

# FINGER CONTROLLED WHEEL DRIVE SYSTEM

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**Abstract**— *Many people in the world have physical disabilities; they cannot move one place to another place itself. People have certain problems with traditional wheel-chair thus we try to design a system that may rotate wheel-chair without much efforts. We may control wheel-chair by using microcontroller and sensors combination, so that it helps to control wheel-chair by implementing the principle of hall effect.*

**Keywords**— *Microcontroller (PIC16F877A micro controller), Hall effect sensor, DC motor, H-Bridge driver, LCD (2-line 16 characters (per line) alphanumeric LCD), Power supply (using 7805), DC Motor, Resistors, Capacitors.*

## 1. INTRODUCTION

In the world the number of peoples having numbers of disabilities that affects their life of living like handicaps, so to overcome this type of problems some people use joystick. But joystick is not comfort them for walking here and there. But some peoples not able to handle the joystick because of more disabilities for those peoples we use this system i.e. —finger control wheel drive system. This system is simple and quite easy to travel and move here and there without taking lots of effort and supports.

The work of this project for the wheelchair control is outlined in the Hall effect device connected only sensor readings, for the representing forward/reverse, left/right we use analog signals along with a Hall Effect signals. Embedded controller control or handle the functionality, safety, control logic and the wheelchair interface. Firstly we filter the Sensor readings to remove drift after that normalized with respect to the range of the sensor signals. So this step is necessary due to variation in the sensitivity of the individual sensors, that's caused by production variability and various sensor geometry.

For activation to signals mapping sensor is use in embedded controller that comply with the signals in an analog hall effect input port on a wheelchair. Output from the port, which describes the physical position of the finger over the sensors, are used to generate analog signals for the moment, using ports output drives motors. The mapping is made in such a way that removing the activation (removing the finger from the sensor pad) gives the same output as placing the activation unit in central/neutral position. Power wheel chair plays the

key role in severely disabled person's life as they completely depend on the external help or support.

Power wheel chair for moving around in home, office and outdoor environment. The objective of this project is to develop a system for non invasive unobtrusive, easy to use and learn that can replace some of the arm and hand functions. That's why in this project we take a initiative to reduce the hard work of disable persons and that's why we provides them to this wheel chair system to reduce the disability and enjoy its life like normal person.

## 2. MATERIAL

### 2.1 Micro-controller PIC16F877A

High-Performance RISC CPU:

- For learning instructions only 35 single-word use.
- For program branches having two-cycle instructions.
- Operating speed for micro-controller 20 MHz and clock input is 200 ns for instruction cycle.
- Flash Program Memory is up to 8K x 14 words, Data Memory is up to 368 x 8 bytes and EEPROM Data Memory is up to 256 x 8 bytes.
- Pin out compatible to other 28-pin or 40/44-pin.

### 2.2 HALL EFFECT SENSOR

The **Hall Effect** is the production of a voltage difference (the **Hall voltage**) across an electrical conductor and a magnetic field perpendicular to the current. Edwin Hall is discovered Hall Effect sensor in 1879. The Hall coefficient is directly proportional to the induced electric field and inversely proportional to the current density and the applied magnetic field. Properties of the charge carriers that constitute the current. With the measurements he made, Hall was able to determine for the first time the sign of charge carriers in a conductor. Even today, Hall effect measurements continue to be a useful technique for characterizing the electrical transport properties of semiconductors and metals. The failure of the simple model of metallic conductivity that we discuss now to

account for measurements and experimental of the Hall effect has been one of the principal motivators and better understanding properties of material of electronics.

### 2.3 H Bridge Driver

To drive D.C. motor in forward and reverse direction for that H Bridge circuit is necessary. Normally H Bridge is made by using relays. There are four relays which are connected in bridge it looks like H and hence it is called H Bridge. It also provides isolation. Suppose we make H Bridge by using this relays for driving a motor it will protect from the high voltage side.

### 2.4 Voltage Regulator (7805 IC)

The LM78XX series of three terminal regulators which is found with several fixed output voltages which making them useful in a wide range of applications .For output voltage the LM117 series provides an output voltage range from 12V-57V.

### 2.5 Liquid Crystal Display (LCD) 16 x 2

A liquid crystal display (LCD) is an electronically-modulated optical device. It is made up of any thin flat panel or monochrome pixels filled with liquid crystals and arrayed in reflector. It is often utilized in battery-powered electronic devices because it required very less electric power.

Nowadays LCD is finding wide spread use replacing 7 segment LEDs or other multisegment LEDs. This is due to following reasons:

- The declining process of LCDs.
- The ability to display numbers, characters, graphics. This is in contrast to LEDs. Which are limited to numbers and a few characters?
- In corporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing LCD. For display data LED must be refreshed by CPU for contrast.
- Ease of programming for characters and graphics.

LCD better known as alpha-numeric modules, display characters, numbers, symbols and some limited graphics.

TABLE: Summary of symbol and its Description

| Pin no | Symbol | Description                       |
|--------|--------|-----------------------------------|
| 1      | Vss    | Ground potential                  |
| 2      | Vcc    | Power supply for logic LCD (+)    |
| 3      | Vo     | Constant adjustment               |
| 4      | RS     | Resistor select pin               |
| 5      | Riw    | Read write                        |
| 6      | E      | Enable pin                        |
| 7      | Db0    | Code I/O data LSB                 |
| 8      | Db1    | Code I/O data 2 <sup>nd</sup> bit |
| 9      | Db2    | Code I/O data 3 <sup>rd</sup> bit |
| 10     | Db3    | Code I/O data 4 <sup>th</sup> bit |
| 11     | Db4    | Code I/O data 5 <sup>th</sup> bit |
| 12     | Db5    | Code I/O data 6 <sup>th</sup> bit |
| 13     | Db6    | Code I/O data 7 <sup>th</sup> bit |
| 14     | Db7    | Code I/O data MSB                 |
| 15     | VLED   | Power supply for LED backlight    |
| 16     | VLSS   | VLED -5V, VLSS -0V                |

### 2.6 D.C. Motor

Movement in wheelchair is done by motor. For moving wheel chair motor is use. So motor will be selected depending upon requirement .i.e. maximum load, torque, current and voltages ratings etc. In our system we have used two motors.

## 3. System Description

### HALL EFFECT CONCEPT

The working of the project is mainly depend on hall effect and therefore it is necessary to understand hall effect first the hall effect given as it is the production of a difference voltage with a current carrying conductor (in presence of magnetic field), perpendicular to both current and the magnetic field.

Herbert Hall while working on his doctoral degree at the Johns Hopkins University in The Hall effect was discovered in 1879 by Edwin Baltimore, Maryland, USA.

How Hall Effect works: On a charged particle there is a no effect of static magnetic field unless it is moved.

- A mutually perpendicular force is induced on the charge particle, When charges flow.
- Now holes and electrons are separated by opposite force.
- When electric field is generated then it is depends upon cross product of current density and [J] magnetic intensity [H].

$$E_h = R (J \times H)$$

- R is Coefficient of Hall.

Now we Consider a Semiconductor bar along with X-axis, hall voltage is along with Y-axis, Magnetic field along with Z-axis.

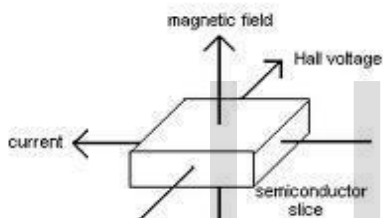


FIGURE (b): Wheel chair control system.

Wheel chair control is shown in Fig. As in designs, such has used Four Hall effect transducer to sense the magnetic field from a given magnet attach on finger tip. This output of proportional due to magnetic field being drawn by magnet.

The resulting signal is given to microcontroller analog port pin. The final output is fed to an analogue-to-digital conversion (ADC) facility, provided via a PIC micro-controller.

PIC controller is main controlling unit. The circuit for the controlling PIC unit is shown in Fig. It runs at 8MHz, as set by crystal X1 in conjunction with capacitors C2 and C3. The PIC converts the incoming voltage signal from the magnetic field to an equivalent decimal value also all sensor ADC value is shows on display.

The working of this project is depending on four Hall Effect sensors. Depending on output of any sensor motor will drive in particular direction .suppose sensor first is used for forward direction. Second sensor is used for reverse direction and other two sensors are used for left and right direction respectively.

Suppose when magnetic field is detected by first sensor it will produce output voltage. Suppose first sensor is for forward direction therefore motor will drive in forward direction by using h-bridge driver. But it depends on threshold value which we can store in program on the basis of output from Hall Effect sensor. Consider largest value from the sensor is 1.5v this is our threshold value if magnetic field is detect by sensor and 1.5v is produce by it then motor will drive in forward direction. The threshold value converted by processor into decimal value which can be displayed on LCD. If we remove tongue from sensor means output goes below threshold controller will stop the motor. In this way second sensor drive the motor in reverse direction and other two right and left respectively.

#### 4. RESULT:

This is simple technique to move here and there without taking lot of efforts to disable person. In this project use Hall effect sensor to generate voltage and rotate motors i.e. forward, backward, right, and left. Thus by using this project we can create finger controlled actual wheelchair which will be very useful for people having certain disease in which they haven't ability to rotate traditional wheelchair.

In future by upgrading the technologies use for further safety purpose there is a provision in the wheelchair to detect the obstacles. Obstacle is detected by obstacle detector in front of wheelchair. Our system is take desire action when obstacle is detected. There are two way to detect obstacle either ultrasonic method or infrared method.

#### 5. CONCLUSION:

Controlling technique in the proposed system is unique and it is quite simple. Any type of disabled person will able to operate this wheelchair except those who are unable to rotate traditional wheelchair. This proposed system could be a boon for disables. This wheelchair can be made more flexible in future by upgrading the technologies used.

This system is very useful for person with disability to move and Durable. This is easy to operate and not costly. ADC value was read before completion of conversion and Back EMF produces in DC motor.

We can use this concept in the clinics and hospitals and very useful for people. This paper could be a great gift for the physically disabled if introduced at industrial level with affordable cost. It could be more than a leg for handicapped with of course no pain since the system is automatic controlling the movement.

## References

- [1] M. A. Oskei And H. Hu, My electric Control System-A Survey, In Biomed. Signal Process. Control, Vol.2 ,No.4. pp.275-294, Oct. 2007.
- [2] V.I. Pavlovic, R. Sharma, And T.S. Huang, —Visual Interpretation Of Hand Gestures For Human- Computer Interaction: A Review, In IEEE transactions On Pattern Analysis And Machine Intelligence, Vol. 19, pp. 677-695, July 1997.
- [3] Fahad Wallam And Muhammad Asif, , In International Journal Of Computer And Electrical Engineering, on: —Dynamic Finger Movement Tracking And Voice Commands Based Smart Wheelchair, Vol. 3, No. 4, August 2011.
- [4] Arai K, Purwanto D, In 7th International Conference On Optimization: on —Techniques And Applications of Electric Wheelchair Control with the Human Eyel. Kobe, Japan, December 2007.
- [5] I. Moon, M. Lee, J. Chu, And M. Mum, —Wearable EMG-Based HCI For Electric-Powered Wheelchair Users With Motor Disabilities, In IEEE Int. Conf. Robotics And Automation, Barcelona, Spain, pp.2649-2654, Apr. 2005.
- [6] L. Wei, H. Hu, And K. Yuan, —Use Of Forehead Bio-Signals For Controlling An Intelligent Wheelchair, In IEEE Int. Conf. Robotics And Biomimetics, Bangkok, Thailand, pp.108-113, Feb. 2008.
- [7] Thomas R`Ofer And Christian Mandel And Tim Laue, In 2009 IEEE 11th International Conference on:—Rehabilitation Robotics, Kyoto International Conference Center, Japan, June 23-26.

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