Voice enabled Robotic Wheel chair for Elderly and physically challenged

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Abstract— *as per the research and implementation we used a multipurpose smart moving robot that is controlled and operated through voice as an input. The advantage of our robot is that it is fast and hand free and further could be used in rehabilitation centres. The wheelchair voice driven module and navigation module is induce as we proposed IHNS (intelligent home navigation system) that is used for supporting and guiding the elderly and physically challenged people to move to their respected destination as they find it difficult to do their work by themselves. Voice recognition module have been used to support the navigations of the wheelchair by recognizing and detecting the voice of the person. Hence IHNS is used to ease the work of elderly and physically disabled people to do their daily task and to be independent.*

Keywords — Wheelchair, IHNS, Voice module, Obstacle avoidance**.**

I. INTRODUCTION

Voice based robot is a gives the exact concept of controlling a robot by giving the required voice instructions. Voice recognition is the technology that is used to recognition of the words spoken by a human through a micro phone this words are then recognized by the voice recognition module. Wheelchair is an automated robot that is controlled and programmed by a voice command. Wheelchair voice was invented in 1932 and was designed in 1950's. Wheelchair is low maintenance and it also helps the users to use it with more freedom and less assistance that includes control, range or travel distance, seating and other options wheelchair is used by people who find it very difficult to do their work without an external aid. Using a wheelchair helps a physically disabled to be independent. Recent years and decades there is a need for humans to communicate with the machines in order to control their actions and to ease their task Robot plays important task every days the physically challenged and the elderly people always require a caretaker to move around like how an elderly person is mostly left alone at home. In such cases it is very much necessary to use an automated move navigation system which has wheelchair that can used by the physically disabled and elderly people to do their work themselves rather than an external aid. IHNS is used to avoid obstacles and can be operated using voice. This way huge problem obtained by person with disability can be overcome by using a robotic voice driven wheelchair.

II. MOTIVATION

Our main aim is to bring out an automatic robotic navigation system that is used by various impaired people in a user friendly manner by using their voices as a mode of operating it. Since today's world is comprising with very large count of people where some of them are dependent on the others and some independent. But in today's life style everybody is busy with their own schedule it is a very difficult task to look after the elderly and physically challenged people who always need somebody to take care of them in their difficulties and to ease their work by using the automatic robotic wheelchair. By using the wheelchair let to a large amount of independent that is impaired people with their disability could feel themselves independent hence a manual skills and hands are needed to guide and help the people as the society that we leave in today is very dangerous to trust upon hence it is a very much necessary to implement the use of wheelchair that help them do their task without being dependent an on other soul.

III. PROBLEM DEFINITION

Introducing voice driven speech recognition robotic for elderly and the physically challenged people in human language, this is referred to as natural language. This is very advanced as it depends on the context, the person and disabled people were socially isolated. These important conditions makes us to think of brings out very new system and includes personal security and safety features and also used by these people so that it will be easy to navigate and without external aids.

IV. SYSTEM BASED ON IHNS

The diagram shown below (Figure 1) describes the IHNS various modules have been discussed below.

1. Voice Customisation Module

Wheel chair is used by humans to ease their daily work the person who uses the wheel chair can customize the voices required for the required movements like left-side, right-side straight, and behind. The various voices have been predefined by the user's voice that is required for utilizing the personal security module that can be specialized in this module.

2. Voice Capture Module

The voice capture module is used to grasp the voice spoken by the user using the wheelchair. Once the voice is captured by the wheelchair the voice that is recorded is given to the next module to do its specific task.

3. Voice Recognition Module

The voice recognition takes the voices and starts to compare it with the voices that were preloaded customized by the system on purchase of the user. It compare all the voices that is found, and instruction have been provided to the control module to do the necessary movements that is to turn or move the wheelchair in whatever directions.

4 .Personal Security Module

We are controlling our robot through voice commands it is our emergency module which is a special feature the voice recognition activates the personal security module it is done and factions with the GPRS modem GPRS modem uses AT (attention)command.

5. RF Receiver Module

This RF transmitter used in this is TWS 424A which sends serial data modulated at 426.72 MHz we have a RF transmitter and RF receiver where RF transmitter sends specific data in each room and RF receiver receives the specific data and checks and identifies which room the wheelchair is in.

6 .Line Follower Module

These robots have the capability to detect a dark/black line on a lighter surface depending on the contrast. The workings of a line follower robot are pretty straight forward and shifting towards their left/right as they move over them based on the given respective signals to the motors to turn left/right so as to maintain a steady center with respect to the line and this module also helps the wheelchair to automatically navigate inside house and also gives the directions of each rooms.

7. Obstacle Detection Module

This device consists of an Infrared Transmitter and Infrared Detector. When it detects an obstacle within range it will send an output low this module uses SONAR sensors to detect an obstacle in the proximity.

8. Motor Control Module

This motor can rotates with different directions and also its speed is controlled using an Arduino board that is embedded into this module. The Arduino board receives commands from the Voice recognition module and works accordingly

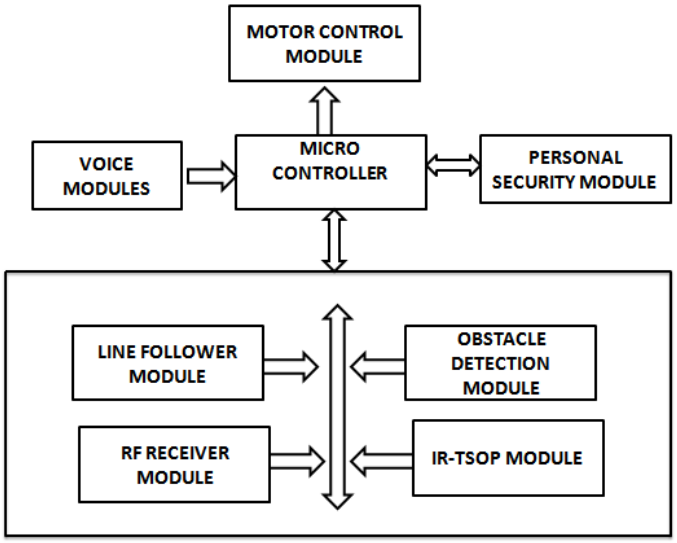
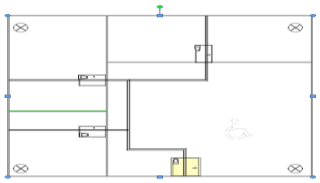


Figure 1. Block Diagram of IHNS

9. IR -TSOP Module

This is setup at each door of the house. As per the reader's request, here is the making of the IR Sensor module. An IR Sensor module is a sensor that transmits and receives infra-red rays each module will be sending a specific data when a surface or object is detected. It is a multipurpose sensor, which can be used in line following robots and also avoiding obstetrical.



. **Figure 2**. Sample Home Structure

V. VOICE RECOGNITION SYSTEM

Speech recognition system is divided into two broad processing categories they are speaker dependent and speaker independent. Speaker dependent systems are trained by the individual that will use the recognizer system. These systems is capable of achieving a high command count and about 97% accuracy for word recognition and also circuit is used HM2007 speech recognition IC. Speech recognition also deals with the style of speech it can recognize in three styles of speech: isolated, continuous and connected. Isolated: Words are spoken separately. This is the most common speech recognition system available today the IC can recognize 20 words, each word a length of 1.92 seconds and rained words can easily be changed by overwriting the original word for instances suppose word seven was the word "vemana" and you want to change it to the word "states". Simply retrain the word space by pressing "7" then the TRAIN key and saying the word "State" into the microphone and the factors should be remember that to achieve the high accuracy.

1. Display Circuit

This display circuit has two seven segments displays with 220Ω resistors and 7447 driver ICs. This section is used to display the input vocal digits.

2. Non-Volatile Memory

This allows the word patterns to be retained in memory even after circuit is turned off. This SRAM used HY6264A, 8K, 28 pin chip with the Backup battery which also supplies backup for the SRAM.

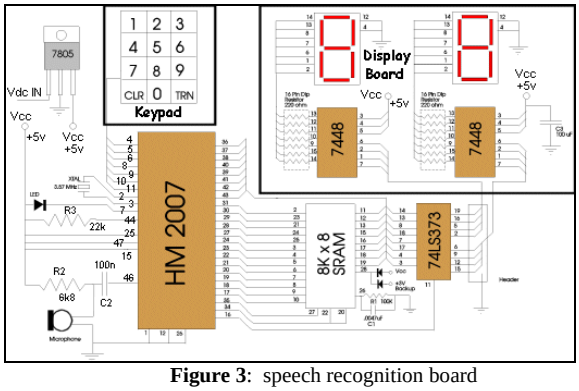


Figure 3: speech recognition board

3. KEYPAD CIRCUIT

It is constructed using 12 pin switches. The keypad and the digital display and also communicate with the programs of HM2007 speech processor.

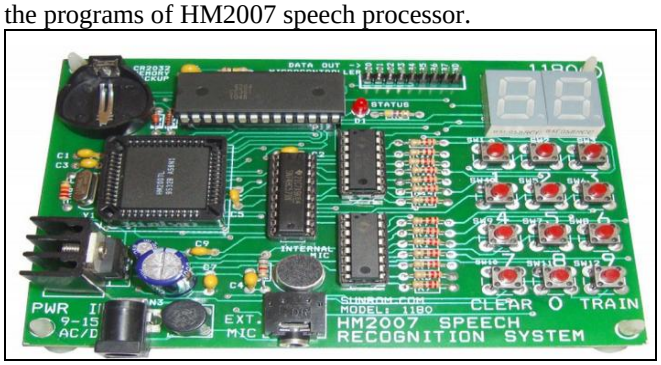


Figure 4: voice speech recognition board

VI. THE WHEELCHAIR

This Robotic wheelchair extends the capability and powered devices by introducing control and navigational intelligence. The device lives of many disabled people, particularly those with many implementations and by increasing with their range of mobility. A robotic wheelchair has been under development at the University of Wollongong for some years. The wheelchair adopted in this work is shown in Figure 5 it consists of two actuated 14.5A/23V/200W DC motors and two passive wheels for balance. Of course there is a possibility to moving the chair mechanically by pushing it with the aid of a helper. If the motor is switched ON, it will accelerate to full speed. If it is then switched OFF, the motor will not just gently stop. It will slam to stop if there is a brake on it. The motor has a fail-safe holding brake.

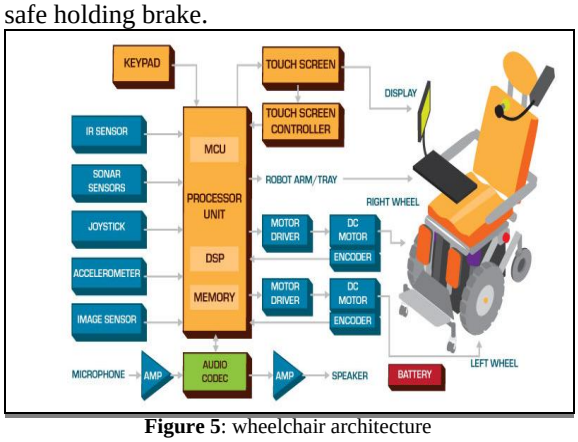


Figure 5: wheelchair architecture

VII. The MICROPHONE

A microphone is the key when utilizing automatic speech recognition (ASR). When a device plays music or voice, that signal is picked up by its microphone. Noise and remove the unwanted sounds during the progression of ASR.The head set style is the best choice since it has the Hi Fi technology that minimizes the ambient noise. ASR accuracy depends upon the clarity of the signal that we feed to the ASR processor.

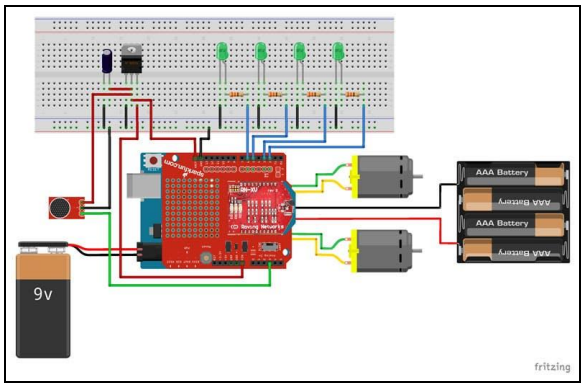


Figure 6: Interface of the Arduino with the driver

VIII. The MOTOR'S DRIVER

As mentioned above the chair has two DC motors with the Following specifications: 24VDC, 14A, 200W, 3900RPM, magnetic clutch, gear box as shown in Figure.7

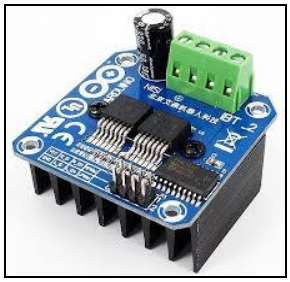


Figure 7:BTS7960 H-bridge motor driver

The wheelchair that consisting for four wheels and considered as a decision making element and controls the motion planning of the chair is the microcontroller. The rate pin SR allows the user to optimize the balances both emission and power dissipation within his own application by connecting an external resistors are used.

IX. FUTURE DIRECTIONS

The limitation of our IHNS is that whenever the user operates the robot the microcontroller in the Arduino board has to be reprogrammed. The future work of IHNS is interfacing part of the wheelchair with the voice related modules. The voice module can be done using MATLAB current status of our work is that the proposed IHNS is navigate manually *by* providing digital commands to arduino and Some of interfacing applications that can be made by controlling robot movements, Speech recognition technologies and Speech to text translation, and many more.

X. CONCLUSIONS

In this project a multipurpose robot is designed from the existing techniques. The speech recognition for robotic control has been achieved. The highest recognition rate that can be achieved is 67.2%. This result is achieved by the system using 25 samples and 10 samples per word for data training. The overall performance of the system can be greatly improved if we explore the options more completely and to enable the user to use it for day to day. Detection of obstacles with the help of IR sensors gives more accuracy than any other sensors thus the results show that the method is also effective in reducing power and maintence.

XI. REFERENCES

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