



Voice Controlled Wheel Chair for Disabled Persons

Dhanalakshmi LN^{1*}, Pallavi P², Syed adnan³, Vemala yashwanth kumar⁴, G Vinutha

Department of Electrical and Electronics Engineering, Sri Sairam College of Engineering,
Visvesvaraya Technology University, Belagavi.

ABSTRACT

This paper describes intelligent voice-controlled wheelchair which operates on user's voice commands. The disabled people cannot move from one place to another on their own. They continuously need someone to help them in getting the wheelchair moving. This voice-controlled system makes them more independent. A voice-controlled wheelchair can provide easy access for physical disabled person who cannot control their movements especially by hands. This voice-controlled wheelchair helps them to drive the wheelchair without anyone's help. This system can be controlled by the simple voice commands given by the user. Depending upon the direction specified in the commands, the Arduino will drive the motors. The speech recognition is done by voice recognition module, connected with Arduino. The principle of the developed wheelchair consists of motor system, voice recognition module that would be controlled by the microcontroller. The automatic obstacle detection system is included to the developed wheelchair by using ultrasonic sensors in order to break the developed wheelchair immediately when any obstacles suddenly come in the way of the developed wheelchair. Therefore, the developed voice-controlled wheelchair can provide easy access for people with physical disability and also offer automatic protection from obstacle collision if the mistake of any voice commands occurs.

Keywords: Arduino Mega, Bluetooth Module, Smart Wheel Chair, Voice Control, Motor Driver Module.

1 Introduction

People with arm and hand impairments find it difficult to utilize a standard wheelchair since their hands are incapable of operating it and cannot move it in any direction. As a result, a voice operated wheel chair is designed to overcome such people's difficulties and enable them to manage the wheelchair. The wheelchair will be controlled by voice instructions using the input provided. The Arduino will handle all of the user's desired directives. Each direction's instructions are written in the form of a program in the Arduino itself. The unilateral mic, which will be positioned according to the user's comfort, will provide spoken commands to the wheelchair. The HC05 Bluetooth module will do speech recognition. Arduino then receives the output from this module [1]. The Arduino's pre-written algorithms assist Arduino in converting these vocal commands into significant output, and the wheelchair will move appropriately. People will gain independence by using a wheelchair control system. The wheelchair control system makes use of a speech recognition technology to trigger and control



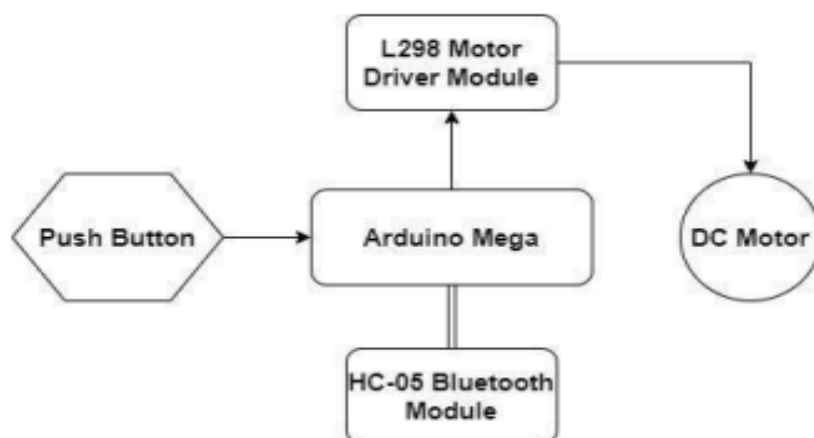
all of its motions. The technology allows users to operate the wheelchair by just speaking into the wheelchair's microphone [2]. The fundamental movement functions are forward and reverse motion, left and right turns, and stop. The spoken words are sent to the speech recognition processor via a flexible microphone that can be bent to the user's specifications. Many physically handicapped people are unable to move any limbs below the neck. As a result, manual and even joystick-controlled wheelchairs are out of the question for these individuals. As a result, the development of voice-activated wheelchairs will answer the question of quadriplegic patients' movement and make them independent of mobility [3]. In our project, we have both voice command and switch control. In this case, we utilized Arduino as a programming device. Where c has used programming to better the project. The major goal of this project is to Wheel Chair System Project for the main aim of creating a smart system so that we may reap numerous benefits from a single project. These are utilizing voice command or switching for wheel chair control, which sick patients or elderly people can easily operate; the goal is to build a contemporary one primarily for sick patients or the elderly. There are numerous advantages to such a system, including the following: it reduces human efforts, it is beneficial to physically disabled people who are unable to operate home appliances with their hands, it will help to save energy to some extent, because some people are too lazy to go and switch off the appliances manually, it is simple to use for those who have tried it and do not need to operate the home appliance manually by hand, and it reduces risk [4]. The suggested system has several drawbacks as well, such as the fact that it requires an additional supply to operate the model and that the module only recognizes the inserted voice and button. This type minimizes the amount of physical effort required to acquire and identify the command for controlling the mobility of a wheelchair. The given commands can be used to control the wheelchair's speed and direction. Thus, all that is required to ride the wheelchair is a trained voice [5]. Aside from that, the development of this project may be done at a low cost. However, certain changes are needed to make this system more dependable. The wheelchair's design might be enhanced by including wireless communication. We can immediately improve the lives of handicapped persons in the community by establishing this system. Finally, we believe that this type of device will help to advance wheelchair technology. The intelligent wheelchair's motor drive and control system has been shown [6]. The voice-controlled intelligent wheelchair based on a microcontroller would be more convenient for handicapped individuals. By avoiding collisions with walls, immovable objects, furniture, and other people, the device can also improve the safety of users who use standard joystick-controlled powered wheelchairs.

2 Recent Works

Our project is the voice control wheel chair. In this project, we first built a robot chair and then set up numerous systems for sick patients and the elderly. Which may be taken anywhere by using the voice command and button control while seated in the chair. The wheel chair was initially intended to help the sick and aged. The goal of this article is to create a wheelchair that moves in response to the user's orders, and to detect the stairs. This system is controlled by the



wheelchair user's voice or button instructions. The technology is completely self-contained, since the user does not require the assistance of another person to move the wheelchair. There are generally five commands and depending on whatever command is provided by the user, the wheelchair will move appropriately. In the first stage, the user's vocal instructions are recognized. When a command is acknowledged, it is translated into the corresponding instructions that drive the system. This system is made up of two primary apps and modules: voice recognition and motor driving. The voice recognition is performed via a voice recognition software. The output of this Bluetooth module is sent to Arduino, which drives the motors with a motor driver IC. The unilateral voice recognition app, Bluetooth, motor driver module, Arduino, and motors are used to power the voice-controlled wheelchair. The phone app serves as the system's input. It can take voice commands from the user and ignore other sounds. The mobile app will be positioned according to the user's preference the output is in the form of speech signals, which are sent to the voice recognition software, which serves as a bridge between the Bluetooth module and the Arduino. The output from the speech recognition software is then received by the Arduino, which converts it to binary code. Any language other than binary code is unintelligible to the system. As a result, the produced voice command is translated into machine-readable form. The Arduino Mega is used in this setup. It is linked to motors that allow the wheelchair to be driven anywhere. The wheelchair's mobility is controlled by motors. As a result, motors get input from the Arduino and move in accordance with the kind of instruction. This system has four motors that are linked by a motor driver. The motors may be given four distinct commands: forward, back, left, and right. The wheelchair's mobility is solely dependent on these four instructions. The wheelchair reacts to vocal commands from its user to accomplish any movement's tasks

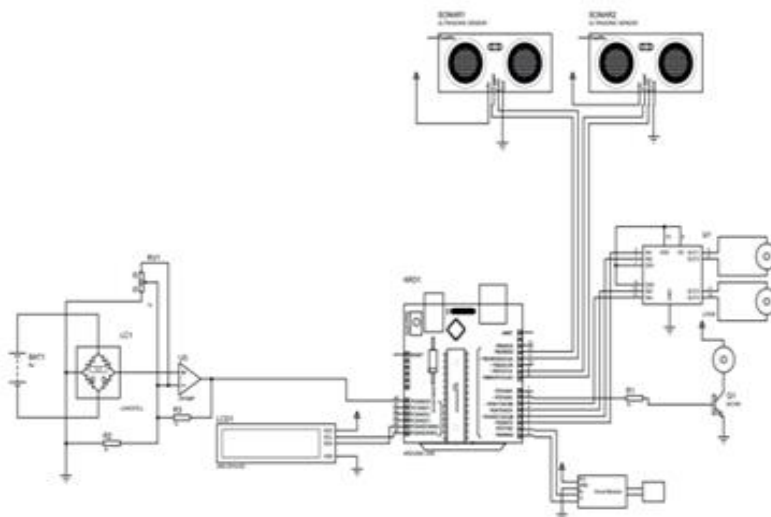


The fundamental movement functions are forward, left, and right. The speech recognition processor must be taught with the words shouted out by the user who will control the wheelchair in order to recognize the spoken words. In our project, we have both voice command and switch control.



3 Proposed Work Explanation

The purpose of this paper is to develop a wheelchair which will move as per the user's commands. This system works on voice commands given by the wheelchair user. The system is fully independent as the user do not need any other person to help him to move the wheelchair. There are basically six commands, which command is given by the user, accordingly the wheelchair will move. The voice commands of the user is recognized in the first step. Once it is recognized, the commands are converted into its equivalent instructions which drive the system. This system consists of two major modules namely Voice recognition module and motor driving module. The voice recognition is done through voice recognition module. The output of this module is directed to Arduino which uses a motor driver IC to drive the motors. The voice-controlled wheelchair works using mic, voice recognition module, Arduino and motors. The input to the system is the unilateral mic. It is capable to take user's voice commands and not bother about other noises. The mic will be placed as per the user's comfort. The output is in the form of voice signals and is transferred to the voice recognition module which acts as an interface between mic and Arduino. The Arduino then receive the output from voice recognition module thus converting it into binary code. The system is unable to understand any language other than binary code. Thus, the generated voice command is converted into machine understandable form. This system uses the Arduino uno. It is connected with motors to drive the wheelchair anywhere. Motors are responsible for the movement of wheelchair. Hence, motors receive input from the Arduino and depending upon the instruction type, motors move accordingly. This system uses two motors connected with motor driver. There are six different instructions that can be given to the motors, they are forward, backward, left, right, stop and water. The movement of wheelchair depends only upon these six commands. The wheelchair responds to the voice command from its user to perform any movement's functions. We also provide a ultrasonic sensor for the obstacle detection. The basic movement functions include forward direction, left and right turns and stop.





4 Working Methodology

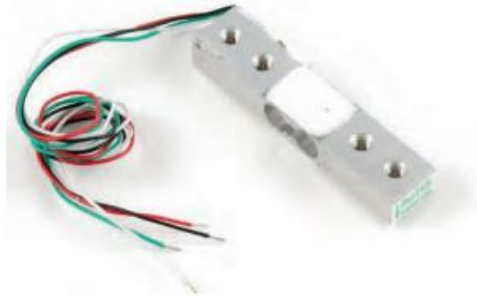
The working principle of developed wheelchair can be explained by the circuit diagram given below. There are six types of commands in the wheelchair, Forward, Backward, Left, Right, Stop and Water. The wheelchair will move when the power supply is given and the load is activated. For the forward command wheelchair will moves in Forward direction and two motors will rotates in forward direction. For Backward command the wheelchair will moves in Backward direction and the two motors will rotates in backward direction. For the Left command the right motor will rotates and the wheelchair moves towards left direction. For Right command the Left motor will rotates and the wheelchair will move towards Right direction. For the Water command the submersible pump will dispense water through the pipe. The two ultrasonic sensors on front and back side of the wheelchair will detect the obstacles while moving the wheelchair and the wheelchair will stops. The Display unit displays the weight applied, and the commands which is given to the voice module. The JHD162A dot-matrix liquid crystal display controller and driver LSI displays alphanumeric, Japanese kana characters, and symbols. It can be configured to drive a dot-matrix liquid crystal display under the control of a 4- or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal system can be interfaced with this controller/driver The JHD162A character generator ROM is extended to generate 208 5×8 dot character fonts and 325×10 dot character fonts for a total of 240 different character fonts. The low power supply (2.7V to 5.5V) of the JHD162A is suitable for any portable battery-driven product requiring low power dissipation. The voice recognition module i. e., v3.1 is used to recognize the voice commands given by the user and it can be trained by the user. It's a 48-pin single chip CMOS voice recognition LSI circuit with on-chip analogue front end. In this system, the Voice recognition module is trained and it takes the input from mic available in the system. The wheelchair uses the voice Recognition module interfaced with the Arduino Uno R3 to convert the voice commands into motor understandable Instructions to move the wheelchair as commanded by the user.



This straight bar load cell (sometimes called a strain gauge) can translate up to 20 kg of pressure (force) into an electrical signal. Each load cell is able to measure the electrical resistance that changes in response to, and proportional of, the strain (e. g., pressure or force) applied to the



bar. With this gauge, you will be able to tell just how heavy an object is, if an object's weight changes over time, or if you simply need to sense the presence of an object by measuring strain or load applied to a surface. This straight bar load cell is made from an aluminium alloy and is capable of reading a capacity of 2KG of weight



5 Results and Discussion

The design construction and development of automatic voice-controlled wheelchair are done and shown in the figure. To verify the performance of wheelchair the relationship between Voice commands, Motor drive, DC motor, Arduino are determined. The results of relationship between Voice command, Motor drive, DC motor and Arduino are display on the display unit. In addition, the ultrasonic sensor is tested to confirm the performance of obstacles detection system. These sensors are used to measure the distance between obstacles and wheelchair at 20 cm distance. The submersible pump is tested for the dispense of water for 2 second. The load results the movement of wheelchair when the load is activated.

6 Conclusions

The design of a smart, powered, voice command, and push button controlled wheelchair utilizing an embedded system is described in this article. The proposed design has a voice activation system for physically disabled people, sick patients, and the elderly. This article depicts a "speech and push button controlled Wheel chair" for physically disabled people, in which the motions of the wheelchair are controlled by a voice command or a switch command. The voice command or switch command is supplied via a Bluetooth-enabled cellular device, and the command is transmitted and translated to string by the smart phone app or switch Control for Arduino and is transferred to the Bluetooth Module linked to the Arduino board for Wheelchair control. For example, when the user commands, the chair will move forward, and when he commands, the chair will travel backward, and similarly, "Left," "Right," and "Stop" to rotate it in the left and right directions, respectively, and "Stop" to make it stop. This method was conceived and built to save the patient's money, time, and energy. Even though there is no manufacturing at this level, the project is deemed a success. The above-mentioned problems will be handled, the implementation phase will be completed in order to complete the job economically, and this project will be a success because the components utilized are not expensive.



References

1. Amin MS, Year: 2021, "Smart Wheelchair-An Implementation of Voice and Android Controlled System".
2. Kataria S, Year: 2021," A Novel IOT Based Smart Wheelchair Design for Cerebral Palsy Patients".
3. Venkatesan; Mithra, Year: 2021," Voice-Controlled Intelligent Wheelchair for Quadriplegics. Computer Communication, Networking and IoT" pp. 41-51.
4. Ahmed; Foez , Year: 2021,"Design and Development of a Smart Wheelchair for the Disabled People. 2021 International Conference on Information and Communication Technology for Sustainable Development (ICICT4SD)"
5. Varghese; Lijo Jacob, Year: 2021," Design and Implementation of a Machine Learning Assisted Smart Wheelchair in an IoT Environment".
6. Mekala Ajay, Year: 2021," Smart Wheelchair. AI and IoT-Based Intelligent Automation in Robotics".
7. Anshul Tyagi, Year: 2021," Smart Wheelchair for Disabled People. Research and Reviews: Advancement in Robotics,".
8. Chatterjee; Sudipta; Sahadev Roy, Year: 2021,"A low-cost assistive wheelchair for handicapped & elderly people".
9. Sarnali Basak , Year: 2021," Gesture-based Smart Wheelchair for Assisting Physically Challenged People".
10. Pratiksha Karn," Smart Wheelchair with SMS Alert and Safety Features".
11. Shamim Ahmad, Year: 2019," A low SAR in-body antenna for wireless monitoring purpose of pacemaker system".
12. Al Rakib; Md Abdullah, Year: 2021," Design and Simulation-Based Parametric Studies of a Compact Ultra-Wide Band Antenna for Wireless Capsule Endoscopy System at Inside Body Environment".
13. Al Rakib; Md Abdullah, Year: 2020," Energy Harvesting Technology from Human Motion".
14. Mahamud; Md Sadad, Year: 2019," Mouchak-An IoT Basted Smart Beekeeping System Using MQTT".
15. Al Rakib; Md Abdullah Year: 2021," Dry and Wet Waste Segregation and Management System".