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Voice Controlled Wheelchair For Physically Disabled

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ABSTRACT

In this report,The purpose of this smart wheelchair project is to develop a regular powered wheelchair by combining sensors to sense the environment around the wheelchair and a speech interface to give commands. In the future welfare society, intelligent wheelchairs will play a critical role. The system combines voice recognition and infrared sensor technology. For wheelchair movement, simple voice instructions will be employed. Start, Left, and Halt, for example. In order to reduce environmental disruptions, the system will use fewer voice commands. Wheelchair will intelligently recognize and avoid obstacles with the help of ultrasonic sensors. This is a one-of-a-kind device that combines voice control and sensor technology to guarantee reliability and comfort. In this approach, the wheelchair recognizes impediments between the paths and can be driven using voice commands.

KEYWORDS: Artificial intelligence, IR and ultrasonic sensors, Arduino microcontroller, and Bluetooth.

1. INTRODUCTION

Physical disabilities occurs due to variety of causes, including accidents, health issues, and ageing. Wheelchairs are design to offer transportation for physically disabled people who have problems with their hands and legs. People having disabilities, such as paralysis or accidents find it difficult to control the wheelchair manually. The project is meant for such persons to function with voice-based commands, allowing the paralyzed or impaired person to offer direction commands simply by speaking into the microphone provided. Speech recognition is a critical technique for allowing humans to interact with robots in order to control a wheelchair.

This project is about a Voice Controlled Obstacle Avoidance Wheelchair that uses Ultrasonic sensors and a speech recognition module. The system is intended to control a wheelchair with the user's voice.

2.Literature Survey

Include papers referred, patents, white papers, technical reports, Datasheets etc.

SUMMARY OF LITERATURE SURVEY:

[1] IEEE paper of "Voice Controlled Automatic Wheelchair"

[2] Product Survey- "Voice operated wheelchair"

It can be concluded from the foregoing literature review that the population in need of assistance can benefit from wheelchairs. The traditional pushing wheelchair requires the user to push the chair with his or her hands. When

travelling over a long distance, it puts a strain on the user. As a result, the notion of an autonomous wheelchair was developed with the use of technology and human intelligence. An input interfacing machine feeds information to the motor in an automated wheelchair. The motor interprets the information and performs the corresponding action (move left, front, rear, or right).Working has gotten less complicated since the introduction of the Android Smartphone into the system. The user will find the system to be very user-friendly.

The strategy is to. There are some disadvantages.

[1] It can only carry out commands such as Backward, Left, Right, and Stop.

[2] In a noisy atmosphere, it may pose issues.

Studies in the field of recognition of speech have been done many times. Systems with Computer-based speech processing have now achieved complicated structure with great accuracy thanks to advanced signal processing algorithms and powerful CPUs. The work at first is to achieve excellent performance while working with mannered computer based memory resources. Research into wheelchair control systems is still underway. People with disabilities have no idea how to operate an electronic wheelchair's joystick. This is the major disadvantage for people with disabilities .Using solely vocal commands, they can operate their wheelchair more easily. The major goal of employing voice activated technology to see how the wheelchair moves in the suggested design to show it can be an exclusive solution for severely crippled people. The purpose of this project is to develop a speech recognition system which can recognize user's input word. In future, a fully autonomous wheelchair that moves automatically based on the user's behavior. That ought to be completely automated and wireless. In this project, we will first develop a voice-activated autonomous wheelchair, and then combine software that will be controlled by a computer and GSM mobile phones. After that, we're considering including a biometric feature that should be somewhat secure. Many efforts have been made to construct robotic wheelchairs that operate similarly to autonomous robots, with the user providing a final target and directing the smart wheelchair as it goes toward the goal.Other smart wheelchairs limit their assistance to collision avoidance; these technologies typically do not require prior knowledge of a location. A voice-controlled wheelchair can help by providing input in the form of vocal instructions such as right, left, back, and forward. We can also control our wheelchair from an angle where the user wants to rotate it, such as 30, 45, or 60 degrees. This version differs from the previous prototype in that it allows the wheelchair to be turned left and right at an angle. This strategy can be performed by using high-torque servo or stepper motors with low RPM.

Vishal V Pandey, conducted a survey in 2015 in which they collected reliable hand gesture data for the sensor system, the gesture should be implemented, and there should be a time interval between the two movements. The accelerometer is used. Quadriplegics are unable to use it. Srishti, et al.[2] presented a paper in 2015 titled Design and Development of Smart Wheelchair Using Voice Recognition and Head Gesture Control System, which uses speech recognition modules in voice based systems instead of whole computer systems to reduce the complexity and size of the overall system.The Voice Recognition Module V2 was utilized in this experiment. The commands were recognized by the speech recognition module via the microphone. Through the serial port interface, it receives configuration requests and responses. [3] proposed an autonomous obstacle detection system based on an ultra sound system that allows the user to apply a temporary break in the event that an obstacle unexpectedly blocks the robot's path. If a vocal mistake occurs, the design protects the user from colliding with an obstacle.

3. COMPONENTS SPECIFICATIONS

i) **Wheelchair battery**:

The battery in this project is a wet kind. Wet batteries are used to generate electrical energy through a chemical reaction between lead and sulphuric acid. The batteries must be filled with distilled water. Wheelchair batteries require more maintenance but are lighter than AGM (Absorbed Glass Mat) or Gel batteries.

ii) **Motors**:

One of the most crucial components of a mobile robotics platform is the motor. Overpowered motors squander the on-board batteries' already limited power supply and cause inefficiency. Undersized motors may be lacking in torque at vital periods. The allowable speed range as well as the motor's optimal rotation speed must be taken into account. The robot will function at a fast, unmanageable speed if the output rpm from the motor shaft is too high. If the output is too low, the robot will be unable to achieve a speed, and the motor's possible speed range must also be addressed. The robot will function at a fast, unmanageable speed if the output rpm from the motor shaft is too high. It has a low output to satisfy the user's needs, and the robot will not be able to reach a reasonable pace. Because movement may not be possible in some conditions, the torque, or motor power, plays a role in performance. As a result, selecting the appropriate motor for the platform is critical. Motors come in a variety of shapes and sizes. Figure depicts the use of a 12V DC motor in a wheelchair. The microcontroller Atmega328's wheels and driver are connected to the 12VDC motor. Two motors can be controlled by one driver at the same time.

iii) **Bluetooth Device**:
Bluetooth Device is main component when connection of the wheelchair and android phone is to be made. The Bluetooth device provides the security to the wheelchair as only one device is connected at a time. Frequency is of 2.4GHz.It is highly cost effective. Used for serial communication between android device and the wheelchair.

iv) **Motor Driver**:
It is an interface between the DC motor and the microcontroller Arduino. The commands are processed further to Arduino towards driver and executed by DC motor to rotate the wheels in specific direction or to stop.
The L298M motor driver makes it simple to control the speed and direction of two DC motors or one bipolar stepper motor. Motors having a voltage between 5 and 35V DC can be used with the L298N H-bridge module. There is also an integrated 5V regulator, so you can get 5V from the board if your supply voltage is up to 12V.

v) **Ultrasonic Sensors**:
Sensors are used to detect the hurdle from specific distances and alert the user about it. They are highly effective and efficient. The use of an ultrasonic sensor makes distance measurement simple. This sensor is ideal for a wide range of applications requiring measurements between moving and stationary objects. move the wheels in response to commands from the microcontroller. The motor will travel in one of four directions: left, right, forward, or backward.
It's simple to connect to a microcontroller. An ultrasonic burst (far above human hearing) is triggered by a single I/O pin, which is then utilized to "listen" for the echo back pulse. The sensor calculates the time it takes for the echo to return and sends that value to the microcontroller via the same I/O pin as a variable-width pulse.

vi) **Arduino UNO**:
The ATmega328P-based Uno is a microcontroller board. It features 14 digital input/output pins (six of which can be used as PWM outputs), six analogue inputs, a 16 MHz quartz crystal, a USB port, a power jack, an ICSP header, and a reset button. It comes with everything you need to get started with the microcontroller; simply connect it to a computer by USB or power it with an AC-to-DC adapter or battery.

3. METHDOLOGY
Firstly the user voice application is connected with the wheelchair Bluetooth device. Then user is supposed to speak specific commands through the application .Then using the Google voice service the word is checked and converted to text. The text format it processed further to controller, it checks for the valid input and then gives specific instruction to the motor drivers for Its movement towards left, right, straight, backward otherwise stop.

4. RESULTS AND DISCUSSION
Voice Controlled Wheelchair is controlled by vocal commands when user provides command to systemwheelchair starts its movement. If any obstacle is detected chair stops its movement and turns itsdirection towards left or right depending on the path available. It turns on its own unless anyspecific instruction is been provided by a person using the wheelchair.
Table: Result of VCOA Wheelchair

Voice Command	\/+
Start	Chair will move in forward direction
Back	Chair will move in backward direction
Left	90o Left turn
Right	90o Right turn
Halt	Stop movement

The Range of obstacle detection sensor is set as 50 cm; if at all any obstacle comes between 50
cm chair stops moving.
When user gives command as left or right wheelchair turn its direction towards left or right by 90degree angle. If user wants to turn wheelchair by small degree then soft left or soft rightcommand is used. It turns the direction by 30 degree angle.

5. CONCLUSION
This paper described the successful implementation of a motorized wheelchair controlled by a joystick or through voice recognition.The voice recognition system worked for most of the commands (over 95%). Only when a word was not properly vocalized, the system did not recognize it.Overall, users reported satisfaction with the system. The project provides the following learning's: 1. Speech recognition module operation. 2. DC motors working and need for motor driver. 3. Interfacing Speech recognition module to Microcontroller 4. Relay working principle.

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