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Smart Automated Wheelchair for Visually Impaired & Physically Disabled People

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ABSTRACT

This paper presents a fully robotic and voice- controlled wheelchair using voice recognition module E-565 and RF Reader, for physically disabled and visually impaired person. The design is established with voice recognition module, which allows the physically disabled person to control the wheelchair by voice command Blind people or Visually impaired person (VIP) generally use white canes or guide dogs for obstacle detection and their advance. These two traditional system have limitations, which leads to inconvenience. Hence it is need to implement the system which will navigate a blind person automatically voice command is given through voice recognition module to Arduino UNO and command covered into a string. This wheelchair is controlled using infrared sensor and RF tag, which is used to indicate the desire destination. Ultrasonic sensor is used to detect the obstacle present in the path. Hence the wheelchair module is capable of providing comfortable, reliable and easy means to drive physically disabled and visually impaired person from source to destination.

Keywords –Voice Recognition Module E-565, Arduino UNO, Ultrasonic Sensor, Infrared sensor, RF Reader

ARTICLE INFO

I. INTRODUCTION

In The most commonly motorized device used all over the world by physically disabled people or old people to move is wheelchair. In normal wheelchair, the user needs extra supportive person or self-assistance by hand to move from one place to another. Around 650 million people which is about 15% of the world population are suffering from some kind of physical disability.

The first Motor-powered wheelchairs were developed around 1950s and many modifications have been done in the form of different control mechanisms. The aim of this paper is to provide a wheelchair suitable for one side or partial body paralysis patients that is automatic and controlled by the user. This will open a window of opportunity to paralysis patients and will allow them to live without constant support and being restricted in their homes which not only puts financial but also intellectual pressure on their families and thus can affect their confidence and self-respect. Although access to wheelchairs is a human right but it is not the case in reality. Hence providing wheelchairs that are reasonable and reachable to everyone not only allows flexibility but also gives everyone the right to access a proficient & social life with rarer barriers.

II.   PROBLEM STATEMENT

Wheelchair system is one of the common automobiles used by handicapped or sick people are limited in its function, such as it needs human force to move it. It is also can't be use for a long period as the user tired in moving the chair using his or her own energy. Then, the other problem is the being wheel chair is also not really contented as the form and its position also cannot be fixing to the user's body in getting comfortable seat. Our aim is to develop fully functional electronic wheelchair using voice module.

III.   MOTIVATION

Millions of people in India are facing infirmity in movement. They face inferiority complex on regular basis, which takes many forms. These people are considered more as a burden than an asset to the civilization. Since they are being judged, they tend to distance themselves

from the society as they feel annoying and excluded. According to survey 2001, India have around 0.6% of population with disabilities that is around 6 million people. Moreover, most of our public organization, public transportation, government constructions are not disabled-friendly. Therefore as a society we have to make efforts to ensure the disabled have access to these places and not feel vulnerable in anyway. First of all we have to accept these people and mix them into our society. For the purpose we are building a special type of wheelchair which would be helpful to these people for being self-dependent and would be helpful to integrate them in our society.

IV. OPEARATION OF PROPOSED SYSTEM

Below section describes the main hardware parts of the proposed system. Block diagram of the proposed system is shown in fig 1.
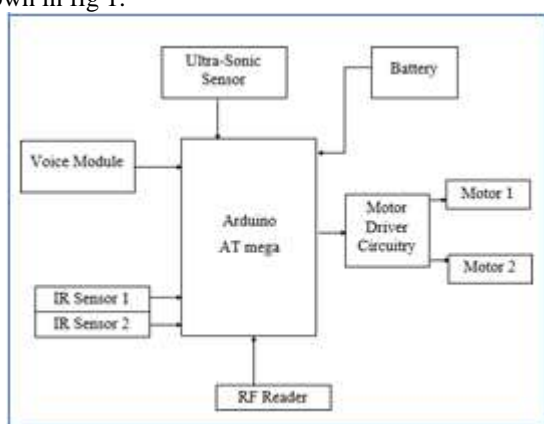

Fig 1. Block diagram of the proposed system

Fig shows the schematic diagram of the setup containing hardware part. Input is taken through voice module. Initially, Voice Module is skilled with 4-5 instructions. After that voice command is send by the user. The Arduino is used to check the signal related with this command and compare it with the stored instructions and completes the task related to this command. The wheelchair instructions and movement possible are as given below:

1. Forward
2. Revere
3. Left 4.Right
5. Stop

When the voice is sensed, the wheelchair can be controlled to move in that way by giving instructions to the wheelchair.

These instructions are shifted to the wheelchair using electrical signals which are used to drive the left or right motor of the wheelchair. There are basically two motors connected to the left and right wheels of the wheelchair. The electrical signals are transferred to these motors using some hardware ports, called the communication ports. Generally, the communication port is serial port. There are

some basic predefined pins of this serial port which accept the commands given to the wheels are used in the wheelchair for proper balancing. The movement of wheels is controlled by dc motors which are attached to the wheelchair. Two wheels located on left side of the wheelchair are controlled by one motor and similarly the wheels on the right side are controlled by the second motor.

The methodology of the proposed system divided into two parts:
1.   Voice Recognition System
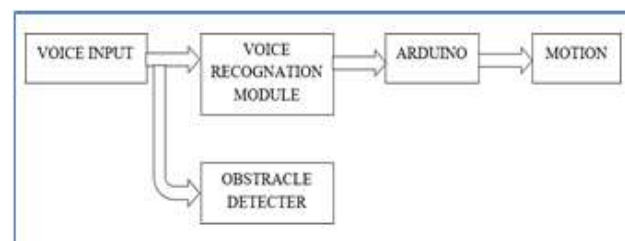2.   Obstacle Detection

1.Voice Recognition System

Fig 2. Proposed Methodology

Initially, voice recognition module means a system for computer examination of the human voice, specially for the purposes of taking words and phrases or recognizing an individual voice. The voice recognition module is a compact and easy control speaking recognition board. This product is talker dependent voice recognition module. Here we have to use a voice recognition module to sense and change sensed voice command into binary signal. Spell voice input for more processing is the first step of voice recognition. As the proposed system for voice recognition is built on voice of person with physically challenged as well as visually impaired person to move inside the home without any trouble.

2.Obstacle Detection:
For obstacle recognition we use ultrasonic sensor. An infrared Sensor is an automated device which is used to sense certain features of its neighboring by either emitting and/or detecting infrared radiation. With full-fledged design and execution of a voice activated tiny model of wheelchair, handicapped person will be able to do his/her day to day activity at own without taking help from others with user safety This can be done with just a voice command of handicapped person which is readily trained to proposed system. End result of the work would be a wheelchair that operated with speaker dependent voice with high degree of accuracy and reliability.
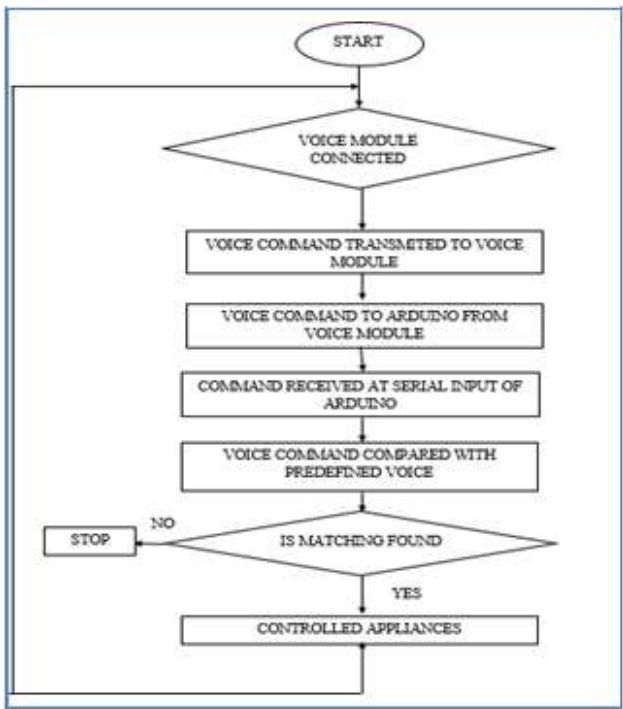
Fig 3. Operational flowchart of the system

A.   Voice Recognization Module:

This Voice Recognition Module is a dense and easy-control speaking recognition board. This product is a speaker- dependent voice recognition module. It supports up to 80 voice commands in all. Max 7 voice commands could work at the same time.

Fig 4. Voice Recognition Module E-565

Any sound could be trained as command. Users need to train the module first before let it recognizing any voice command. This board has 2 controlling ways: Serial Port (full function), General Input Pins (part of function). General Output Pins on the board could generate several kinds of waves while corresponding voice command was recognized

B.   Arduino UNO:
 Arduino is a development board that integrates microcontroller and its support circuitry with digital and analog inputs and outputs. It has an open source computing development platform based on an environment for programs creation.

Fig 5. Arduino UNO

C. Motor:
Geared DC motors can be defined as an extension of DC motor which already had its Insight details interpreted. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction. This Insight will explore all the minor and major details that make the gear head and hence the working of geared DC motor.

Fig 6.DC Motor

D. Battery:

Two 3.7V, 7.5mAh sealed lead acid rechargeable batteries were used to provide power of the system. These two batteries are connected in series.

E. Ultrasonic sensor:

Ultrasonic sensor has 4 pins Vcc, GND, Echo, Trig. It
 works on Echo principle, when transmitter transmit sound waves if any obstacle found in line follower path these wave strike on that objected and reflect back and receiver

receive these wave and internally compute distance between wheelchair and these obstacle.

Fig 8.Ultrasonic Sensor

When distance between wheelchair and obstacle is less than 50 cm than it send signal to the arduino.

Infrared Sensor:
Proposed system contain two infrared sensor which has transmitter and receiver. Transmitter has black LED and Receiver has white LED. When white LED transmit the signal, it is sensed by the black strip and black LED doesn't absorb this signal and wheelchair moves, if these signal sensed by the Black LED wheelchair doesn't move.
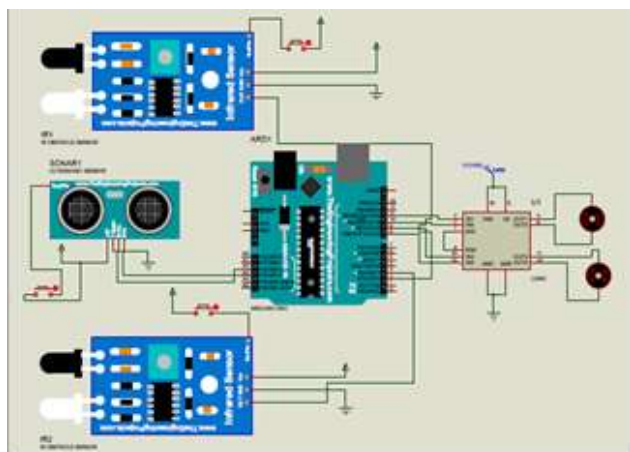

Fig 9. Infrared Sensor

Fig 10. Circuitry of the proposed system

V. CONCLUSION

India is one of the countries with world's largest population of blind as well as physically disabled people. Initially many blind people wish to not use electronic assistances, and use only sticks or guide dogs. This is because of comparatively high costs and poor levels of user fulfillment associated with existing electronic system. So we tried to develop a reliable and user friendly system for blind people. This method offers advanced solutions in order to swap the conventional methods of guiding blind person. This proposed system contributes to the self- dependency of disabled and elder people.

FUTURE ENHANCEMENT

The automatically controlled wheelchair is a useful for paralyzed person as well as visually impaired person. The developed a prototype of smart robotic wheelchair using voice module and line follower which is capable of operating indoors. In future we can design and improve this system for outdoor purpose by using already available blindsquare application which is available in iphone app store but the limitation of these app is only available for iphone but we are developing these app for our smartphone also which is easily available for users.

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