ISSN: 2320-1363

# Design and Development of a Hand-glove Controlled Wheel Chair Based on MEMS

**M. Nagaraju[*1], Prasanna Jyothi[*2]**

M.TECH ,Dept of ECE, Aurora's Research & Technological Institute, Warangal, India

Asso. prof Dept of ECE, Aurora's Research & Technological Institute, Warangal, India

## Abstract:

This paper presents the Design and Development of a Hand-glove controlled wheel chair based on MEMS. This paper purpose of life in the lives of disabled people based on MEMS, The aim at incorporating the modern ways of wheel chair dynamics and control and at the same time making it cost effective, so that it is affordable to the common masses. The goal of this research is to develop a wheelchair system which controls its movement by the merely bending of a person's fingers. In this research a prototype of an affordable and technologically advanced wheelchair is to be designed and developed. The proposed prototype will be communicating wirelessly between the controller and the plant and it will also replace the traditional joystick by the implementation of user hand glove control based on MEMS. The MEMS sensors inside the glove can sense the movement of fingers. The controller sends the signals to the receiver section which is placed under the wheelchair through a wireless technology. In The receiver section get the signals from the transmitter according to the signals the motor is running which changes the wheel movement. The technologies presented in this paper suggest a wide domain of possibilities to a wide variety of users. In addition, it also aims at making hi-tech wheelchairs are made and so that control the security problem with Alarm and cost effective by people Disabilities.

## I. Introduction

This Document provides people worldwide with physical disabilities require the assistance of a wheelchair, To provide The MEMS sensor based on hand-moment of the person's fingers. The aim at incorporating the modern ways of wheel chair dynamics and control and at the same time making it

ISSN: 2320-1363

cost effective, so that it is affordable to the common masses .The goal of this research is to develop a wheelchair system which controls its movement by the mere bending of a person's fingers. 'MEMS sensors' are embedded into a hand glove in order to achieve the desired goal. The MEMS sensors inside the glove can sense the movement of fingers. The controller sends the signals to the receiver section which is placed under the wheelchair through a wireless technology. In The receiver section get the signals from the transmitter according to the signals the motor is running which changes the wheel movement. In this research a prototype of an affordable and technologically advanced wheelchair is to be designed and developed. This is to aid the communication of severely disabled people and enhance the man covering of the vehicle with the use of hand movements. Another lternative would be an electric wheelchair controlled by a joystick. Although the electric powered wheelchair is a much improvised vehicle and an easier-to-control device, but it might not help the cause of severely disabled. The paper presents a control-method to man motorized wheel chair merely by the movement of fingers. It aims at incorporating the modern ways of wheel chair dynamics and control the security problem with alarm and cost effectively..

## II. Literature review

This technology progress provides there were the manual wheelchairs', then came the electric powered wheelchairs and now there are Smart Wheelchairs. In this particular we are designing electric powered wheelchair which is controlled by hand movement. As per our need to control wheelchair, we use only two fingers of hand gloves. On these two fingers we place two photodiodes at upper side and two tactile micro switches below the finger as sensors. The signal coming from these gets encoded and sends to the transmitter to transmit. On the other hand, at receiver side we get this signal with the help of receiver and send it to the decoder to decode it. Microcontroller is already been programmed for different code combinations, so that the decoded signal gets converted into appropriate movement of wheelchair with the help of relays and DC motor. A 'Motorized Chair'

ISSN: 2320-1363

consists of a chair with the two motors and a joystick controller. A microcontroller outputs the speed and direction to the motors.

Most wheelchairs are controlled from their back wheels. The front wheels respond direction of rotation of motors and rotate in accordance to the back wheels. The design a hand-glove wheel chair which is controlled according to the movement of fingers of hand .These always requires an extra effort. So, instead we can opt for use of daily gestures like hand, head movements and also voice to drive these devices. Initially wheelchairs were used just as a fast and easy means to move disabled from one place to another, but this role changed as society progressed. Numerous inventions and improvements fashioned push rim for self-propulsion and slings for seat and backrests Then came the joystick controlled wheel chair . The joystick was pushed or pulled against on/off switches which would cause the chair to jerk when it started, stopped or changed directions. So the next big step in electric wheelchair development was the introduction of electronic circuitry and proportional control drive of a man motorized wheel chair merely by the movement of a person's fingers.

## Iii. Methodology and Working

The methodology consists of a thorough study and analysis of electric powered and joy-stick controlled wheelchairs, The Microcontroller will continuously monitors MEMS sensor values and if it found any security problem then the Microcontroller will switch on the Alarm until the Reset button was pressed. In this particular we are designing electric powered wheelchair which is controlled by hand movement. As per our need to control wheelchair, we use only two fingers of hand gloves. On these two fingers we place two photodiodes at upper side and two tactile micro switches below the finger as sensors. The signal coming from these gets encoded and sends to the transmitter to transmit. On the other hand, at receiver side we get this signal with the help of receiver and send it to the decoder to decode it. Microcontroller is already been programmed for different code combinations, so that the decoded signal gets converted into appropriate movement of

ISSN: 2320-1363

wheelchair with the help of relays and DC motor.

A 'Motorized Chair' consists of a chair with the two motors and a joystick controller. A microcontroller outputs the speed and direction to the motors. Most wheelchairs are controlled from their back wheels. The front wheels respond direction of rotation of motors and rotate in accordance to the back wheels. ZigBee is a cost-effective, standard-based home-area wireless network, designed specifically to replace the proliferation of individual remote controls, and supports low data rates, low power consumption, security, and reliability. To address those specifications, the ZigBee Alliance, an industry working group [4], develops standardized application software, working closely with the IEEE to ensure an integrated, complete, and interoperable network for the market. In this project we are using the two microcontrollers. ZIGBEE, fire sensor and home appliances are interfaced one microcontroller, ZIGBEE transceiver, switch, and Buzzer is connected to the microcontroller. The function of the motor driver circuit is to control the direction of rotation of the motors. Through the H-bridge the motors receive the instructions and act consequently, having complete control over the speed and direction of rotation of the motors.

Hence, the wheelchair begins to move according to the movement or bending of the user's fingers. Once the voltage is received by the microcontroller, it needs to be transmitted over to the other side of the system, which is the wheelchair, underneath which lies the main controller board. This is done by the transmitting circuit present on the hand-glove, hence realizing wireless communication between the chair and the glove. The wireless transfer protocol used is Zigbee, since it is easier to use and the wheelchair doesn't require a long-range communication. A motor-control ATMEGA328p circuit controls the speed and the direction of rotation of motors.

report on the development of a device called 'The Magic Glove'. The 'Magic Glove' is an instrumented glove with wide range of applications in the field of robotics. The glove measures the force exerted by the wearer of a material handling robot.

ISSN: 2320-1363

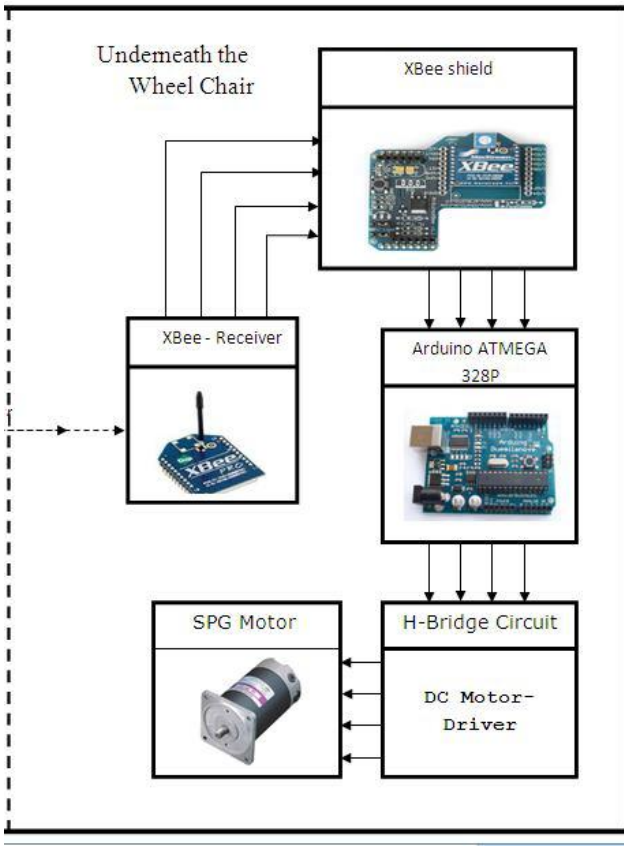


Figure 1. Block Diagram Of Wheel Chair Side

## B. On The Hand-Glove

The most significant component in this design is the flex sensor, because it requires negligible force to bend the sensor, which in turn causes the motion of the wheelchair. This small force overcomes the limitation provided by the traditional joystick control of wheelchairs making it easier for people with severe disabilities of the vehicle. The flex sensors are embedded into the instrumented gloves, with each finger having a different function. The bending of the index finger causes the chair to move forward.

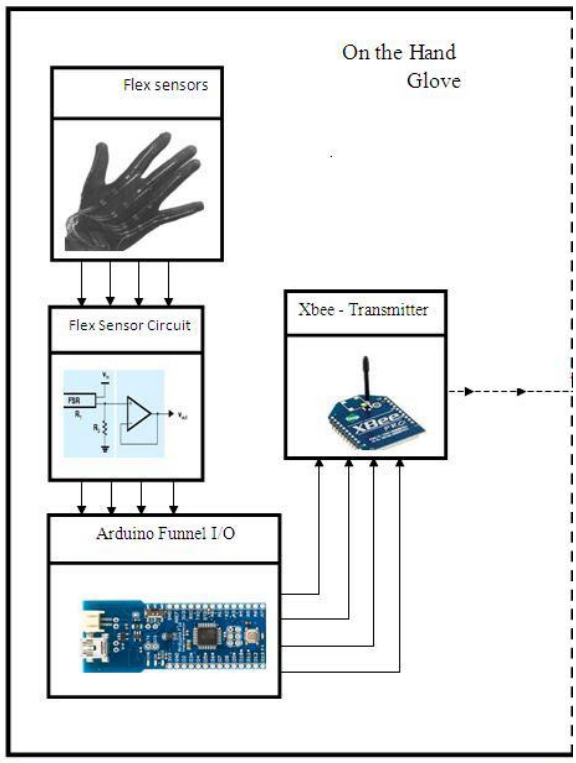


Figure 2. Block Diagram on the Hand-Glove

As the finger is bent more, the voltage across the divider-circuit increases and so does the speed of the vehicle. The rest of the fingers are used to move the chair right, left and backwards. There is a tolerance

ISSN: 2320-1363

provided for the abnormal bending because of the tendency of the fingers to follow the one which is bent, although vaguely. If all four fingers are bent at a time, the microcontroller is programmed such that it will all the operations and the chair will come to standstill.

## Iv. Result and Analysis

The main purpose of the robot is to detect any Landmine in its path and provide the information to the controller and handle the device to defuse. The 'Magic Glove' is an instrumented glove with wide range of applications in the field of robotics. The glove measures the force exerted by the wearer of a material handling robot. Once the force is sensed and measured, it is broadcasted to the controller. The wireless transfer protocol used is Zigbee, since it is easier to use and the wheelchair doesn't require a long-range communication. The equations will be represented based on MEMS in the form of:

```
if(tilt==0x15)    ----------(1)
{
      lcd_str(" forward ");
      serial1("@front*");
}

if(tilt==0x19)    ----------(2)
{
    lcd_str(" backward ");
    serial1("@back*");
}

 if(tilt==0x05)    ----------(3)
 {
   lcd_str(" left ");
   serial1("@right*");
 }

if(tilt==0x09)    ----------(4)
{
  lcd_str("  right ");
  serial1("@left*");
}
```

Results:

Image A:

Image B:

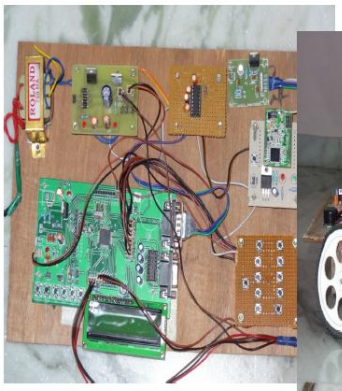

Figure 3. Control Section

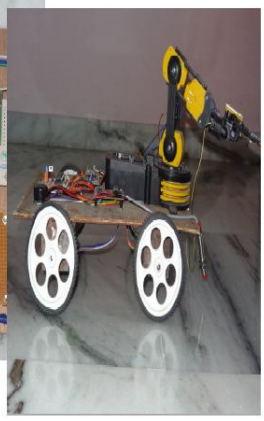

Figure 4. Robot Section

ISSN: 2320-1363

## V. Conclusion

In this paper, the main aim of our project is to detect wheel chair control and the cost effective and security problems by alarms is discussed. To develop this Project we are using MEMS sensor, and the system is fully controlled microcontroller. In this paper hand glove controlled Smart Wheelchair is A model of the system has been developed which is believed to provide better control to people with severe disabilities in comparison to the traditional joystick-controlled because of the lesser amount of force required to manipulate the hand glove in contrast to the joystick and it includes the integration of an obstacle avoidance and collision detection system. The Microcontroller will continuously monitors MEMS sensor values and if it found any security problem then the Microcontroller will switch on the Alarm until the Reset button was pressed. Further research includes the integration of an obstacle avoidance and collision detection system; there is also a huge scope to improve breaking mechanisms of the system on which research is underway.

## References

[1] a. Birk and s. Carpin, "rescue robotics – a crucial milestone on th road to autonomous systems, "Advanced robotics journal, vol. 20, j. Peters, Ed. New York: mcgraw-hill, 1964, pp. 15–64.

[2] a. David's, "urban search and rescue robots: from tragedy to technology," intelligent systems, IEEE, vol. 17, no. 2, 2002, pp. 81-83.

[3] j. Y. Wong, theory of ground vehicle, 3rd edition. John Wiley and sons, inc., 2001, ch.4.5.

[4] larry shapiro, special police vehicles , isbn 0-7603- 07602, mbi publications, pg 44-45.

[5] David axe, war bots: us military bots transforming war in Iraq, Afghanistan and future, ISBN 978-1-934840-37-5, nimble books inc.

**M.NAGARAJU** completed her B tech in Balaji Institute of Technology and Science and pursuing M-Tech in Aurora's Research & Technological Institute

**Mrs. PRASANNA JYOTHI** is working as AssO. prof in Dept of ECE, Aurora's Research & Technological Institute