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A REVIEW ON VOICE CONTROLLED WHEELCHAIR WITH OBSTACLE SENSOR AND THERAPY UNIT

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Abstract: ***This paper presents the design of an automated wheelchair with voice control. The main objective of this campaign is to promote voice control of wheelchairs for individuals who need it. The system's safe mobility is enhanced by additional features including obstacle identification that reduce the likelihood of accidents while travelling. This gadget also features a component for therapy that helps the user's limbs avoid becoming numb after extended rest.***
Keywords-wheelchair, voice, obstacle, disability, therapy

I. INTRODUCTION

Inspiring and admirable effort has been done by many researchers to make patients' life as simple and independent as possible. The fact that physically challenged patients can hardly move and must use a wheelchair is one of their major limitations. A controller is now built into certain wheelchairs, making them more modern. This type of wheelchair can be useful for patients who have functional upper limbs but little control over their bottom limbs. In today's world, speech recognition is a hot topic. Speech recognition has a wide range of uses that improve the quality of our lives. However, for wheelchair remained a notable barrier. As a result, an intelligent wheelchair system based on voice recognition is suggested. The voice-activated wheelchair is built with safety features to prevent collisions with obstacles and can be operated via voice commands. The primary goal of this system is to be able to recognise speech as accurately as possible. Speech recognition is the process of turning spoken words into forms that computers can understand. This intelligent wheelchair incorporates speech recognition, so when a command is given verbally, the system will carry it out as instructed. It has a therapy machine to help the crippled person's limbs and prevent numbness from being brought on by prolonged rest. Through this approach, disabled people can receive some therapies alone. Through the use of their voice commands, those who are physically disabled or socially isolated will be able to move around freely and independently like other members of the community. This paper discusses the creation of a system that uses an infrared sensor, Raspberry Pi, Google Assistant, servo motor, and an Android handset as a microphone.

II. LITERATURE SURVEY

[1] Muhammad Azlan Alim, et al. In this proposed system, a voice-activated intelligent wheelchair device for those with physical disabilities who are unable to steer with their limbs. This innovation uses voice commands to control the wheelchair's mobility in various directions. The Android device serves as a microphone to connect to the Google Assistant before the Raspberry Pi processes the data. The servo motors will subsequently be given the appropriate instructions by the Raspberry Pi. Through the employment of an infrared sensor, this technology provides automated obstacle detection and assists the operator in applying the temporary stop button when the impediment is detected. The trial findings of more than 90% accuracy and a reaction time of less than 1.2 seconds confirm that it is a trustworthy system for usage by disabled individuals. The dual-controller mode further highlights its importance for users who have limited control over one or both of their lower limbs. This wheelchair also has a user-friendly mechanism since it doesn't require any special training or user restrictions to use.

[2] Ms. Cynthia Joseph, et al. In this proposed system, The device is built on a design that incorporates manual operation to let physically challenged persons use voice activation. Voice recognition software and an Arduino microcontroller have been utilised to facilitate wheelchair mobility. An improper spoken command does not cause the wheelchair to move. The Arduino controls the wheelchair directions in accordance with the instructions provided by voice and gesture. Obstacle detection is performed via ultrasonic sensors. The prototype's layout makes it possible to utilise it effectively and without much effort on your own. It helps consumers save time, money, and energy. Ultrasonic sensors are effective at detecting any obstruction. The prototype begins to move as soon as the user turns it on, and any impediment that is anticipated to be within a specific range will be picked up. Older because of their independence. [3]M.Senthil Sivakumar, et al. In this proposed system, They suggest a wheelchair, speech module, and navigation module for the Intelligent Home Navigation System (IHNS). An older person or someone with physical limitations can easily move around the house using their method. The wheelchair is controlled automatically or manually in the suggested system

by spinning the wheels with the hands or with the help of external devices. The suggested speech-controlled autonomous wheelchair is built with the Intelligent Home Navigation System in mind across all of its components. The wheelchair is programmable to travel in all directions using the microcontroller AT89C51. The vice directive to move the chair in the necessary directions or to halt is recognised by the speech recognition kit. The wheel chair stops when an intruder is spotted thanks to an ultrasonic detecting module, which also identifies the invader. The wheel chair's logic function is displayed via a liquid crystal display (LCD). The instructions from the microcontroller operate the DC motor through four relays. The voice-controlled load-carrying robot wheel chair that is being designed is particularly helpful for elderly and physically disabled people.

[4] Sumet Umchid, et al. In this proposed system, The created wheelchair may be controlled with voice commands by using the input. The motor system and voice recognition module of the designed wheelchair are both controlled by a microprocessor. A wheelchair that has been designed has an autonomous obstacle detection system that uses ultrasonic sensors to stop the wheelchair as soon as an obstruction unexpectedly blocks its path. Therefore, the voice-controlled wheelchair that has been created can make it simple for persons with physical disabilities to utilise it and can also automatically safeguard them from colliding with obstacles in the event that a spoken order is misheard. People with physical disabilities may easily utilise the wheelchair since it has voice control, and it also offers additional safety because it automatically avoids collisions with obstacles.

[5] Romil Chauhan, et al. In this proposed system, In order to control the gadget, they employ a Raspberry Pi, infrared and versions is improved while also attaining cost effectiveness. The suggested concept makes use of cutting-edge technology that not only analyses voice but also manages motors. Consequently, using less hardware results in lower costs. Because of its durability and lengthy processing time, the CPU utilised has a faster reaction time. This model overcomes the restriction on the number of speech commands utilised in researched models. The concepts in the recommended model increase the product's intelligence. This type is therefore more sophisticated since it lowers the cost while simultaneously improving user comfort.

[6] Polash Pratim Dutta, et al. In this proposed systemFor persons with physical disabilities, there is a voice-controlled wheelchair. The work is completed using an Arduino microcontroller board, which may either be connected to a Bluetooth module via a smartphone or a speech recognition module via a microphone attached to it. Adapting movement in accordance with pre-programmed vocal commands. Formulation and design calculations can also provide some theoretical outcomes. The sufferers will be able to go about independently without the assistance of any other family members or others thanks to this voice-operated wheelchair.

[7]P. B. Ghule et al. In this proposed system, For those with physical disabilities, a speech-controlled wheelchair that can be utilised in many languages has been designed. A laptop with an interactive and user-friendly GUI was constructed with a speech recognition system utilising Mel Frequency Cepstral Coefficients (MFCC), and a regular wheelchair was transformed into an electric wheelchair by adding a gear mechanism to the wheels and a DC motor to the gear. The relay driver circuit uses an Arduino Uno board to receive the control signal from MATLAB and pass it on to move the wheelchair in the appropriate direction. When the user speaks commands like "forward," "back," "left," "right," or "stop," the wheelchair moves in accordance with that command. Through the use of the discrete cosine transform and ceptral coefficient, they have suggested an unique isolated word recognition approach that produces effective results. It can offer information about the voice signal's temporal and frequency parameters. One of the best ways to extract characteristics from a voice signal is to convert the signal to ceptral coefficients. Since there are only a few words in the training database for the specific wheelchair application, the suggested technique provides excellent accuracy while taking up little processing time. A wheelchair in real life has been used to successfully test the viability of the suggested technique. The circuitry responded quickly, generating the control signal needed for motor control shortly after obtaining the signal.

[8]K Sangeetha, et al. In this proposed system, a voice-controlled wheelchair for those with physical limitations is the goal. Speech recognition technology is used by the wheelchair control system to start and control all of its actions. A microprocessor, speech recognition through Google Assistant, and a motor control interface board are all included in the wheelchair's operation. By speaking orders into the Google Assistant and speaking, users of the gadget may operate the wheelchair. The basic operating process includes pauses, turns to the left and right, and forward and backward travel. A Microchip Technology PIC controller controls the system's operations. It responds to orders provided from the Ada-fruit cloud using the speech recognition capabilities of Google Assistant and works with commands recorded as a number system. A matching output instruction to activate the left and right motors is established once the speech has been spoken. To do create a voice-controlled wheelchair for those who are disabled and often rely on others to get around, especially while travelling.

[9] Md. Mamunur Rahman, et al. In this proposed system, A wheelchair with a joystick and built-in obstacle detection was developed using the Arduino platform. A Bluetooth voice control module was included, in addition to a joystick, for users who have suffered damage to their upper limbs. The system incorporates numerous governing factors, is capable of identifying impediments, and provides a constrained number of treatment possibilities. In order to control the wheelchair's motion, a speech recognition system and an Arduino-interfaced joystick are being developed for usage. A system

that uses ultrasound may also automatically identify impediments. The research's objective is to affordably fit a wheelchair with a variety of conveniences.

[10] Mohammad Ilyas Malik, et al. In this proposed system, They employed a voice recognition system and an Android application. This project discusses a wheelchair that can only be operated by voice commands and an android application. Key technology that and software. It is acknowledged that we are employing an Android phone as a middleman for voice input. In this project, a wheelchair's mobility is controlled by an Arduino kit (Atmega 328) using a user's voice as an input. The following list of five tasks that a wheelchair can complete is provided: Backwards and forwards, Taking a right and left turn, Stop situation

[11] Yashoda A M, et al. In this proposed system, The major goal was to create a smart wheelchair with numerous control interfaces that would help those with physical disabilities who experience mobility limitations. The smart wheelchair includes three alternative control methods: speech, gesture, and joystick. These control options are available for the smart wheelchair's users to employ. To assess the capabilities of the produced smart wheelchair at this early stage of development, they performed user studies with a group of healthy participants. The users like the produced smart wheelchair over the traditional wheelchair, according to the findings of the experiments.

[12] Priya C A, et al. In this proposed system, The proposed solution calls for a wheelchair that can be controlled by voice commands and a smartphone. Voice recognition is the primary piece of technology that allows for human interaction with wheelchair control systems. The wheelchair may be controlled by the user or by commands sent from a smartphone linked to the Wi-Fi module. By allowing the old or unable to function independently, this eliminates the necessity for slaves. The wheelchair user is halted and warned if they fall out of it when an impediment is identified. The wheelchair also has vibration treatment to hasten the patient's recovery. An method based on neural networks can improve the performance of a voice-activated wheelchair.

[13] Deepak Kumar, et al. In this proposed systemThe authors developed a chair that functions as both a moving chair and a wheelchair using Location Track through the Global Positioning System (GPS) and Open Head mat using Pettier Transducer (with a foot mat during rainy days). A smart wheelchair that reacts to the weather and the handicapped person's varied moods is mentioned in this suggested system. The average wheelchair can't determine if the day will be bright or overcast. They have proposed a variety of aims in this study piece that are vastly different from those of a regular wheelchair. A typical wheelchair is unable to tell whether it is raining or not. The wheelchair we have, though, has sensors that can sense the weather. Foot mats automatically form when the roads are moist during the rainy season.

[14] Muneera T N, et al. In this proposed system, The primary goal is to allow the person using the wheelchair to operate it using only their voice. The suggested system also contains a treatment unit that will support the user's limbs and avoid numbness from prolonged slumber. The system has an obstacle sensor built in to look for anything in the path of movement. This method can stop enslavement and assist those with disabilities in moving independently. The suggested approach aids in both rehabilitation and movement for those with disabilities and handicaps. With the use of this device, handicapped people can do some therapies independently.

[15] Suvendu Prasad Sahu, et al. In this proposed system, The system supports the independence of elderly, physically challenged, and paralysed persons. It lessens the human effort required to achieve and identify the instruction for directing a wheelchair's movements using specific commands. Therefore, having a trained voice is all that is required to operate the wheelchair. Additionally, this project's development was done affordably and at a lower cost. This system is made up of an entirely new addition of electronic circuits, hardware design, and software expertise. The voice-activated, microcontroller-based smart wheelchair that is being suggested would increase convenience for the crippled. It also has the capability of spinning at a predetermined angle, which will be very helpful for the user while turning left or right.

[16] Satyavir Singh, et al. In this proposed system, For those with impairments, having a voice-activated microcontroller built into a wheelchair that speaks the local dialect might be beneficial. By eliminating accidents with objects, walls, and other people, this technology also increases the safety of wheelchair users in general and has a special ladder feature. The voice recognition circuit and the motor driver are in charge of managing the entire operation. This project has a biometric function that will increase user security a little bit. After that, it can focus on enhancing the wheelchair user's capacity to ascend stairs with different degrees of incline.

[17] Rashmi P, et al. In this proposed system, They discussed the voice-activated wheelchair and the implementation of health sensors for routine health checks. Investors are less affected by the fact that current smart wheelchairs require specialised training to understand how they operate. A touch-screen doctor consultations and health monitoring. The smart wheelchair's base is made up of Python software and a Raspberry Pi. To obtain variable speed mobility, utilise the "Bluedot" app. The exact health information is read by Arduino and sent to the Raspberry Pi. The web server for the live streaming is a raspberry pi. The data from the health monitoring is consistently provided to ThingSpeak. The caretaker will be immediately informed of any changes in the patient's health readings so that prompt medical attention can be given. This will guarantee that timely treatment will save lives.

[18] M. S. Arsha1, et al. In this proposed system, A voice-controlled wheelchair's main function is to carry out spoken orders. In addition to the common operational methods like a joystick or keypad, a cutting-edge web application will be made accessible for controlling the chair. This allows the

wheelchair user to control the wheelchair while seated in a room corner. The proposed concept employs state-of-the-art technology that can process voice in addition to managing motors, resulting in the utilisation of less hardware overall and lower costs. The risk of orders being heard by someone else is minimised when the user is using a dynamic microphone with a. The wheelchair may be moved in four different directions. By speaking orders like forward, reverse, left, right, and stop to the speech recognition module, the user may direct the movement of the model. A battery level indicator is also included in order to provide the battery level.

[19]Vijay Khare Jaypee, et al. In this proposed system, The system presents an automatic wheel chair using voice recognition. The circuit comprises of an Arduino, HM2007 Voice recognition module and Motors. The voice recognition module recognizes the command by the user and provides the corresponding coded data stored in the memory to Arduino Microcontroller. Arduino Microcontroller controls the locomotion accordingly. The wheelchair also has provision for joystick for physically disabled people who can move their hands. Over 95% of the commands were successfully carried out by the voice recognition system.

[20]Vishal Dalvi, et al. In this proposed system, A voice-activated wheelchair for the disabled has been designed and put into operation. It can learn and identify orders for managing the mobility of a wheelchair and other household appliances thanks to the switch control and speech recognition processor HM2007. The wheelchair's direction may now be altered using the appropriate voice commands or switches. This project has a lot of advantages, such as safety, comfort, energy efficiency, entire automation, etc. Therefore, all that is needed to operate the wheelchair is a trained voice. Future wheelchair designs will benefit from wireless networking inside the chair. By making this system stronger, we immediately raise the standard of living for the area's disabled population. The design of voice-activated household appliances and wheelchairs utilising embedded technologies is described in this system. For those with severe impairments, the proposed design provides voice activation with manual control and a switch. Electronic Control Module Voice recognizer processors (16F877A) and voice processors provided assistance for the wheelchair and home automation (HM2007). For dependability, safety, and comfort, this innovative gadget integrates voice control for a wheelchair with home automation.

[21] Kaushal Balu Karande, et al. In this proposed system, System offers a revolutionary method that does away with intricate ges of this technology include the removal of the Bluetooth module and the controlling system. As a result, a precise, affordable autonomous model that simplifies the process may be used. Thus, this article indicates that by directing the wheelchair using their voice, a design is offered in this study that is effective in assisting physically challenged persons without requiring their power and effort to move the wheelchair.

[22] Victor Achirgbenda, et al. In this proposed systemThe concept illustrates how a smart solar-powered wheelchair will respond to orders and be able to move over great distances thanks to the solar panel used for charging. In order to facilitate easy and convenient movement for people with quadriplegic issues, this paper focuses on achieving seamless control of a smart wheelchair via voice command and control buttons. This leads to the design of a pocket-friendly, environmentally friendly, and effective solar-powered wheelchair. The wheelchair, which is affordable, reacted to orders and, thanks to the solar panel for charging, is also capable of long-distance travel.

[23] Zannatul Raiyan, et al. In this proposed system, They developed a voice recognition system, microprocessor, and GSM module for location tracking in an autonomous wheelchair. The speech recognition and motor driver module will need to be positioned in the patient's most optimal posture, the wheelchair will need to be appropriately balanced, and more work will be necessary to make the design more compact. The wheelchairs' configuration has joystick controls that were created using speech recognition software. The design of the autonomous wheelchair system also incorporates a few extra features, such as obstacle detection for secure navigation and a GSM-based navigation system for tracking and sending alerts, to increase its utility. The wheelchair is used to realise the concept, coupled with relay-based motor controller circuits, Easy VR3 voice recognition module, SIM900A GSM module, Arduino Mega2560, and these parts.

[24] Ninad N Joshi, et al. In this proposed system, The project of building a real-time embedded system for a smart wheelchair was picked because of the embedded sensor that would be employed in it. In this research, they also aimed to make the robot interactive and as near to a person as possible. Most contemporary technologies employ sensors to capture interactive input. Additionally, they want thorough knowledge of the Ultrasonic Sensor's operation as well as the ability to quickly and effectively create projects that would benefit others. For some who have lost their ability to move, the gadgets are a blessing. These tools are very helpful when moving from one location to another. The devices can also be utilised in nursing homes for elderly people who have mobility issues. For some who have lost their ability to move, the gadgets are a blessing.

[25] Mr. Shivraj H. G, et al. This system's capabilities include the capacity to identify barriers, provide a few different types of treatments, and provide a notion of various regulating characteristics. Additionally, a joystick connected to an Arduino is identify obstacles. Additionally, the project's primary goal is to let paralysed persons walk freely as well as to ease their suffering so that they may quickly return to their regular lives. This last goal can be regarded as the project's unique selling point. The goal of this project was to build a motorised wheelchair with control systems for people who are crippled due to injuries to either their lower limbs alone or to both their lower limbs and their upper limbs, as well

as to offer certain therapeutic services to help them regain their stamina. The combination of the governing and therapeutic components makes up the entire system, which is regarded as the unique aspect of this endeavour.

III. CONCLUSION

The design and deployment of a voice-activated wheelchair for handicapped individuals are discussed in this study. The suggested method aids in movement for people who are crippled or handicapped and also offers vibration treatment to hasten the patient's rehabilitation. With the use of this device, handicapped people can do some therapies independently. The technology can detect impediments, which is something that a typical wheelchair cannot do. The created wheelchair has ultrasonic sensors built in for an autonomous obstacle detection system that will halt the wheelchair as soon as an obstruction unexpectedly blocks its path. When an obstruction is recognised, the wheelchair user is stopped and alerted if they fall out of it. As a result, those with physical disabilities may easily utilise the voice-controlled wheelchair, which also offers greater safety thanks to automated protection against contact with obstacles. The technology in use makes it easier for those who are physically impaired to live their lives and keeps them moving along with society.

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