

AUTOMATIC WHEELCHAIR USING FLEX SENSOR

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ABSTRACT

For the people with physical disability, sickness or injury in their legs, wheelchairs are designed to ease their mobility and to provide them with proper moving technology. This paper describes an intelligent motorized wheelchair for physically handicapped people using flex sensor technology. Such a wheelchair helps physically handicapped people to navigate without the help of any other individual. It consists of a FLEX SENSOR connected to a microcontroller which drives the motor in the desired direction of the operator. To drive the wheelchair we use flex commands like forward, backward, left and right to take it in their respective directions. These directions are controlled by the command valid through Flex Sensor. FLEX SENSOR produces analog signal i.e its resistance increases or decreases depending on the direction of bend which is given to the microcontroller, the microcontroller converts three analog signals into digital using the inbuilt ADC, therefore different ADC values are obtained with different touch positions. Depending on the angle and direction of bend corresponding ADC values are calculated by microcontroller and the motor moves in the desired direction.

Key Words: Wheelchair, Flex sensor, Crystal Oscillator, PIC16F877A microcontroller, DC motors, Motor drivers L293D, Power supply and IR Sensor

1. INTRODUCTION

Driving a wheelchair in day to day life is difficult and becomes even more difficult for a person with physical disability. Some people with arms disability cannot navigate the wheelchair in the desired direction. Therefore Automatic wheelchair is developed to solve the problem for navigation and safe movement in the desired direction. Different input methods can be used to perform task. In this wheelchair, we are using Flex Sensor command for the mobility in desired direction. Since Automatic wheelchair can gain speed which may not be required. So, we need to control the speed of the wheelchair. So, to control the speed of the wheelchair we use PWM method. Four Flex Sensor is used for the movement in forward, backward, left and right direction. Also an IR sensor is used to detect any hindrance that comes in between. A crystal Oscillator is used to give clock signal and dc motor drivers are used to rotate the dc motor in the desired orientation. And a micro controller is used to control the entire circuit.

2. METHODS AND MATERIALS

Four Flex Sensor is used as input device to navigate the Automatic wheelchair in different directions. FLEX SENSOR produces analog signal i.e, its resistance increases or decreases depending on the direction of bend which is given to the microcontroller, the microcontroller converts three analog signals into digital using the inbuilt ADC, therefore different ADC values are obtained with different touch positions. Now this command is passed on to the DC motors driver which in turn rotates the DC motor(wheel) and the mobility of the wheelchair is observed. A crystal Oscillator is used to give clock

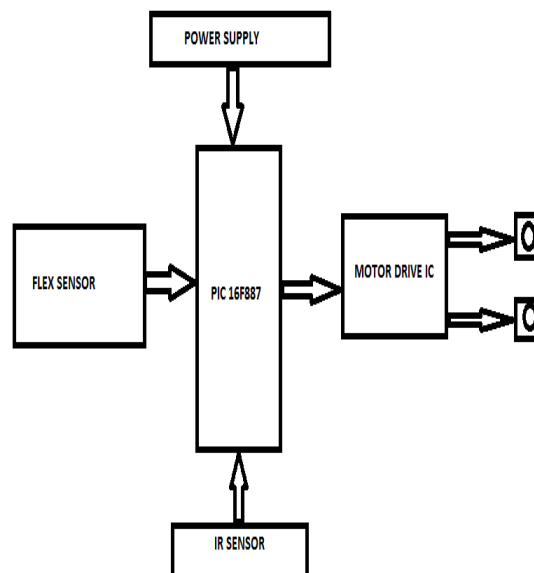
signal. An IR sensor is used to detect any obstacle that comes in between. All these components are connected to the PIC microcontroller which need DC input to operate.

2.1. COMPONENTS OF ATTACHMENT

Below are components used in the project:-

1. Battery
2. Flex Sensor
3. PIC 16F877A microcontroller
4. Crystal Oscillator
5. DC Motor driver L293D
6. DC Motor
7. IR Sensor
8. PCB BOARD

3. BLOCK DIAGRAM AND ITS DESCRIPTION



3.1 DC MOTOR DRIVER-L293D

Since motors need more current than what amount is generated by micro controller pin, for this we need some kind of switch (transistors, MOSFETs, Relay etc.) which can accept a small current, amplify it and generate a larger current, which will further drives the motor. This entire process is performed by the motor driver. L293D is a typical motor driver or motor driver IC which drives DC motor in either direction. L293D is a 16 pin IC. L293D can control a set of two DC motors in multiple direction. It means that we can control two DC motors with one driver, dual H-Bridge motor driver integrated circuit (IC). The L293D can drive both small and big motors.

3.2 IR SENSOR

An “Infrared Sensor” is used as an electronic instrument which is used to sense certain characteristics of its surrounding by either emitting or detecting infrared radiations. In this project it has been used to detect any obstacles that comes in between the way of wheelchair. It contains two parts, transmitter and receiver. First the transmitter sends the radiation and if it detects any obstacle in the way it send back the signal which is the received by the receiver.

3.3 FLEX SENSOR

FLEX SENSOR is a strip connected to a microcontroller which drives the motor in the desired direction of the operator. To drive the wheelchair we use flex commands like forward, backward, left and right to take it in their respective directions. These directions are controlled by the command valid through Flex Sensor. FLEX SENSOR produces analog signal i.e, its resistance increases or decreases depending on the direction of bend which is given to the microcontroller, the microcontroller converts three analog signals into digital using the inbuilt ADC, therefore different ADC values are obtained with different touch positions.

3.4 CRYSTAL OSCILLATOR

A Crystal Oscillator an electronic oscillator which is already built inside PIC miro-controller which is used for giving clock input. It has precise frequency. In this project Crystal Oscillator is used to give clock signal to the circuit.

4. LITERATURE SURVEY

1. *Speech controlled Wheelchair for physically disabled person by Final year students, Lecturer, Department of Instrumentation Technology, Basaveshwar Engineering College, Bagalkot, Karnataka, India-586709.*

This paper describes an intelligent motorized wheelchair for physically handicap person using dependent user speech controlled and flexes sensor technology. It enables a disable person to move around independently using speech recognition and flex sensor application which interfaces with motor through microcontroller. In this project, to drive the wheelchair we are using speech commands “forward, backward, maximum, medium, minimum and stop”. The direction of the wheelchair is controlled by flex sensor application.

2. *Accelerometer Control of a Smart Wheelchair for the Automated Transport and Retrieval System.*
The recent development promises a wide scope in developing a smart wheelchair. Today’s world works on automation. Everything around us is getting automated. Considering the increase in demand of automation, we are designing a complete automated accelerometer based device control. This article presents a smart wheelchair which controls the wheelchair using accelerometer. It measures the linear acceleration in the x, y, z directions based on the movement the device. In this system, by just showing some head gesture which will be sensed by accelerometer. In this project, we are designing a system which will respond to our head gesture. The system has an accelerometer which is fixed on the head of the operator.

5. APPLICATIONS

1. A wheelchair itself is an application, but to add on this we could connect a Flex Sensor to the same and can allow operation using a Flex Sensor. For example, instead of giving the movement commands by joystick we could create a Flex Sensor to control the movement.
2. Another addition to this could be a Bluetooth application to control the movement but this could add delay in transmission thus, increasing danger to the life of the person on it.
3. Also the same kind of idea can be used in designing Hi-Tech games,for kids. For example, in movement of mini cars and jeeps.

6. ADVANTAGES

1. Minimal effort is needed to control the wheelchair because you use a simple Flex Sensor.
2. Easy to move from one place to another place.
3. Operating principle is very simple.
4. Non-skilled person can also operate this machine.
5. It is economical.

7. DISADVANTAGES

1. The cost of maintaining and repairing an electric wheelchair can be substantially higher than a manual wheelchair.
2. Electric wheelchairs are larger than manuals and may not be suitable in every home.
3. If the battery packs are not recharged properly, you may end up with a dead battery before you return home.

8. CONCLUSION

Thus we can say that as per the bending of the Flex Sensor, the wheel move. Four Flex Sensor allows the wheelchair to move in forward, backward, left and right directions and the crystal oscillator gives clock input and DC motor driver L293D drives the DC motor(wheel) in return thus, giving the wheelchair a movement.

9. REFERENCES

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