move in left, right, forward and backward directions. Whenever an obstacle is detected it stops, moves backwards and again stops. Then it waits for the next voice command by the user. Moreover temperature monitoring of patient is also done. The wheel chair can be suitable for paralysed patients and is easy to handle and use. The voice recognition app is affected by noise and may cause small amount of delay to detect the commands. Obstacle detection is implemented only in the forward direction. On further extension more number of sensors for obstacle detection in all directions may be used. Complete health monitoring of patients may be achieved by including heart beat sensor, pressure sensor and so on. Moreover information about surrounding conditions of patients can be obtained using fire sensor, humidity sensor and so on. Also the wheel chair can be made into a semi sleeper mode so that the patient can lie down if he wishes to take rest.

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