A Project Report on Microcontroller and embedded System (ECE3031)

Voice Controlled Wheelchair

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I. *ABSTRACT*

This project is of designing a smart voice controlled wheelchair with integrating flame sensor. A segment of the disabled community finds it difficult or impossible to use wheelchairs Especially paralyzed people with both upper and lower limb disabilities.
A voice controlled wheelchair makes it easy for physically disabled person who cannot control their movements of hands and for paralysed people. Here The voice recognition Api recognizes the command by the user and provides the corresponding coded data stored in the memory to Microcontroller. Microcontroller controls the locomotion accordingly.

Meanwhile, The integrated flame sensor checks the surrounding environment to ensure the safety of the user and updates the care take with a message to their mobile. The main objective of this project is to provide an effortless and low cost wheelchair that is available within the reach of everyone who needs.

II. INTRODUCTION

The wheelchair is the most ubiquitous equipment used by people with lower limb disability. The needs of many individuals with disabilities can be satisfied with traditional, manual or powered wheelchairs. A segment of the disabled community finds it difficult or impossible to use wheelchairs Especially paralyzed people with both upper and lower limb disabilities. There is extensive research on computer controlled chairs where sensors and intelligent control algorithms have been used to minimize the level of human intervention. Anything beyond that is custom made which is costly and not within the reach to most of people.

Day by day the number of handicapped people is going on increasing due to road accidents as well as the disease which leading paralysis. Among people with disabilities, percentage of physically handicapped person is most. If a person is handicapped, he is dependent on other person for his day to day work like transport, food, orientation etc. So a voice operated wheel chair is developed which will operate automatically on the commands from the handicapped user for movement purpose.

III. KEY WORDS

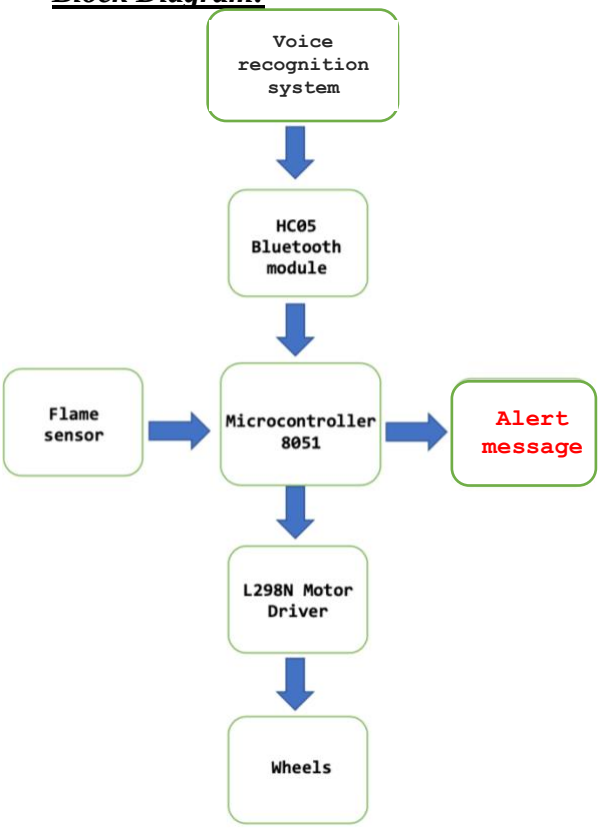
Voice control, Microcontroller AT89s52, Flame sensor, Wheelchair, Bluetooth module, low cost, Wireless.

IV. METHODOLOGY

Apparatus Required:

- Microcontroller AT89S52
- Voice Recognition Api
- HC-05 Bluetooth Module
- L298N motor driver
- Flame sensor
- LEDs
- DC motors

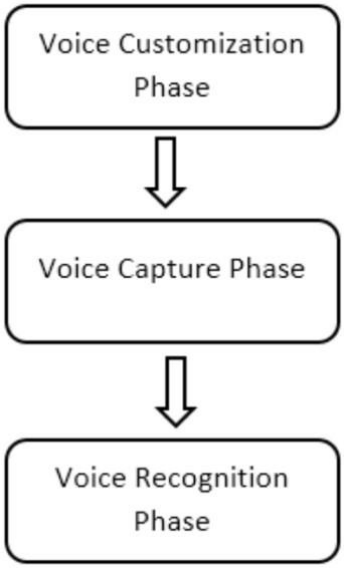
Block Diagram:



Working flow diagram of voice controlled wheel chair.

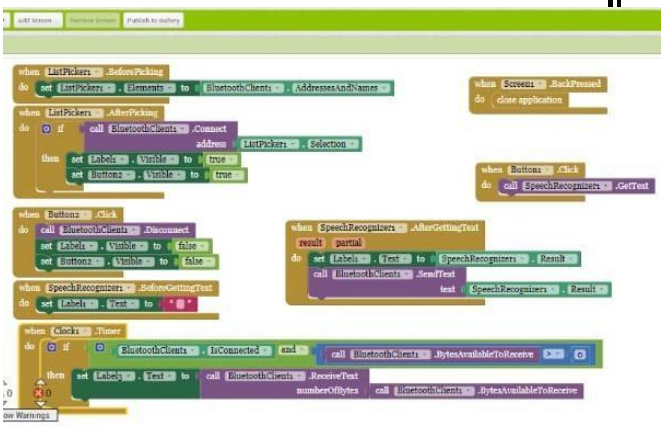
Voice recognition system:

The voice recognition Api is the key feature of this project that is used to setup the desired voice command and output. Firstly voice recognition Api means a system for computer analysis of the human voice, especially for the purposes of interpreting words and phrases or identifying an individual voice. It consists of three phases, which is voice customization, voice capture and voice recognition. Voice customization is the process of matching the desired voice recorded to the desired output signal. Voice capture is the phase that records the desired person's voice command and saves the voice based on the customization configuration. The voice recognition phase is the final phase where when voice command has been recognized, this module will send a specific signal to the Microcontroller for the necessary operation.



Block diagram of voice recognition Api

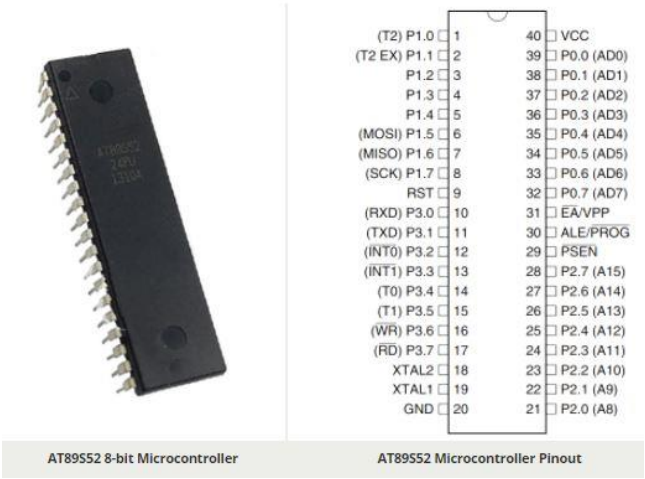
Voice recognition app deals with the voice customization, voice capture phase and voice Recognition phase. As well as it converts the recognised voice command into text and send the command text to the HC-05 Bluetooth module which is connected to the Voice recognition app through Bluetooth. Using This Bluetooth module will eliminate the need for long and messy wiring.



Code of Voice Recognition app

Connections and Working of Microcontroller AT89s52:

The HC-05 Bluetooth module's TXD and RXD pins are connect to the Microcontroller's RXD(P3.0) and TXD(P3.1) respectively. Microcontroller receives the voice command from the Bluetooth module and proceed further. Here we give inputs Vin as 12V and 5V.



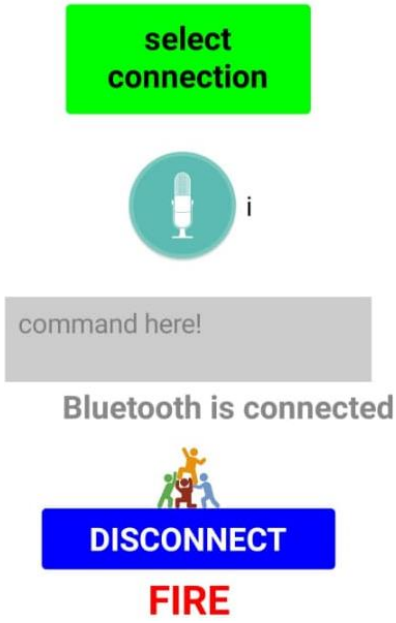
AT89S52 pin diagram

- The P3.0 and P3.1 are connected to the Bluetooth module as said before.
- P2.3, P2.4, P2.5 and P2.6 are connected to the L298N's IN 1, IN 2, IN 3 and IN 4 respectively.
- P0.7 is connected to the Flame sensor's Output.
- P2.0, P2.1, P2.2 are connected to the 16*2 LCD screen's RS, RW and enable respectively.
- All 8 Pins of Port P1 is connected to the LCD screen.

And the serial communication is used Microcontroller's bound rate is set to 9600 bit/s (bits per second).

Working process :

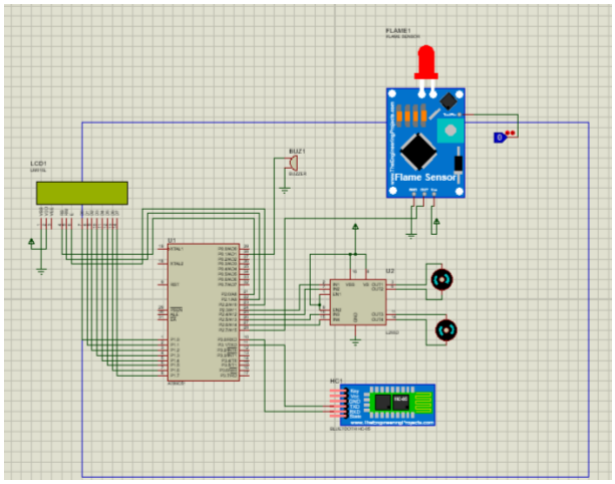
Firstly the voice recognition Api listen for the user's command and process the received voice command into a text format. The text command it then sent the HC-05 Bluetooth module. the Bluetooth module transmits the converted text command to Microcontroller. When Microcontroller receives the command it acts as per it is programmed for that command. If the given command is forward then the Microcontroller produces high value through P2.3, P2.4, P2.5 and P2.6 Which are connected to the L298N motor driver which leads the wheels of the wheelchair to spin in forward direction. As well as the Microcontroller send 'Forward' comment data to the LCD display.



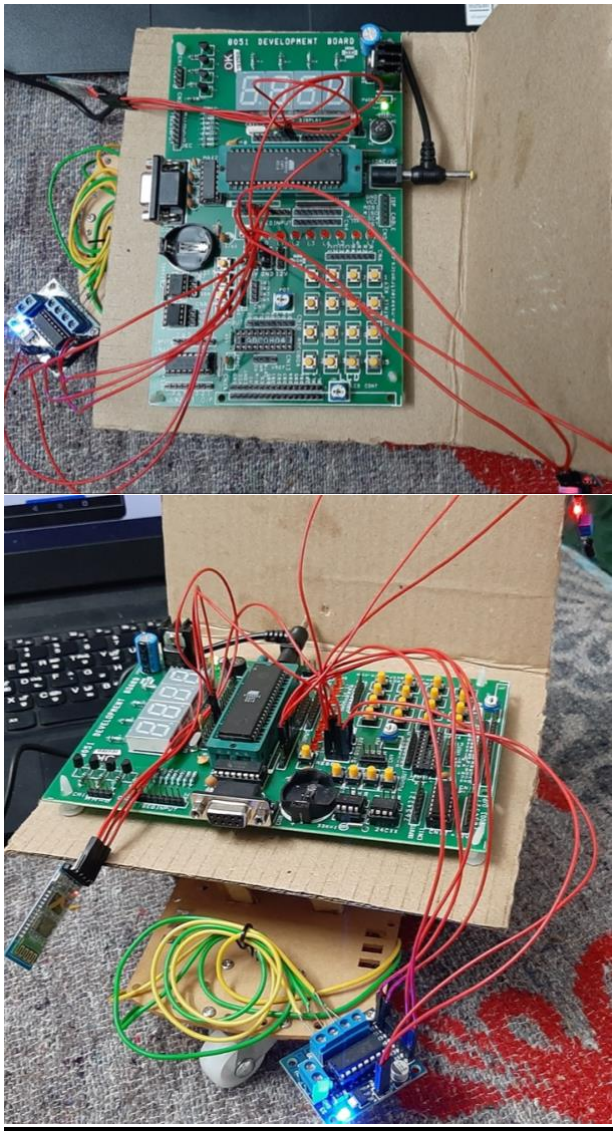
Message to the care taker When Fire is detected

Meanwhile the Flame sensor is sensing for the fire around wheel chair give low input to the microcontroller when there is no fire detected and high input to the Microcontroller when fire or flame is detected near the wheel chair. When the fire is detected the Arduino sends high input to in the 9th Pin to make the red LED glow as well as a message is sent to the caretaker. This is how the whole system is working.

Circuit Diagram :



software circuit diagram of Voice controlled wheel chair



***Hardware model* of Voice controlled wheel chair**

Source Code:

```
#include<reg51.h>

unsigned char ch1;
unsigned char s;

sbit Flame=P2^2;
sbit m1f=P2^3;
sbit m1b=P2^4;
sbit m2f=P2^5;
sbit m2b=P2^6;

void delay(unsigned int)  ;
char rxdata(void);
void txdata(unsigned char);

void main(void)
 {
unsigned char i;
unsigned char msg1[]={"FIRE"};


TMOD=0x20;
SCON=0x50;
TH1=0xfd;
TR1=1;

while(1)
{
           if (Flame){
           delay(50);

for(i=0;msg1[i]!='\0';i++)
       {
    txdata(msg1[i]);
      }
              }
     s=rxdata();
if(s=='f')
     {
          m1f=1;
   delay(1);
          m1b=0;
   delay(1);
          m2f=1;
   delay(1);
          m2b=0;
   delay(1);


    }

     else if(s=='b')
     {
          m1f=0;
    delay(1);
          m1b=1;
    delay(10);
          m2f=0;
    delay(10);
          m2b=1;
    delay(10);
```

```
      }

      else if(s=='r')
      {
          m1f=1;
          delay(1);
          m1b=0;
    delay(10);
          m2f=0;
    delay(10);
          m2b=1;
    delay(10);

    }

      else if(s=='l')
      {
          m1f=0;
          delay(1);
          m1b=1;
     delay(1);
          m2f=1;
     delay(1);
          m2b=0;
     delay(1);

     }

      else if(s=='s')
      {
          m1f=0;
          delay(1);
          m1b=0;
     delay(1);
          m2f=0;
     delay(1);
          m2b=0;
     delay(1);

     }
       txdata('\n');

                  }
}

char rxdata()
{
  while(RI==0);
  RI=0;
  ch1=SBUF;
  return ch1;
}

void txdata(unsigned char x)
{
   SBUF=x;
   while(TI==0);
   TI=0;
}

void delay(unsigned int z)
{
  unsigned int p ,q;
  for(p=0 ; p<z ; p++)
  {
    for(q=0 ; q<1375 ; q++);
  }
}
```

V. TESTS AND RESULTS

Lastly here is the discussion of results and outcome of the project when the voice command is given from the voice recognition app the data is processed and the model acts accordingly if the given Command is “F” the microcontroller makes the high and low input for the motor driver as m1f =1, m1b=0, m2f=1, m2b=0 which makes the wheelchair to move forward.

Accordingly if the Command is “B” then the microcontroller gives the input for the motor driver as m1f =0, m1b=1, m2f=o, m2b=1 which makes the wheelchair to move Backward.

For “R” command the input of motor driver are m1f =1, m1b=0, m2f=0, m2b=1 which directs the wheelchair to turn Right.

For “L” command the input of motor driver are m1f =0, m1b=1, m2f=1, m2b=0 which directs the wheelchair to turn Left.

Final command “S” stops the motors as all the inputs are directed to be low and the wheelchair stops.

These are the results that has been observed from both software as well as hardware implementation of the voice controlled wheel chair. The communication between android device and receiver is sent as serial communication data. The microcontroller program is designed to move the motor through a motor driver IC as per the commands sent by android device.

Voice command	Motor 1	Motor 2	Movement
F	Forward	Forward	Moves Forward
B	Backward	Backward	Moves Backward
R	Forward	Backward	Turns Right
L	Backward	Forward	Turns Left
S	Off	Off	Stop

Tabulation on the observed output

Advantages :

- Less Hardware is required i.e. compact.
- User friendly.
- A handicapped person with voice or Hand can use this and become Independent.
- Economical.
- Reduce manpower

Limitations :

The main limitation is taking a Wheelchair Up and Down Stairs and Curbs.

- Going Up the stairs
- Going Down the stairs
- Going up a curb
- Going down a curb

VI. *CONCLUSION*

Recent advancements in the technology are making lives easier for everybody. The system was successfully implemented to move the wheelchair left, right, forward, backward or stay in same position. This work is to help the disabled persons by providing alternative methods to control the equipment through voice, there by serving many disabilities. Thus the wheelchair understands the signals coming from control system and reacts accordingly.

As the future work, we can provide a friendly atmosphere for disabled persons that is alerting in case of obstacles and updating the whole indoor environment condition to wheel chair and giving controlling of the devices at wheel chair itself which avoids the problem of approaching the switch.

VII. REFERENCE

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