International Journal of Engineering Inventions
e-ISSN: 2278-7461, p-ISSN: 2319-6491
Volume 12, Issue 5 [May. 2023] PP: 95-98

Automated Voice and Gesture Control of Wheelchair for Physically Challenged People Using IOT

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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 wheelchair platforms that could enable the person for its ease of operation without any ambiguity. The main aim of our project is to develop the smart wheelchair to make the life easier of physically challenged persons. This smart wheelchair comes with enhanced features like voice control, Gesture control, Location sharing etc.

Key Words: *Arduino microcontroller, Smart wheelchair, Voice control and Gesture control.*

Date of Submission: 28-04-2023 Date of acceptance: 07-05-2023

I. INTRODUCTION

In today's world there are many disabled persons who find it difficult to perform movements or perform daily activities. These types of persons are mainly dependent on others for their assistance. But they can become self-independent and perform some daily activities on their own with the help of assistive devices. The most widely used assistive devices are Wheelchairs. Wheelchairs is basically a chair fitted with wheels, which can help people move around who cannot walk because of illness, disability or injury. But there are many disabled people with weak limbs and joints who cannot move the wheelchair. Thus, smart wheelchair can benefit a lot to them and everyone in society. Smart wheelchairs are electric powered wheelchairs with many extra components such as a computer and sensors which help the user or guardian accompanying wheelchair to handle it easily and efficiently. The recent development in the field of Artificial Intelligence, sensor technologies and robotics help the growth of wheelchairs with new features.

Smart wheelchairs have been greatly considered over power wheelchair. Power wheelchairs are traditional/manual wheelchair with battery or electric supply to power them. They largely lack functionalities and safety features. Unlike this, smart wheelchair has functionalities and safety features. This Smart wheelchair consists of microcontroller, which is responsible for the movements of the wheelchairs with help of inputs from the sensors like Accelerometer sensor, GPS module, and Bluetooth module. These sensors collect the data through the input from environment and that data is processed by Arduino microcontroller and necessary action are taken. And it has gesture alert messages system through which alert messages can be sent to the caretaker. This Smart wheelchair can be also controlled manually by the user just like normal electric powered wheelchair.

II. RELATED WORK

Sudipta Chatterjee, Sahadev Roy et al [1] The proposed MCW can also be controlled using either joystick or voice command or finger movement or through mobile app or a combination of all. This system uses multiple sensor networks to measure the terrain condition, users command and translate it into control action.

Ms. Cynthia Joseph, Aswin S, Sanjeev Prasad J et al [2] This paper is based on a design that aids the voice activation system for physically disabled people by incorporating manual operation. Arduino microcontroller and voice recognition have been used to support the movement of the wheelchair. The wheelchair does not respond to an incorrect speech command. Depending on the direction given through voice and gesture, the Arduino controls the wheelchair directions.

Jigmee Wangchuk Machangpaa, Tejbanta Singh Chingtham et al [3] We have developed a Robotic Wheelchair for the quadriplegic patients for mobility assistance operated using the head gesture. The Robotic Wheelchair includes accelerometer sensor, gyroscope sensor, ultrasonic sensor, relay, battery, DC stepper motor and raspberry pi. The MPU 6050 sensor detects the movement of the head and the signal is transmitted to the Pi. The controller processes the signal and enables the motion of wheelchair for its navigation. The ultrasonic sensors help to avoid obstacles, using the environment information gathered during navigation.

Ananda Sankar Kundu, Oishee Mazumder, Prasanna Kumar Lenka, Subhasis Bhaumik et al [4] This paper presents a hand gesture-based control of an omnidirectional wheelchair using inertial measurement unit (IMU) and myoelectric units as wearable sensors. Seven common gestures are recognized and classified using shape-based feature extraction and Dendrogram Support Vector Machine (DSVM) classifier. The dynamic gestures are mapped to the omnidirectional motion commands to navigate the wheelchair. A single IMU is used to measure the wrist tilt angle and acceleration in three axis.

III. PROPOSED SYSTEM

The hardware of the proposed system consists of Accelerometer sensor, GPS module, Bluetooth Module, IoT module, Arduino uno,12 V to 5 V voltage regulator,2- channel relay module, DC motor and Battery. Here the Arduino uno microcontroller is the control unit. The input signal are from Accelerometer sensor, GPS module, Bluetooth Module, IoT module and corresponding output signal is given to the relay module. In this we have used two relay module each for left and right DC motor which is fixed to the left and right wheels of the wheelchair. Here 12V Battery is used as power source using 12V to 5V voltage regulator 5V supply is given to Arduino and Relay is operated at 12 V battery source.

The coding for the functioning of the prototype is done using Arduino IDE. The Arduino Software (IDE) contains a text editor to write code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with the hardware.

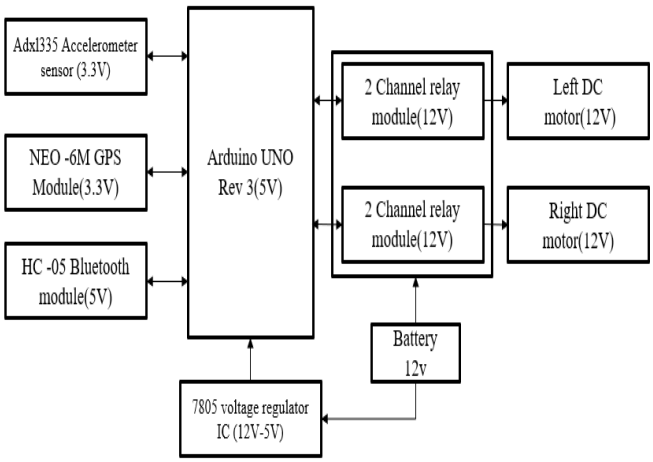

Fig.1. Block diagram of proposed system.

IV. RESULTS AND DISCUSSION

To begin with the user must set the control mode of wheelchair. Gesture control is done by Accelerometer sensor the input signal is processed and is transferred to the Arduino Uno board. Arduino translates the instructions into commands which can be recognized by the motors to control the direction of movement of the prototype. For voice control the respective action for the commands by user is done through Arduino. Also this wheelchair can be controlled by the default controller keys designed. Fig 2 shows the voice control and keys control.

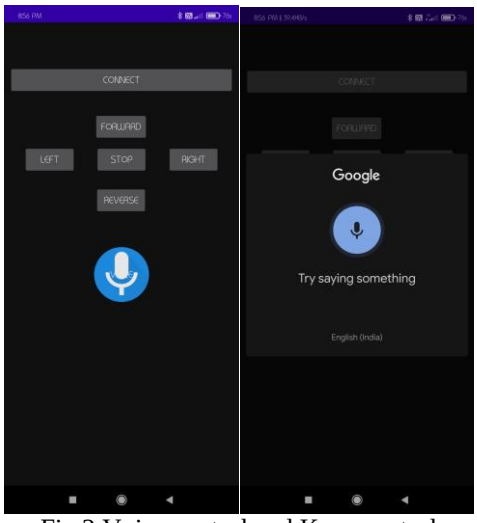

Fig.2.Voice control and Keys control

It has gesture alert message system through which the user can communicate their caretaker in emergencies. Fig 3 shows the gesture alert message system.It also shares it location.

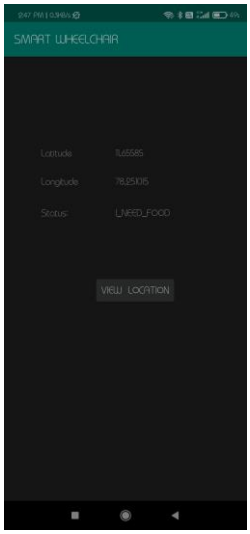

Fig.3.Gesture alert message system

Fig 4 shows the hardware arrangement of the prototype. The setup includes an Accelerometer sensor, Bluetooth module, power supply, LCD display, Arduino Uno board, and a motor driver etc. These components are integrated to construct the prototype.

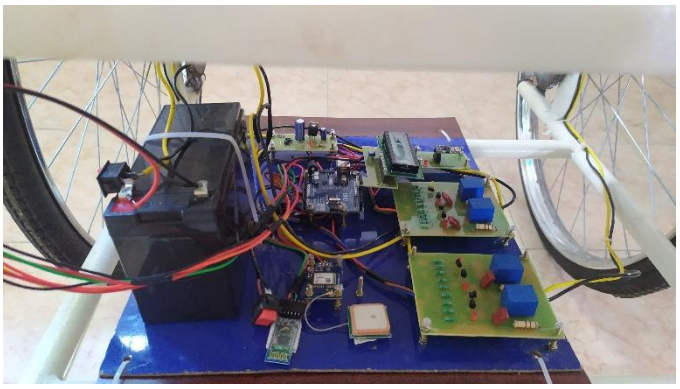

Fig.4.Prototype arrangement

Fig.5.Smart Wheelchair

V. CONCLUSION

The proposed method explains the design and construction of Automated Voice and Gesture Control of Wheelchair for Physically Challenged People Using IoT. The model works in accordance with the commands given by the user. The model aids physically challenged people to control their wheelchair using an android application in their smartphones. As the person switches ON the prototype, it starts moving according to the commands given by the user. The proposed system is contributed differently abled and older people for their self-dependency.

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