Gesture Control Wireless Wheelchair Prototype

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*Abstract –*In today, out of total population, 1% of peoples need wheelchair for physical support. And in day to day life of handicapped peoples which are physically ill, faces many problems in their daily life routines. They are not able to stand alone , they need support for every work. So this study develop their lifestyle and also to reduce these difficulties of handicapped peoples with the minimum cost. The overall framework of this project is to be helping handicapped peoples for storing their freedom. With using developed technology, project goal is to help those peoples who are not able to walk due to physiological or physical illness. And there is recently extensive research on computer controlled chairs for physically handicapped persons.

*Index-terms–*AT89C51-Microcontroller, acceleration sensor, L293D driver, Gesture control, Wireless control.

I. INTRODUCTION

Handicapped person which is physically ill or partially paralysis should communicate with normal humans in natural way. Also many handicapped persons suffering from various difficulties, like they are not able to do work individually, therefore it is essential to overcome this situation. So this study gives reliable means and little bit help to avoid these problems. This project is based on wheelchair for physically disabled peoples. Wheelchair is automatically controlled by giving commands through hand movements of handicapped person as per the need of handicapped one.

This accelerometer based project use acceleration sensor for moving backward direction, forward direction, left direction or right direction [3]. In this system reset feature also available for resetting the project operations. And due to this important feature, if any problem is created in the circuit or any damage is occurred in system on the running time of wheelchair then this reset function is helping handicapped person to solve these problems by pressing the reset button. Because of the wired heavy problems, this project uses wireless technology to overcome these problems. This makes project very powerful.

The basic of this project is done keeping in mind to able the handicapped person to move around their home without any help of other person[1]. A wheelchair is an electric wheelchair fitted with acceleration sensors and obstacle sensor. And by using this wireless obstacle sensor enhanced this project. If there is any obstacle in the way of chair is present, then chair detects it automatically, will stop the chair and also rings the alarm. This helps us to avoid any type of accidents and protects handicapped persons. The obstacle sensor can helps the rider to control the wheelchair for avoiding objects until he or she is able to handle the job.

Due to this quality of life of handicapped person is enhanced. This increase disable people's ability to live independently, that is to enjoy same choice, same control as well as same freedom as other normal peoples. Here this system trying to make automatic wheelchair for handicapped peoples, which obeys direction like move left side, right side, forward side or backward side[3].

II. LITERATURE REVIEW

Recently development promises scope in making intelligent wheelchairs for handicapped one [2]. In earlier days, Automatic wireless gesture control wheelchair has gained popularity due to advanced technology. And also there is need of advanced wheelchair due to today's fast working world, no one has free time for the handicapped person, every person is busy in their personal life [4]. After paralysis or physical disability person require hand recognition and the wheelchair is most common need of gesture recognition [1]. A disable individual which is physically partial paralysis feels more convenient to survive in world also to move anywhere using with the help of chair. This wheelchair gives valuable physical support to disabled person [2]. In this project accelerometer sensor is used which is main component of system and used to measure static as well as dynamic acceleration. Accelerometer sensor measures gravity force and it is related to the displacement [8].

To alert the concerned people of handicapped person or himself handicapped one get alert or when there is any sudden detection of obstacle during backward motion. This protects the wheelchair from various accidents [1]. In this study, system allows the user to use human hand movements (like gesture sense) and synchronize movements with the wheelchair. Therefore handicapped person can use this wheelchair comfortably

and avoid all kinds of obstacle problems [2]. And it makes handicapped one life is less complicated.

III. PROPOSED SYSTEM

In this project some assumptions to be consider [5]-

1. To use wheelchair automatically for moving forward, backward, Left & Right through hand movements of handicapped person.
2. This project automatic wheelchair basically works on the principle of acceleration.
3. When person move his hand in upward direction then chair will move in forward direction.
4. If person move his hand in downward direction then chair will move in backward direction.
5. If person tilt his hand in left side then chair will move in left direction.
6. If person tilt his hand in right side then chair will move in right direction.

III. BLOCK DIAGRAM

Figure 2 and Figure 3 shows the block diagram of transmitter unit for gesture based wireless wheelchair prototype and Figure2. Shows the receiver unit respectively. It consists of two parts: Transmitter part and Receiver part. Transmitter part consists of accelerometer, comparator, HT 12 encoder, RF transmitter, 8 WAY DIP switch. Receiver part consists of RF receiver, HT 12 decoder, microcontroller 89C51, motors and motor drive, transistor, buzzer, 8 WAY DIP switch, obstacle sensor.

By just tilting acceleration sensor wheelchair can be moved in four directions.

- Forward direction
- Backward direction
- Left direction
- Right direction
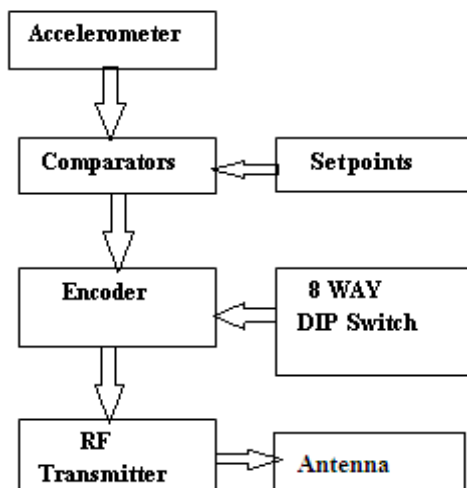
A.TRANSMITTER SECTION

Figure 2: Transmitter Section [2]

This project works on acceleration sensor, this acceleration sensor, provides two axes, which is analog output and varies according to acceleration input applied to it. Sensor gives x-axis & y-axis o/p independently which is fed to ADC & then it given to microcontroller 89C51. By applying simple formula system can calculate the output that will decide to move in which direction. When person tilt his hands in forward direction, chair will move in forward direction. If person tilt his hand in backward direction, chair will move in backward direction. If person tilt his hand in left direction, chair will move in left direction. If person tilt his hand in right direction above chair will move in right direction.

Gesture sensor measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration. Output of accelerometer is given to op-amp as comparator. For zero gravity output of accelerometer is 1.5V. For positive acceleration, output increases above 1.5 volts and for negative acceleration output decreases below 1.5V. Therefore the set point for comparator is above 1.5V and below 1.5V. And the output of this comparator is given to the microcontroller 89C51. Encoder is used here for addressing purpose. It encode the information which consists of 8 address bits and 12 data bits. It is used to convert parallel data to serial data bits. RF module works on 433MHz frequency. With the help of antenna, RF transmitter convert electrical signal into electromagnetic signal.
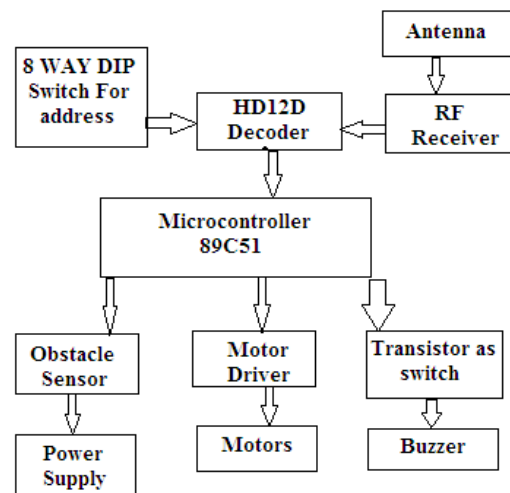
B.RECEIVER SECTION

Figure 3: Receiver Section [3]

At the receiver side, RF receiver used to convert Electromagnetic (EM) signal into electrical signal. Decoder is used for decoding address as well as serial to parallel data conversion. In this Series of encoder and decoder is used with RF module. Then this signal is fed to Microcontroller 89C51. After that signal is given to motor driver to drive the motors, Without motor driver motor cannot run safely. Because of the possibility of collision, there is essential need of motor driver. One motor driver IC L293D can handle two motors at a time simultaneously. In

that two H-Bridges are inbuilt. This project uses two DC gear motors. These motors are connected at the output of motor driver. The direction of motor will decide the direction of the wheelchair.

In this project as a limit switch obstacle sensor are used. When handicapped person want to move wheelchair in the reverse direction but handicapped person are unable to see in the back side of wheelchair to move wheelchair in reverse direction. And if there is any obstacle or wall at the back site of wheelchair is present then this is critical situation for handicapped one, therefore system uses obstacle sensor and this sensor will operate to indicate the obstacle and avoid the serious accident. When obstacle is detected system has to turn on the buzzer but output of micro-controller is not sufficient to drive the buzzer directly. Therefore to drive the buzzer this system are using transistor as a switch and this is output device. When there is obstacle detected then Buzzer turns ON automatically, otherwise buzzer will be turned off.

In this project, requirement of power supply is +12Vdc, and +5Vdc. +5 volts is required for Micro-controller 89C51 board, sensors and signal conditioning etc. + 12 Volts are required for Buzzer, motor driver and motors. This wheelchair is moving so here cannot use 230Vac supply. Therefore it uses 12VDC battery. Also in this system reset button is present if any problem is occurred on the working time of wheelchair, it helps handicapped one to reset the all functions of the project and again it start from beginning.

IV. IMPLEMENTATION

A. *Hardware Description*

Components of this project are:

  I.   Accelerometer Sensor

  II. RF Module Transceiver- Receiver Set

  III. Encoder And Decoder

  IV. Dc Motor, Motor Drive

  V.   Microcontroller 89c51

B. *Software Requirement*

The software for the wheelchair prototype was coded in embedded C, because of compiler availability, our familiarity with the language, as well as the greater control of the system offered as compared to other high level languages.

V. RESULTS AND EXPERIMENTATION

The prototype of gesture control wheelchair has been shown in figure 4. This wheelchair has been tested by tilting transmitter of wheelchair. By the gesture sensing of transmitter, wheelchair moves in the four directions as per the transmitter commands. Wheelchair moves in forward direction, backward direction, left direction and right direction. And if any obstacle present in the path of wheelchair in backward direction then also wheelchair will automatically stops and rings the alarm.
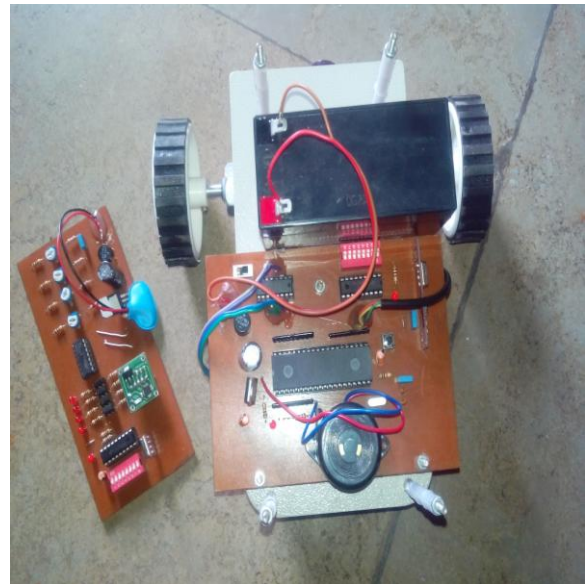

Figure 4: The Prototype of Gesture Control Wireless Wheelchair

VI. CONCLUSION

By using this system physically handicapped persons finds easy way to navigate within house using this automatic control wireless wheelchair without any external support, also this gives operation very friendly and simple as well as small in size. If this sensor replace with another sensor, it can control the chair by head movements respectively. This wheelchair could make a handicapped one independent and also there is no any need to depend on another person for his day to day work in life. This automatic wheelchair helps handicapped one, which are not able to move and cannot stand alone effectively.

VII. ACKNOWLEDGMENT

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