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Smart-WheelChair

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ABSTRACT

A Wheelchair is a device used by people for whom walking is difficult or impossible due to illness, injury or any disability. There are often handles behind the seat to allow it to be pushed by another person. Recent development promises a wide scope in developing smart wheelchairs. Our article presents a hand motion controlled wheelchair. Our device is divided into three broad parts i.e. accelerometer (3-d), motor driver (L293D) and control unit using ATmega328.

Keywords: Wheelchair, Gesture control, Ewheelchair, Accelerometer controlled wheel chair.

I. INTRODUCTION

According to WHO, in today's time, an estimated 1% of the world's population needs a wheelchair. If the same 1% is used to estimate the number of wheelchair users worldwide, we would come up with 73 million people. However, unfortunately, the number of people who need wheelchairs in the world is almost certainly much more than 73 million and the number who actually have wheelchairs is almost certainly much less than 73 million. An increased percentage of elderly and disabled people who want to enhance their personal mobility, for them wheelchair is the best assistive device. The device comes in variations allowing either manual propulsion by the seated occupant turning the rear wheels by hand, or electric propulsion by motors.

Traditional wheelchairs have certain limitations in context to flexibility and maneuverability. Our approach is to allow the user to use hand movement and to synchronize them with the movement of the wheelchair so that they can use it with

comfort and ease on all kinds of terrains without the hurdle or cardiovascular problems or fatigue.

II. METHODOLOGY

In this project hand gesture is used to control wheelchair. And for sensing the hand gesture accelerometer is used. An accelerator looks like a simple circuit for some larger electronic device. Despite its humble appearance, the accelerometer consists of many different parts and works in many ways, two of which are the piezoelectric effect and the capacitance sensor. The piezoelectric effect is the most common form of accelerometer and uses microscopic crystal structures that become stressed due to accelerative forces. These crystals create a voltage from the stress, and the accelerometer interprets the voltage to determine velocity and orientation.

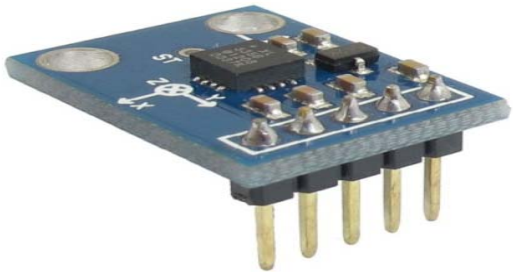

Fig. 1 Accelerometer used

The capacitance accelerometer senses changes in capacitance between microstructures located next to the device. If an accelerative force moves one of these structures, the capacitance will change and the accelerometer will translate that capacitance to voltage for interpretation. Accelerometers are made up of many different components, and can be purchased as a separate device. Analog and digital displays are available, though for most technology devices, these components are integrated into the main technology and accessed using the governing software or operating system. Typical accelerometers are made up of multiple axes, two to determine most two-dimensional movement with the option of a third for 3D positioning. Most smartphones typically make use of three-axis models, whereas cars simply use only a two-axis to determine the moment of impact. The sensitivity of these devices is quite high as they're intended to measure even very minute shifts in acceleration. The more sensitive the accelerometer, the more easily it can measure acceleration.

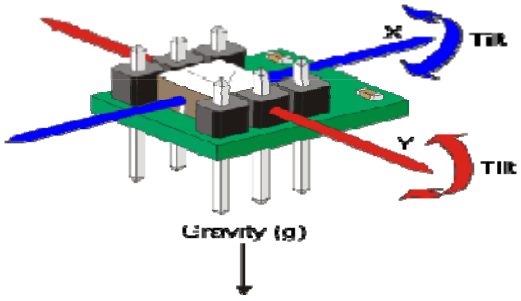

Fig.2 Accelerometer Working

Accelerometer sends the information about the tilt of the accelerometer sensor. This information is in the form of analog and the information of the tilt is in the form x, y, z. The x, y, z axis is indicating the position of the pointer.

III. WORKING

When the robot is switched on,it initializes the constructing values to the microcontroller IC (ATmega328) pins and set the baud rate for the IC for serial data communication which for our case in 9600 bits per second. These pins include initializing the input and output ping for all external devices which include our tilt detecting sensor i.e. accelerometer, motor controller pins, buzzer and other devices.

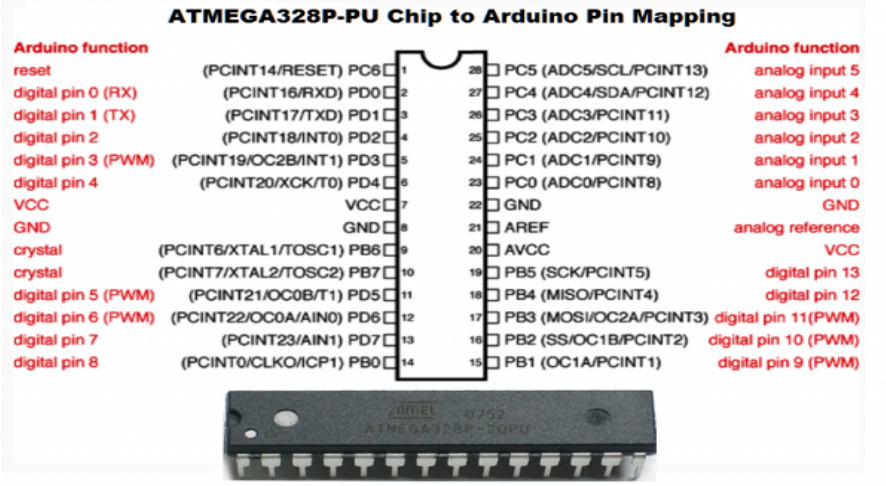

Fig.3 IC and pin diagram

As soon as our accelerometer is activated it starts transmitting the data to microprocessor which is in analog form and is further converted to degree for human processing. Further a set of rules are defined to control motors, according to the angles generated by our hand, as given below:

Direction	Angle X	Angle Y
Forward	*	300-330
Backward	*	30-60
Right	300-330	*
Left	30-60	*
STOP	**	**

Table No. 1. Angle Table

*Any angle.

**Any angle other than above mentioned.

Using the rules mentioned above motor pings are controlled respectively.

Motor Control Rules

Direction	Pin 2 (Lf motor)	Pin3 (Lb motor)	Pin 8 (Rf motor)	Pin9 (Rb motor)
Forward	1	0	1	0
Backward	0	1	0	1
Right	1	0	0	1
Left	0	1	1	0
STOP	0	0	0	0

Table No. 2. Motor Control
*Lf= left forward
Lb= left backward
Rf= right forward
Rb= right backward
**Here 1 and 0 are the on and off values.

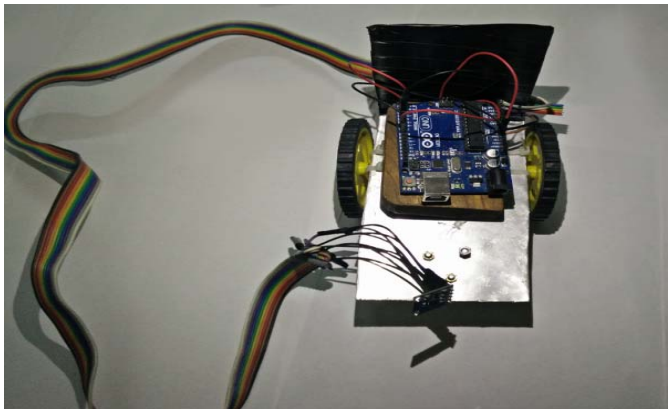

Fig. 4 Wheelchair Prototype

IV. ALGORITHM

Step1: Read initial values by accelerometer xRead,yRead,zRead

Step2: Convert the read values into degree x,y,z

Step 3: Set rules for motor controls

```
If y lies between 300 and 330:
        drive_forward()
else if y lies between 30 and 60:
        drive_backward()
else if x lies between 300 and 330:
        drive_right()
else if x lies between 30 and 60:
        drive_left()
else for any case:
        motor_stop()
```

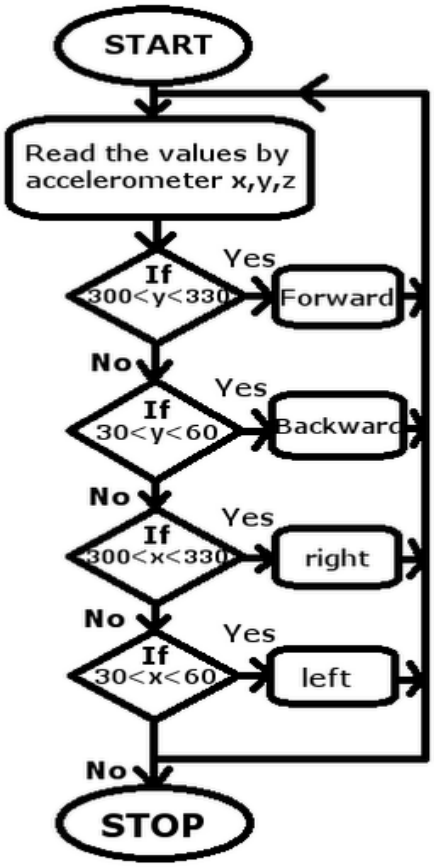

Fig. 5 Working Flow chart

V. CONCLUSION

In this desperate time of modern age, a few unlucky people who felt of being left behind and underprivileged because of their dependency on other beings, hand gesture controlled wheel chair can be a boon. Using simple processor and a few electronics knowledge we can help these people a little balance and joy to their life. Microcontroller connected with a little chip can help these men to maneuver with only

tilting their hand. Only with few minutes training anyone who deprive physical strength can control his life and movements with as independence as anyone else.

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