Voice Controlled Smart Wheelchair For Physically Disabled Person

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Abstract: Physically challenged persons those who are suffering through different physical disabilities face many challenging problems in their day to day life for commutating from one place to another and even sometimes they need to have to be dependent on other person to move from one place to another. There have been many significant efforts over the past few years to develop smart wheel chair platforms that could enable the person for its ease of operation without any ambiguity. The main aim of our paper is to develop the smart wheel chair to make the life easier of physically challenged persons This voice-activated smart wheelchair has improved functions like voice control, electric power, queue following, obstacle avoidance, etc. The integrated AVR microprocessor ATmega328 smart wheel chair control unit also includes Bluetooth, GSM, ultrasonic, and infrared sensors, a temperature sensor LM35, and a motor driving circuit for managing the motor's speed.

Keywords: Arduino Uno ,LDR sensors ,LED, Bluetooth module ,Motor driver, ultrasonic sensors ,IOT.

I. INTRODUCTION

The wheelchair is the most frequently utilised piece of equipment among those who have lower limb disabled. Compared to people who have both upper and lower limb limitations, it gives them a certain amount of mobility freedom and independence. Nature with some available with motorized option. Anything beyond that is custom made which is costly and not within the reach of most people. People with severe lower and upper disabilities have to resort to costly electronic controlled wheelchairs or be totally dependent on another person to move them around in their manual wheelchairs. There are several expensive motorised wheelchairs on the market, however the majority of them do not accommodate those with upper limb disabilities. Instead, they are controlled by a joystick, softball, finger, tablet, chin, or head. The advances in speech recognition technology have made it possible to control any electronics-based device using voice command. This technology is capitalized for voice-controlled wheelchair to assist those with both upper and lower limb disabilities Another researcher has also created many voice-controlled wheelchairs.

II. LITERATURE SURVEY

His project, Automated Wheelchair with Voice Recognition System, is intended for people who are physically unable to use even their hands. So, using simulations in the Proteus design suite software, we created an autonomous wheelchair with voice control. Additionally, this wheelchair uses sensors to identify impediments, uses sensors to balance the chair on busy highways, and uses a global system for mobile communication (GSM) to alert a responsible party if the patient is in danger. The automated wheelchair will be built using a few little gadgets, including sensors, an Arduino board, a VR3 module, a GSM module, and more. To operate the autonomous wheelchair, the user does not need to wear any sensors or other devices. The user only needs to command clearly with their voice (Left or Right) then it will move automatically to left or right. The novelty of the research is to help certain people live a life with less dependence on others for their movement in daily life. Where the user only needs to command clearly with their voice[1].

Smart Wheelchair for Physically Challenged People , ccording to the World Health Organization (WHO), in the world population, there around 70 million people who requires the need for wheelchairs, yet only 5-15% have access to it. The wheelchair we developed here is very cost effective and aids the people who are disabled and physically challenged. The wheelchair allows them to maneuver around their surrounding with ease without the intervention of another person, allowing them to be independent[2]. Towards Developing an Intelligent Wheelchair for People with Congenital Disabilities and Mobility ImpairmentPhysical disability in people may be either congenital or acquired. . In both situations, the disabled person needs a mobility aid for both inside and outdoor environments. The wheelchair is the most popular type of aid used to help the disabled. In this study paper, we demonstrate a wheelchair that we developed and prototyped to help people with different mobility problems. Both voice commands and manual controls using a joystick are supported. People with a variety of motor impairments are unable to operate a wheelchair and must find alternative

means of control. This is why the wheelchair has a voice control system that may be customised and is set to Bengali by default. Along with this, the provision of continuous monitoring is also present for ease of caregivers to locate the user when help is asked or the caregiver is unable to be physically present with the user. Other features such as obstacle detection, speed control on ramps, lighting up of the headlight in dark environment[3]
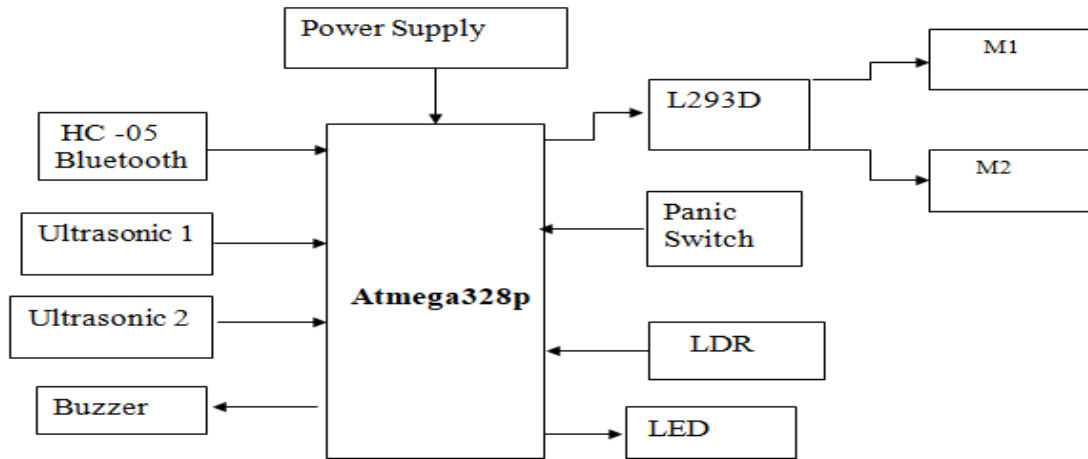
III. VOICE CONTROL SYSTEM

Figure: System Architecture

1.Atmega328P microcontroller controls all the operations, it takes input from the sensors and perform the specific task which has to be assigned.
2.HC-05 Bluetooth module is used to control the wheelchair directions wirelessly or remotely
3.L293d motor driver is used to drive DC motors which can be operates on 12V power supply
4.LDR sensor used to detect the light or dark, if dark seen automatically the Bright LED will turn ON to avoid any collisions.
5.Two ultrasonic sensors used to detect any type of obstacle to avoid collisions.

IV.FLOW CHART:
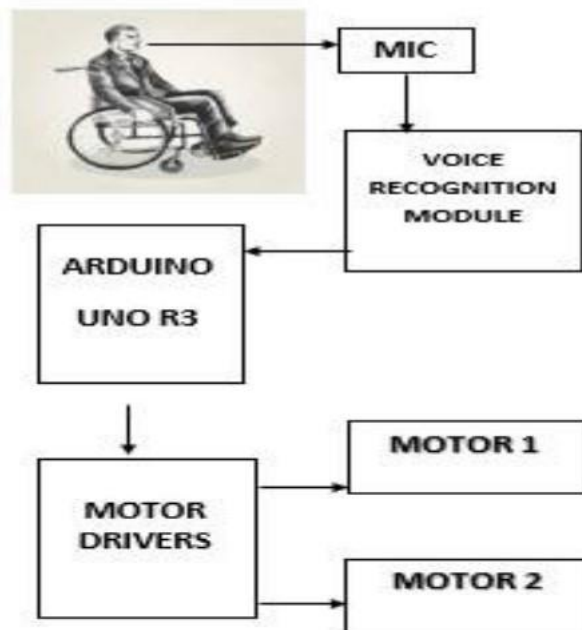
1]The different directions of motions possible are: forward, backward, left, right and stop. In achieving the task, the controller is loaded with program using the Arduino programming language and Arduino development environment. § First make sure Bluetooth module is paired with the android mobile. The pairing password is "1234" or "0000" by default.

2] When a user speaks "GO," the AMR Voice application transmits a string of data to the Bluetooth module affixed to the circuit in the form of "*GO#."

3]When microcontroller detects "GO", the motor attached to the wheelchair moves FORWORD.

4]The AMR Voice application delivers data in the form of the string "*BACK#" to the Bluetooth module attached to the circuit when the user says "BACK." The motor connected to the wheelchair goes REVERSE when the microcontroller senses "BACK."

5]The Bluetooth module attached to the circuit receives data in the form of the string "*LEFT#" when the user says "LEFT" using the AMR Voice application. The wheelchair's motor is moved to the LEFT side by the microcontroller when it recognises the word "LEFT."

6]The Bluetooth module attached to the circuit receives the data in the form of the string "*RIGHT#" when the user says "RIGHT" using the AMR Voice application. When a "RIGHT" signal is detected by the microcontroller, the wheelchair's RIGHT side motor is moved.

7]When the user says "STOP" button which is in the Centre of remote the AMR Voice application sends the data in form of string "*STOP#" to the Bluetooth module connected to the circuitWhen a "STOP" signal is detected by the microcontroller, the wheelchair is stopped.

To unpair the connected Bluetooth module, click the "DISCONNECT" button.

V.COMPONENTS

1] Atmega328p : Atmel's single-chip microcontroller in the meagre family is the Atmega328. It has an 8-bit RISC processing core with a modified Harvard architecture. The 8-bit AVR-based microcontroller from Atmel includes a serial programmable USART, a byte-oriented 2-wire serial interface, an SPI serial port, a 6-channel 10-bit A/D converter (8 channels in TQFP and QFN/MLF packages), programmable watchdog timer, 1 KB EEPROM, 2 KB SRAM, 23 general-purpose I/O lines, 32 general-purpose working registers, 3 flexible timer/counters with compare modes The device's operating voltage range is 1.8 to 5.5 volts. Throughput on the device is close to 1 MIPS/MHz.

2] Ultrasonic sensor: An ultrasonic sensor is a piece of technology that uses ultrasonic sound waves to detect the separation between a target object and itself and then turns the reflected sound into an electrical signal. Compared to audible sound, ultrasonic waves move more quickly. There are two primary parts to ultrasonic sensors: the transmitter. The main application of ultrasonic sensors is as proximity sensors. Self-parking automotive technology and anti-collision safety features contain them. In robotic obstacle detection systems, ultrasonic sensors are also employed.

3] Buzzer: A buzzer or beeper is a mechanical, electromechanical, or piezoelectric (short for piezoelectric) auditory signalling device. Buzzers and beepers are frequently used as alarm clocks, timers, train horns, and to validate human input such a mouse click .

4] L293D (Motor Driver): An integrated circuit chip known as a motor driver is typically used to operate motors in autonomous robots. An Arduino and the motors are connected by a motor driver. The L293 series of ICs, including the L293D, L293NE, and others, are the most often used motor driver ICs. These ICs are made to manage two DC motors at once. Two H-bridges make up L293D. The simplest circuit for managing a motor with a low current rating is an H-bridge. The motor driver IC will just be referred to as L293D. 16 pins make up L293D.

5] Switch(pushbutoon): A push button switch is a mechanical device that uses manual pressure to activate an internal switching mechanism in order to regulate an electrical circuit. Depending on the needs of the design, they are available in a number of forms, dimensions, and arrangements.

6] LDR Sensor: When it's required to detect the presence or intensity of light, electronic circuit designs frequently include light dependent resistors, also known as LDRs or photo resistors. The carbon film resistor, metal oxide film resistor, metal film resistor, and similar resistors that are frequently used in other electronic systems are very different from LDRs. They are made expressly for the change in resistance caused by their light sensitivity.

7] LED: A semiconductor light source called a light-emitting diode (LED) produces light when current passes through it. Energy in the form of photons (Energy packets) is produced when electrons in the semiconductor recombine with electron holes. The energy needed for electrons to pass through the semiconductor's band gap determines the colour of the light, which corresponds to the energy of the photons. Multiple semiconductors or a coating of light-emitting phosphor on the semiconductor device are used to create white light.

8] DC motor: Any rotating electrical motor that uses direct current (DC) to produce mechanical energy is referred to as a DC motor. The majority of types rely on the magnetic field's forces. For a portion of the motor's current to occasionally shift direction, almost all types of DC motors contain an internal mechanism that is either electromechanical or electronic.

VI.SOFTWARE REQUIREMENTS

Arduino IDE: It is simple to write code and upload it to the board using the free and open-source Arduino Software (IDE). Any Arduino board can be used with this software.

VII.RESULT
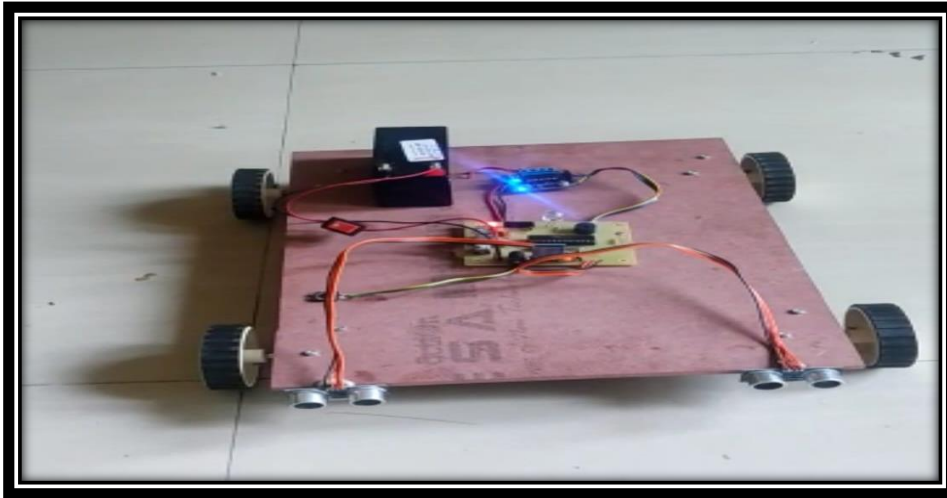
VIII.CONCLUSION

With the aid of a Bluetooth module, this project elaborates on the design and building of a smart electronic wheelchair. The circuit works properly to move as the command given by the user. After designing the circuit that enables physically disabled to control their wheel using an android application in their smartphones and it has also been tested and validated. The microcontroller successfully manages the detection of any obstruction. Any barrier that is anticipated to be within a range of 4 metres will be recognised by the Ultrasonic sensor as soon as the person turns on the circuit and begins moving. This proposed system contributes to the self-dependency of differently abled and older people.

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