

Voice Controlled Smart Wheel Chair for Physically Disabled Person

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ABSTRACT - As the usage of the Android smart phones has been considerably increasing, a lot of applications have been developed for the benefits of mobile users. In the past, many applications have been designed aiming to help physically disabled persons. This project presents an android application which provides several options for controlling the movement of wheelchairs effectively. The proposed application enables People with Disabilities (PWDs) to operate the wheel chair with minimum effort. Apart from voice commands, the proposed application detects and measures the tilt change, and moves the wheelchair based on the degree of the tilt. It also provides a soft joystick as in mobile games to ease the operation of the wheelchairs. Furthermore, sensors that are fixed in the wheelchair can detect and avoid obstacles when the chair is on the move. Hence, it ensures the safety while using the wheelchairs. The proposed application will help both physically challenged persons and elders to operate the wheelchairs more comfortably.

1 INTRODUCTION

The wheelchair is the most ubiquitous equipment used by people with lower limb disability. It enables them some degree of freedom in mobility and independence as opposed to those with both upper and lower limb disabilities. Most of the wheelchairs available in the market are manual in 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. Motorized wheelchairs controlled through joystick, softball, finger,

tablet, chin and head are readily available at a high cost but most of them do not cater for those with upper limb disability. 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. A variety of voice controlled wheelchairs have also been developed by other researcher.

2 LITERATURE SURVEY

Akter; Md. Ashikur Rahman; Ummay Afrina Jahan Sutapa; Md. Rifat Shahriar; Shishir Roy; K. M. Sazzad Ibne Sayed ,Automated Wheelchair with Voice Recognition System , his research is established for those patients who are physically disabled and cannot even move their hands. So, we generally designed an automated wheelchair with voice control through simulations in the Proteus design suite software. This wheelchair also detects obstacles through sensors, balances the chair on critical roads with the help of sensors, and sends a notification to a responsible person through a global system for mobile communication (GSM) if the patient is in a dangerous situation. Some small devices, such as Arduino, VR3 module, GSM, and sensors, will be used to design the automated wheelchair. The user doesn't need to wear any external device or sensor to control the movement of the automatic wheelchair. 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.

- 2022 International Conference on Electrical, Computer and Energy Technologies (ICECET) Year: 2022 | Conference Paper [1]

Petson Varghese Baiju; Kevin Varghese; Jacob Mathew Alapatt; Sanjo Jame Joju; K. Martin Sagayam , Smart Wheelchair for Physically Challenged People , according 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.

- 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS) [2]

Tasneea Hossain; Md Sabbir-Ul-Alam Sabbir; Asma Mariam; Toki Tahmid Inan; Muhammad Nazrul Islam; Khairul Mahub; Towards Developing an Intelligent Wheelchair for People with Congenital Disabilities and Mobility Impairment Physical disability in people may be either congenital or acquired. In either cases, the disable person requires an aid for movement in both indoor and outdoor environment. The most common form of assistance to provide support to the disabled is the wheelchair. In this research paper, we are presenting our prototyped and developed wheelchair that is designed to provide assistance to various types of mobility impairments. It has the provision for both - voice commands as well manual controls via a joystick. People suffering from various motor disorders are incapacitated and thus, need to use other ways to control the wheelchair. For this reason, the wheelchair includes customizable voice control system which is Bengali by default. Along with the modes of controls, the wheel chair incorporates a feature that can be used for asking

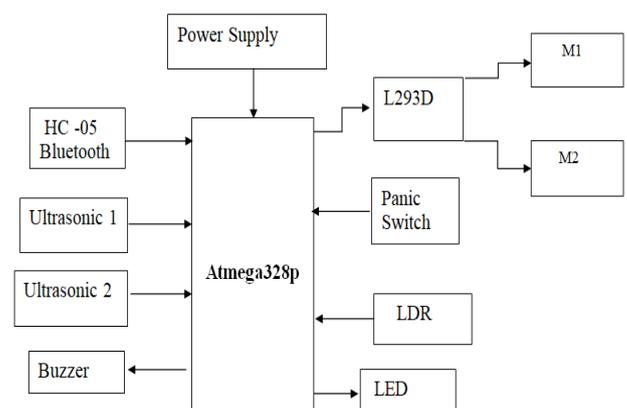
help in case of a necessity. Thus informing a relative or caregiver has been simplified which notifies them if the user is in need. Along with this, the provision of continuous monitoring is also present for ease of caregivers to locate the user when help is asked or the caregiver is unable to be physically present with the user. Other features such as obstacle detection, speed control on ramps, lighting up of the headlight in dark environment,

- 2019 1st International Conference on Advances in Science, Engineering and Robotics Technology (ICASERT) [3]

3 METHODOLOGY

In this project Android application is connected to the wheel chair via Bluetooth. For connection the HC-05 module is used inside Microcontroller. The figure 4.1 shows the system architecture which defines the actual working of system. We have provided the IR sensors which helps to avoid accidents happens due to any obstacle. User can use two features provided in application either Voice or Touch mode and these commands will be forwarded to the Microcontroller mounted on wheel chair via Bluetooth. We have used battery as power supply which helps to accommodate large distance.

4. BLOCK DIAGRAM



Description:

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

COMPONENTS

1. Atmega328p :- The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8bit RISC processor core. The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general-purpose I/O lines, 32 general-purpose working registers, 3 flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8 channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and 5 software-selectable power-saving modes. The device operates between 1.8 and 5.5 volts. The device achieves throughput approaching 1 MIPS/MHz.

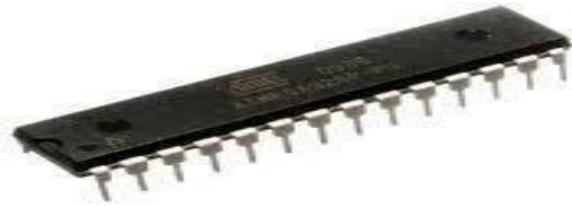


fig:1 Atmega328p

2 Ultrasonic sensor :-

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

Ultrasonic sensors are used primarily as proximity sensors. They can be found in automobile selfparking technology and anti-collision safety systems. Ultrasonic sensors are also used in robotic obstacle detection systems, as well as manufacturing technology. In comparison to infrared (IR) sensors in proximity sensing applications, ultrasonic sensors are not as susceptible to interference of smoke, gas, and other airborne particles



Fig:2 Ultrasonic sensor

3 Buzzer :-

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke.



Fig:3 Buzzer

4 L293D (Motor Driver) :-

A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver act as an interface between Arduino and the motors . The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. We will be referring the motor driver IC as L293D only. L293D has 16 pins.



Fig 4: L293D (Motor Driver)

5 Switch(pushbutton)

push button switch is a mechanical device used to control an electrical circuit in which the operator manually presses a button to actuate an internal

switching mechanism. They come in a variety of shapes, sizes, and configurations, depending on the design requirements.



Fig: 5 Switch(pushbutton)

6 LDR Sensor

Light dependent resistors, LDRs or photo resistor are electronic components that are often used in electronic circuit designs where it is necessary to detect the presence or the level of light. LDRs are very different to other forms of resistor like the carbon film resistor, metal oxide film resistor, metal film resistor and the like that are widely used in other electronic designs. They are specifically designed for their light sensitivity and the change in resistance this



causes.

Fig 6: LDR sensor

7. DC motor:-

A DC motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.



Advantages

- This voice controlled system make them more independent.
- Powered wheelchairs with the standard joystick interface are unable to be control by many people.
- A voice controlled wheelchair can provide easy access for physical disabled person who cannot control their movements especially hands.

CONCLUSIONS

As the number of people with disabilities has been constantly increased, there is need to develop different assistive tools for those people. Perhaps, many software applications have been developed and used by the people who are deaf, hearing impaired, blind or language disorders and paralyzed. In this project, a new android application is designed to assist the physically challenged people. The proposed application controls the wheel chair through voice commands and gesture moves. As the application does not need any additional accessories, it is easy to operate. Perhaps, it provides multiple interfaces that are customizable and better speed control. It makes the life of both PWD and elderly people easier

APPLICATION

- Wireless controlled robots are very useful in many applications like remote surveillance, military etc.

- Android App controlled robot can be used by physically challenged in wheelchairs.
- Android App controlled industrial grade robotic arms can be developed.

FUTURE SCOPE

- Voice recognition module is used to develop the voice recognition system. Voice recognition issues a Command to control the movement of wheelchair. For movement of wheelchair Microcontroller Atmega and DC motor circuit were built. For not to occur disorder during recognize the user voice, this system works in a quiet environment. Furthermore, the pronunciations accuracy must be ensured and the word-related (voice) the users voice must clear in short distance on microphone was essential in this innovation
- Using gear box we can produce high speed moving wheelchair.
- PWM modulation can also increase speed.
- Solar Panel can also be used to charge the battery for power supply to the components required to drive the wheelchair.
- The wheelchair can also include the gesture feature to operate the wheelchair
- Wheelchair only can function properly when the weight of the load for this system must be below 50 kilogram. Obstacle avoidance sensors are used.

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