# Wheelchair that Converts into A Bed with Safety System

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**Abstract - The creation of a voice-activated, joystick-controlled, smart wheelchair with bed-like conversion is done. On the Android Smartphone, Bluetooth application is installed. Joystick mode and voice recognition mode are the two major operating divisions of the system. The user may speak commands like "Move Forward", "Go Back", "Turn Left", "Turn Right" and "Stop" for the speech recognition mode. Moreover, voice commands like "Light On", "Light Off", "Fan On" and "Fan Off" can be used to manage home appliances remotely. In response to the user's commands, the wheelchair will move. Users can choose the designated direction for the joystick mode. To carry out all commands, an Atmega328p is used. This system makes use of the HC05 Bluetooth module, L293D motor driver, Accelerometer.**

**KEYWORDS: Voice Mode, Joystick, Home Appliances, Atmega328p, Bluetooth module-HC05, L293D Motor driver, Accelerometer.**

## I. INTRODUCTION

Due to sickness or accidents, many people have a temporary or permanent disability. The use of a wheelchair is highly essential in situations when walking is difficult or impossible. For the majority of low- and medium-level physical disability cases where

## II. OBJECTIVE

1. The primary goals of this project are to increase patient comfort, lower costs and the amount of space needed, and increase system efficiency.
2. The goal is to create a functional prototype of a smart assisted wheel chair.
3. To enhance older people's stability and positive balance.
4. To lighten the load on those who push the wheelchair.
5. Effortlessly changes from the sitting position to the sleeping position. Easy accessibility to several areas.

## III. METHODOLOGY

The Atmega328p microcontroller, relay modules, Bluetooth module, DC motor, motor driver L293D, and batteries are used in the design and construction of this project.
Accelerometers are furthermore utilized to track the patient's mobility. The primary element and brain of our system is the battery. The 12-volt battery is utilized here.
In addition, the wheelchair with joystick control was the first to be created. An intelligent product is one like the voice-activated wheelchair. An application for voice control has been installed on an Android Smartphone. Following that, the user may use an Android Smartphone to enter voice instructions. The Android Smartphone will convert the spoken commands into a string of data that will be sent to the Bluetooth module and subsequently the Atmega328p microcontroller [10].

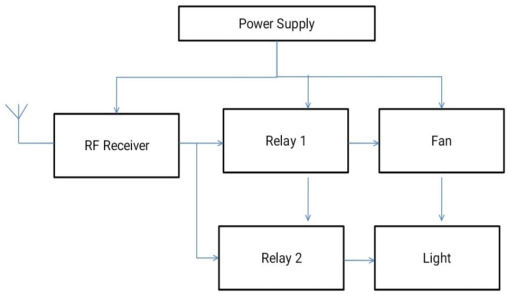


Fig 1.1: Block Diagram

**A.** Hardware Implementation & Design

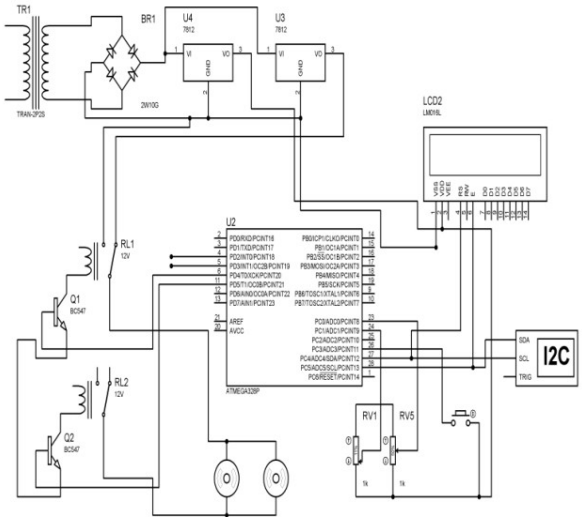


Fig 2: Circuit Diagram

The L293D is a 16-pin motor driver IC that has the ability to concurrently operate two DC motors in either direction. The L293D is made to deliver bidirectional driving currents up to 600 mA (per channel) at voltages between 4.5 V and 36 V.

The Microcontroller sends signals to the L293D IC, which then delivers the appropriate signal to the motors. It has two voltage pins, one of which is used to apply power to the motors and draw current for the L293D to function [9].

## IV. HARDWARE REQUIREMENTS

*A. Atmega328p Microcontroller*

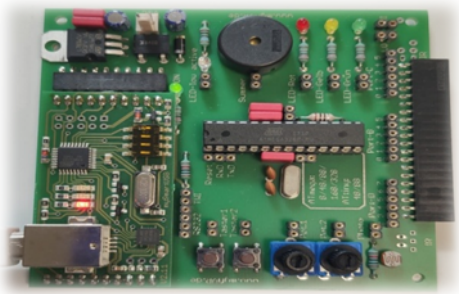

Fig 3: Atmega328p Microcontroller

One of the high-performance AVR technology microcontrollers with a lot of features and pins is the ATmega328P [9].

- The device's operating voltage range is between 1.8 and 5.5 volts. 8-bit core size.
- Maximum speed of 20MHz.
- Number of I/O: 23.

- 14 digital I/O pins are available (6 PWM outputs)
- 6 Analog inputs

***B. Motor Driver - L293D***

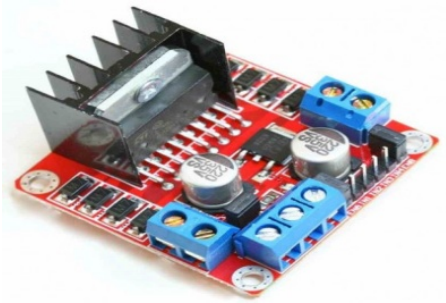

**Fig 4: L293D Motor Diver Module**

***Voice control***

The result are as follows:

| S.NO | SPEECH | CHARACTER SENT |
|---|---|---|
| 1 | Move forward | "F" |
| 2 | Go Back | "B" |
| 3 | Stop | "S" |
| 4 | Turn Left | "L" |
| 5 | Turn Right | "R" |
| 6 | Light On<br>Light Off | "A"<br>"X" |
| 7 | Fan On<br>Fan Off | "C"<br>"D" |

## VI. MODEL FIGURE

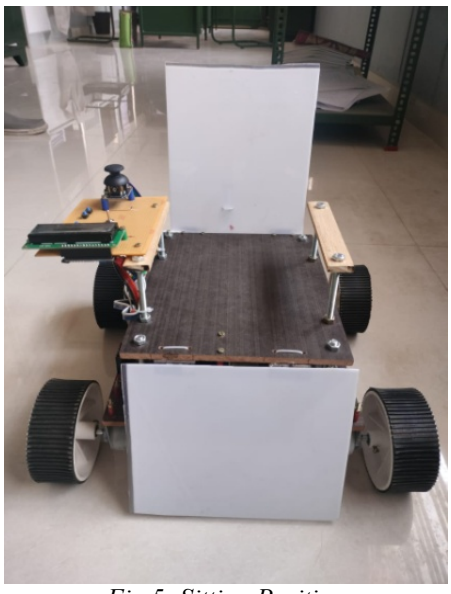

*Fig 5: Sitting Position*

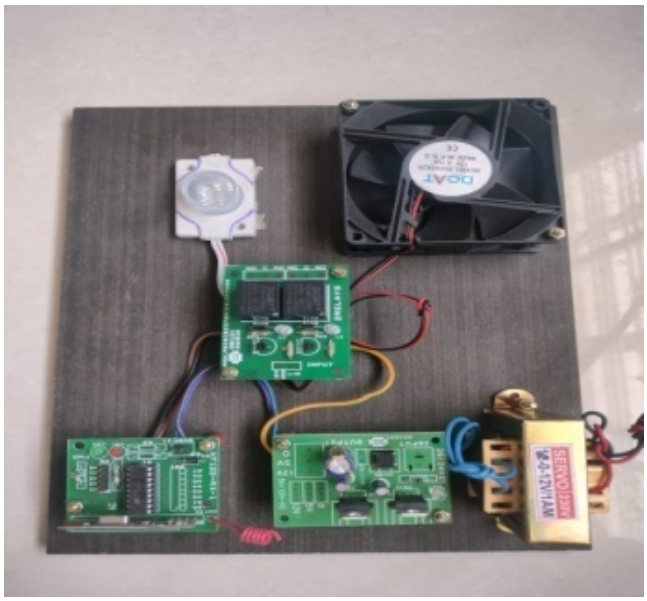

*Fig 6: Fan & Light Control*

Patients can use the wheelchair independently, manual or electrical wheelchairs are satisfactory.

For the majority of low- and medium-level physical disability cases where patients can use the wheelchair independently, manual or electrical wheelchairs are satisfactory yet, using wheelchairs independently might be challenging or impossible in severe circumstances. Wheelchair users in these situations frequently rely on someone else to handle the wheelchair since they lack autonomous movement. Wheelchairs are the ideal assistive gadgets to help the growing population of elderly and physically challenged persons improve their personal mobility [6].

In an effort to improve the quality of life for people with disabilities using automated technology, several scientists and organizations have been investigating the design of various products.

A scarcity of beds frequently develops during epidemics or when there is a significant increase in the number of hospital patients. We created a wheel chair that transforms into a bed in order to solve this issue. This wheelchair's design allows it to be transformed into a bed or a wheelchair as needed. People with disabilities spend a lot of time relaxing on their beds. After that, the microcontroller will process and decode it. The wheelchair's motor driver will operate it in accordance with the instructions. When the user speaks "Move forward," the wheelchair will travel ahead; "Go back" makes it move backward; "turn left" causes it to turn left; and "turn right" causes it to turn right; “Light On”, the light will be On; “Light Off “, the light will be Off; “Fan On”, the fan will be On; “Fan Off”, the fan will be Off through Bluetooth module [2]. An accelerometer is used to measure the wheelchair's tilt angle. The buzzer will sound when the wheelchair angle is either greater than 45 or less than 100.A transmitter and a receiver are combined in this RF module. The 433 MHz frequency is used by the transmitter and receiver (TX/Rx) pair.

The joystick can be used to manually control the wheelchair's movement. The command is carried out using a joystick before being transmitted to the Atmega328p, which will carry out the instruction's processing. After processing, the controller sends a digital signal order to the motor driver, who in turn controls the movement of the two DC motors.

MPU6050 is essentially a motion processing device sensor. It was created for high-performance, low-cost wearable sensors, tablets, and smart phones. It simultaneously records motion in the X, Y, and Z axes. For communication with the Atmega328p microcontroller, this module uses the I2C module.

The MPU6050 costs less. It is made up of hardware that is a 16-bit analogue to digital converter. This feature allows it to simultaneously capture three-dimensional motion

## V. RESULT & DISCUSSION

All the programming is done by the Arduino IDE and the program is loaded into the microcontroller .Control of the wheelchair is facilitated via the joystick and voice mode. The desired output is obtained once all components have been connected in accordance with the circuit schematic. Our project was accomplished successfully. An Atmega328p microcontroller, a joystick, Bluetooth-HC05, an L293D motor driver, a DC motor, a 12V battery, and an RF transmitter and receiver were all used in our project.

Fig 7: Resting Position

## VII. CONCLUSION

For those who are physically unable to walk, wheelchair is built so that they may simply operate it with their hands by using joystick. The speech recognition control wheelchair, however, can address this problem for those individuals who are unable to move their legs as well as their hands. An accelerometer sensor is included to track human movement. The nurse or assistant to handle the patient with ease. The difficulties that patient' bodies face when switching from a wheelchair to a bed or vice versa are diminished or eliminated.

## REFERENCES


[1]. Deepak Kumar. Reetu Malhotra, S.R Sharma, "Design and Construction of a Smart Wheelchair" ScienceDirect (2020).

[2]. Harsh Vora, Aime Gupta, Chintan Pamnami, Tushar Jaiwal, "Multimodal Smart Wheelchair Integrated with Safety Alert System" International Journal of Engineering and Advanced Technology. Volume-9 Issue-4, April 2020.

[3]. Mohammed Hayyan Alsibai, AI Sibai, Sulastri Abdul Manap, "A Study on Smart Wheelchair System" International Research Journal of Engineering and Technology.Vol.4 (1) December 2015.

[4]. Ramadas E R, Krishna Sagar, "Design and Fabrication of Wheelchair Cum Stretcher" International Journal Of Engineering Research & Technology. Volume 11, Issue 08(Aug 2022).

[5]. Renuka K, Harini R, Balaji V, "Raspberry Pi based Multi-optional Wireless Wheelchair Control and Gesture Recognized Home Assist System" OP Conf.Series: Materials Science and Engineering-2021.

[6]. Sandeep Kumar, Gautam Sahni, Gaurav Kaintura, Alok Thapliyal, Nirmal Bisht, Vikas Bijalwan, Gurpreet Singh, Department of Mechanical Engineering, "Fabrication of Collapsible Chair Cum Bed Model An Engineering Approach" International Journal of Scientific & Engineering Research Volume 9, Issue 8, Augsut-2018.

[7]. Saurabh Jambhulkar , Nageshan Ramteke , Sagar Prajapati, Adesh Nitnaware ," Design and Fabrication of Wheelchair Cum Stretcher with Suspension" International Journal of Scientific Research and Review. Vol 8, Issue 3, 2019.

[8]. SK Samim Akhtar, Rajendra Prasad Nayak, Srinath Kumar Tripathy, "Smart Home Automation System for Physically Challenged and Elderly Care People on IOT" Pramana Research Journal.

[9]. Sirisha P, Prakash Bethapudi, Ratna Meghana M, Yamini, Neveena Lakshmi E, "Wireless Smart Wheelchair" International Journal Of Creative Research Thoughts. Volume 8, Issue 5 May 2020.

[10]. Trinayan Saharia, Jyotika Baural, Chayanika Bhagabati, "Joystick Controlled Wheelchair" International Research Journal of Engineering and Technology (IRJET). Volume:04 Issue: 07| July – 2017.

[11]. Yassine Rabhi, Mrabet, Farhat Fnaiech, "Intelligent Control Wheelchair Using a NewnVisual Joystick" Journal of Healthcare Engineering 2018(3):1-20.

[12]. **C.Nagarajan** and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - ***Journal of ELECTRICAL ENGINEERING,*** Vol.63 (6), pp.365-372, Dec.2012.

[13]. **C.Nagarajan** and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- ***Springer, Electrical Engineering*****,** Vol.93 (3), pp.167-178, September 2011**.**

[14]. **]C.Nagarajan** and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- ***Taylor & Francis, Electric Power Components and Systems*****,** Vol.39 (8), pp.780-793, May 2011.

[15]. **]Nagarajan** and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- ***Iranian Journal of Electrical & Electronic Engineering***, Vol.8 (3), pp.259-267, September 2012.

[16]. G.Neelakrishnan, K.Anandhakumar, A.Prathap, S.Prakash "Performance Estimation ofcascaded h-bridge MLI for HEV using SVPWM" Suraj Punj Journal forMultidisciplinary Research, 2021, Volume 11, Issue 4, pp:750-756

[17]. G.Neelakrishnan, S.N.Pruthika, P.T.Shalini, S.Soniya, "Perfromance Investigation of T-Source Inverter fed with Solar Cell" Suraj Punj Journal for Multidisciplinary Research,2021, Volume 11, Issue 4, pp:744-749

[18]. G.Neelakrishnan, P.Iraianbu, T.Abishek, G.Rajesh, S.Vignesh, "IOT Based Monitoringin Agricultural" International Journal of Innovative Research in Science, Engineering andTechnology, March 2020, Volume 9, Issue 3, pp:814-819

[19]. G.Neelakrishnan, R.S.Jeevitha, P.Srinisha, S.Kowsalya, S.Dhivya, "Smart Gas LevelMonitoring, Booking and Gas Leakage Detector over IOT" International Journal ofInnovative Research in Science, Engineering and Technology, March 2020, Volume 9,