JOYSTICK CONTROLLED WHEELCHAIR

Trinayan Saharia[1], Jyotika Bauri[2], Mrs. Chayanika Bhagabati[3]

[1,2]Student, Department of Electronics and Communication Engineering
[3]Assistant Professor, Department of Electronics and Communication Engineering
Assam down town University, Assam, India

Abstract: *A joystick control wheelchair is very important for the physically challenged people. They cannot move anywhere like a normal person. For this reason they always depend on the other people. But the joystick control wheelchair can removed this problem and help them to move anywhere. The movement of wheelchair can be control manually by the joystick. The command is implemented by using joystick and then the command is sent to the Arduino board where the controller ATMega328p will process the command. After processing the controller send the command in the form of digital signal to the motor driving IC and the motor driving IC control the movement of wheelchair.*

Key Words: Analog joystick, Arduino ATMega328p, L293D IC, DC Motor

1. Introduction

The wheelchair is very useful for physically handicapped people. By using robotics and intelligent system technologies the powered wheelchair can be designed. The joystick control wheelchair is very easy to operate. By using the joystick the physically challenged person can control the movement of wheelchair. In this project ,we have employed microcontroller to monitor and control the system. In public gathering , specially in hospital the wheelchair is widely used.

2. Working Principle

Initially joystick is turned to exact middle position. Till the joystick is kept at middle position the motor will be stop. When the joystick is moved the potentiometer encodes analog voltage values and transfers it to the Arduino board through the analog data pin. The Arduino take these analog values and send it to an ADC(Analog to digital converter).The ADC convert the analog value to digital signal .The digital signal is sent to the motor driving IC(L293D) via digital data output pin. L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward or reverse and right or left direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. As joystick is slightly turned forward the voltage input at ADC increases and the motor starts rotating in forward direction. When the pot is turned back to middle position, the motor will stop. Now as the pot is turned slightly reverse, the motor starts rotating in reverse direction . To stop motor again, the pot is turned back to middle position. Thus ,the motors move forward or reverse and right and left as the pot is turned forward or reverse and right or left. To implement these functionalities a software program is embedded into internal FLASH of ATMega328P micro controller. The two DC motors are controlled by L293D IC and Ardunio ATMega328P according to the instruction of the Joystick.

3. Block Diagram

The command is implemented by using joystick and then the command is sent to the microcontroller where the controller ATMega328p will execute the command. After executing, the controller send the command in the form of digital signal to the motor driving IC(L293D) and the motor driving IC control the movement of the two dc motors. Thus the dc motor rotates according to the command of the joystick.

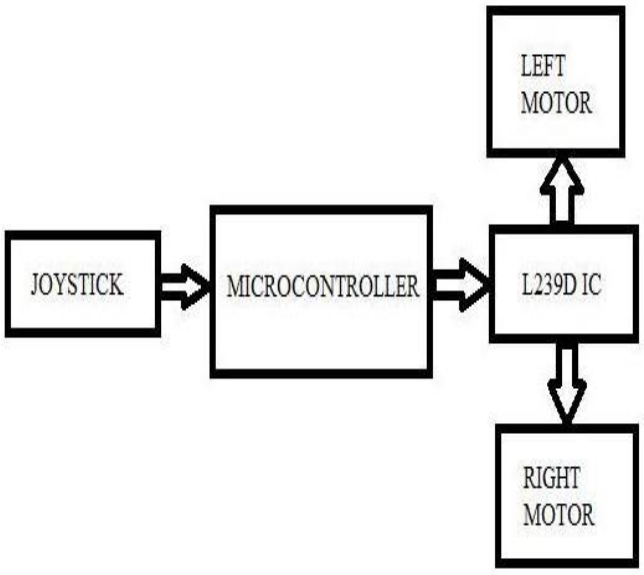


Fig.1:Block diagram of joystick control wheelchair

3.1 Analog Joystick

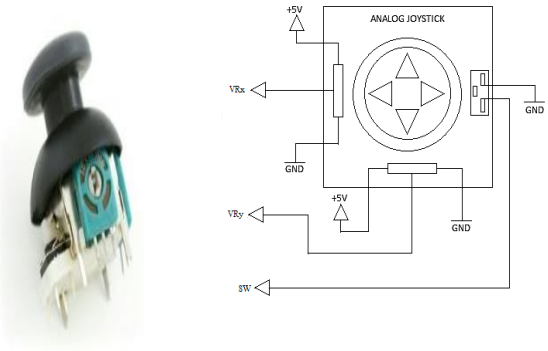


Fig.2 Analog Joystick

An analog joystick, sometimes called a control stick joystick or thumb stick is an input device for an controller that is used for two dimensional input. An analog joystick is similar to two potentiometers one for the vertical movement(Y-axis) and other for the horizontal movement(X-axis). The joystick also comes with an select switch. It can be very handy for retro gaming, robot control or RC cars.

3.2 Arduino ATMega 328P

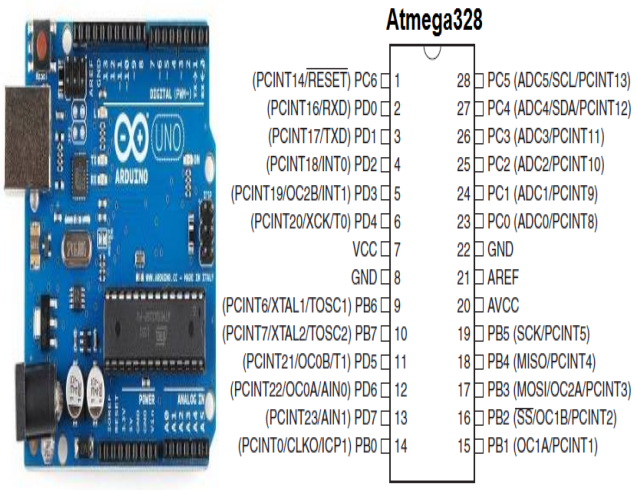


Fig.3 Arduino ATMega 328P

ATMega 328P IC has 28 pins out of which, 20 of the pins function as I/O ports. This means they can function as an input to the circuit or as output. Whether they are input or output is set in the software. 14 of the pins are digital pins, of which 6 can function to give PWM output. 6 of the pins are for analog input/output.Two of the pins are for the crystal oscillator. This is to provide a clock pulse for the Atmega chip. The chip needs power so 2 of the pins, Vcc and GND, provide it power so that it can operate. The ATMega328P is a low-power chip, so it only needs between 1.8-5.5V of power to operate. The ATMega328P chip has an analog-to-digital converter (ADC) inside of it.

3.3 L293D IC

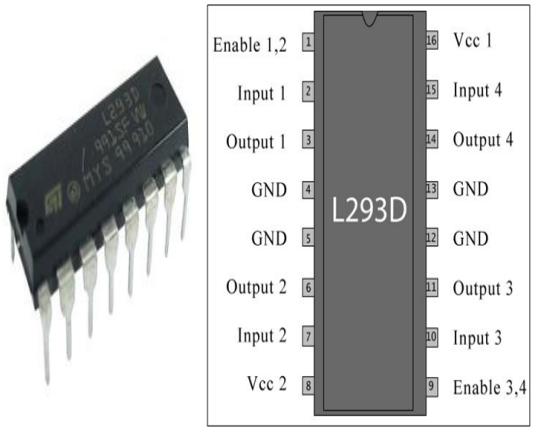


Fig.4 L293D IC

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating .Pin no (2, 7, 10, 15) of L239D IC is connected to Pin no (14, 15, 16, 17) of the microcontroller respectively.

Table-1: Truth table for robot Movement

Sr.No.	IN1	IN2	IN3	IN4	Movement of robot
1	0	1	1	0	Reverse
2	1	0	0	1	Forward
3	1	1	1	1	Stop
4	1	0	1	0	Left
5	0	1	0	1	Right

3.4 Dc Motors

Two DC motors are used to move the wheelchair in different direction such as Forward, Reverse, Left, and Right. Microcontroller is used to control these motors. L293D is a dual bridge driver IC is used for driving the DC motors.

4. Circuit Diagram

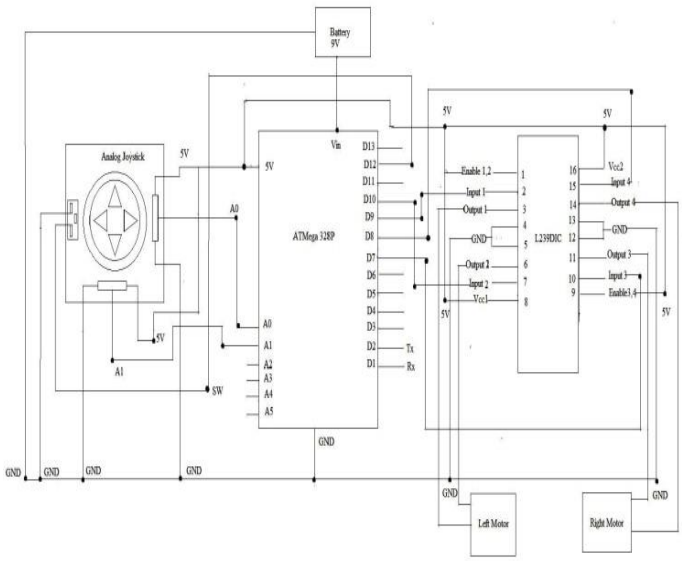
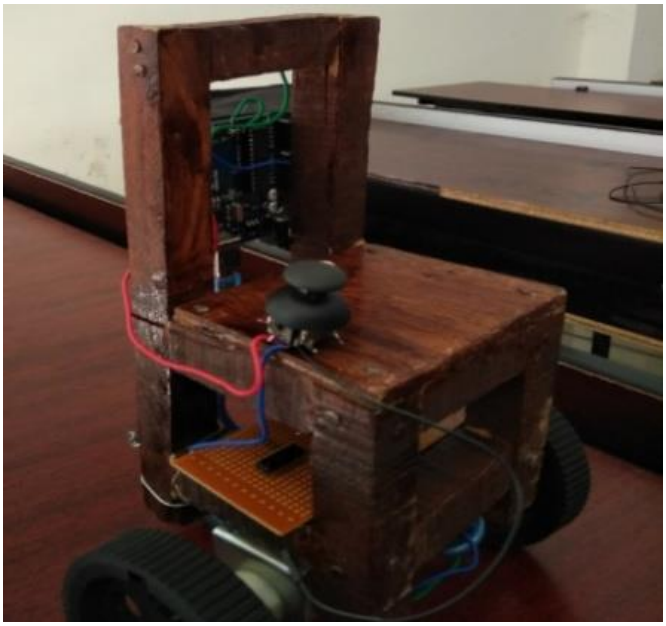


Fig.5: Circuit diagram of joystick control wheelchair

5. Result And Discussion

All the programming is done by the Ardunio IDE and the program is loaded in to the Arduino board. The joystick gives a facilitated control over the wheelchair. After interfacing of all components according to the circuit diagram we get the desired output .We have successfully completed our project. In our project we have used a joystick, an Ardunio ATMega328P Controller, L293D IC , two DC motors and and 9v battery.

5.1 Model Figure



6. Conclusion

We have designed this wheelchair for the physically disabled people those who cannot walk, so that they can easily handle it with their hands by using the Joystick. But for those people who cannot move their legs as well as hands, the voice recognition control wheelchair or the image processing wheelchair can resolve this issue. We can also add an sensor unit to the circuit so that it can detect the obstacle in its path.

7. Refferences

[1] "WORKING PRINCIPLE OF ARDUINO AND USING IT AS A TOOL FOR STUDY AND RESEARCH" by L.Louis, IJCACS, Vol.1, No.2, April 2016, pp.21-29
[2] "Automatic wheelchair for physically disabled persons" by Prof. R.S.Nipankar, V. Gaikwad, C. Choudhari, R. Gosavi, V.Harne, IJARECE, Volume 2, Issue 4, April 2013, ISSN: 2278 – 909X, pp.466-474
[3] www.engineersgarage.com/electronic_circuits.
[4]https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=motorized%%20robot
[5]http://www.electricaltechnology.org/2014/10/IC7404-electronic-project.htmlk
[6] Simon monk, , "Programming Arduino", 2nd Edition, PHI, pp-407,408,409.