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# Unique Locomotive Wheelchair Robot Mechanism using Gesture and Android

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***Abstract-*** Wheelchairs are used by the people who cannot walk due to physical illness, injury or other disability. Elderly peoples are unable to walk, we need to take care of these peoples every days .so, elderly people to maneuver a mechanical wheelchair, which many of them normally use for locomotion. Hence there is a need for designing a wheelchair that is intelligent and provides easy transportation for the physically challenged peoples and elderly peoples. In this context, an attempt has been made to propose a thought controlled wheelchair, which uses the captured signals from the user's action and processes it to control the wheelchair. The signals which are captured and translated into movement commands by the microcontroller which in turn move the wheelchair.

***Index Terms—****Android phone microcontroller, Gesture sensor,ultrasonic sensor, Bluetoothmodule.*

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## I. Introduction

### 1.1 Background

"World report on disability" [1] jointly presented by World Health Organization (WHO) and World Bank says that there are 70 million people are handicapped in the world. Unfortunately day by day the number of handicapped people is going on increasing due to road accidents as well as disease like paralysis. Among all the disabilities percentage of physically handicapped person is most .If a person is handicapped he is dependent on other person for his day to day work like transport, food, orientation etc.

The aim of the project is to use wheelchair automatically and operate by using voice and gesture control for moving forward , backward ,left and right by smart phone.Quadriplegics and Multiple sclerosis patients have severe disabilities and cannot drive joystick operated traditional wheelchairs.Traditionally.wheelchair have some limitations in content to flexibility, bulkiness and limited function. The approach allows the user to use human voice, gesture movement smart phone and synchronize the with the movement of wheelchair so that they can use it with comfort.Individually Gesture sensor is placed..ultrasonic sensor is used to detect the obstacles.

The signals which are captured by the user action this action are translated into movements commands by microcontroller which in turn move the wheelchair.

## II. Related Works

### 2.1 Joystick Interface

We have used a 3D joystick which gives us control signals in 3 rotary axis. Forward, lateral velocities and turn rates of the omni system are mapped with the joystick axes.

For controlling omni drive, we need 3 degree of freedom, two for position and one for orientation. We have used a 3D joystick which gives us control signals in 3 rotary axes (Fig. (4)). Forward, lateral velocities, and turn rates of the omni system is mapped with the joystick axes. Table (I) shows the mapping between joystick and robot motion. Along with these six defined motion, intermediate motion can also be obtained like moving forward at an angle of 45 degree.

TABLEI: Joystick states and robot motion mapping

| Joystickstates | Wheel1and3 | Wheel2and4 | Robot Motion |
|---|---|---|---|
| Front Back Left Right | StopStop Forward Backward Left | Forward Backward Stop | Forward Backward Left |
| YawLeft | Right | Stop Left Right | Right CCW CW |
| YawRight | | | |

### 2.2 Eye Movement-Controlled

An eye movement-controlled wheelchair is designed for paraplegic patients. Eyes are used to control the wheelchair. The design of eye-controlled panel fixed on the top of eye tracker is showed in Fig.5. It is used to indicate the direction of the wheelchair movement. The gazing point falls into black circle. Eye tracker is used to

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determine the position. According to pre-defined eye-control rules, a computer is used to transform eye tracking information to control the wheelchair movement.

Fig 2.1 Eye-controlledpaneldesign

## III. System Analysis

In existing system, there is automated way to operate a wheel chair. So wheel chair can be operated with own hand or with someone's help. So handless people felt very difficult to operate it. To overcome these problems we go for proposed system. Automation way is existed to operate a wheelchair.Wheelchair can be operated with own hand or with someone's help.Physically challenged people felt very difficult to operate it. To overcome these problems we go for proposed system. The disadvantages are

- Wheel chair robot is difficult to operate.
- Wheel chair has no alternative method is used to operate the wheel chair in this system.
- Wheelchair Robot cannot detect obstacle.
- Hand disabled people are difficult to operate.

Here we proposed, introducing advanced method to control the wheel chair with the help of embedded systems. Here we are introducing two methods for controlling the wheel chair. 1) Hand gesture control 2) smart phone control.

Here robot can be operated in four ways like forward, reverse, left and right with the hand Gesture signal movement. But some cases hand gesture is not possible to operate a wheel chair. Therefore we introduce alternate way to operate a wheel chair with the help of android mobile. Using this android application, it can be used with 2 in 1 option. We can control the wheelchair robot with two methods using this application. There are Steering control, Voice control, and touch screen button control. Also Ultrasonic sensor is used to detect the obstacle. LCD is used to display the various statuses. The advantages are

- Wheelchair Robot mechanism is easy to operate.
- Gesture control is used to operate the wheelchair easier.
- For paraplegics and blind peoples, voice control is used to control the wheel chair.
- For a safety monitoring of ultrasonic sensor is used to detect the obstacles.

## IV. System Design

This System Architecture represents a controlled wheelchair, which uses the captured signals from the user's action and processes it to control the wheelchair.

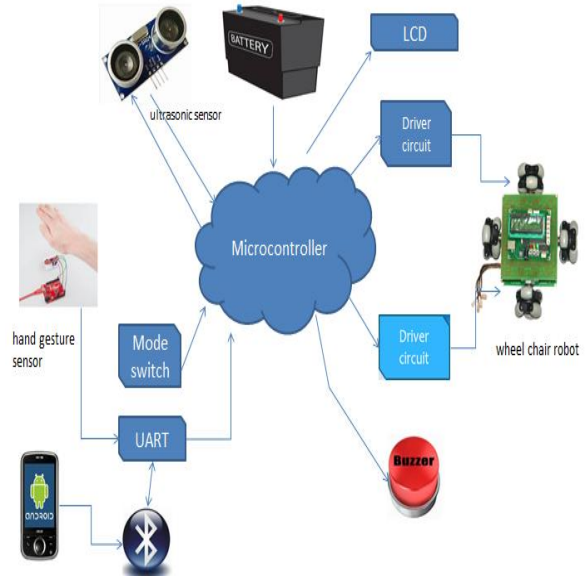


Fig 4.1 System Architecture

The signals which are captured and translated into movement commands by the microcontroller which in turn move the wheelchair.robot can be operated in four ways like forward, reverse, left and right with the hand Gesture signal movement. But some cases hand gesture is not possible to operate a wheel chair. Therefore we introduce alternate way to operate a wheel chair with the help of android mobile. Using this android application, it can be used with 2 in 1 option. We can control the wheelchair robot with two methods using this application. There are Steering control, Voice control, and touch screen button control. Also Ultrasonic sensor is used to detect the obstacle. LCD is used to display the various status.

### 4.1 Pic Microcontroller

The PIC16F877A CMOS FLASHbased 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx and PIC16C7x devices.It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port.

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### 4.2 Gesture

Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Current focuses in the field include emotion recognition from face and hand gesture recognition. Users can use simple gestures to control or interact with devices without physically touching them.

### 4.3 Bluetooth:

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication.

### 4.4 Ultrasonic Sensor:

Ultrasonic sensors generate/trigger high-frequency sound waves and evaluate the echo which is received back by the sensor. Measuring the time interval between sending the signal and receiving the echo to determine the distance to an object.

### 4.5 Driver Circuit:

The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It consists of seven NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diode for switching inductive loads. The collector-current rating of a single Darlington pair is 500mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED gas discharge), line drivers, and logic buffers. The ULN2003 has a 2.7kW series base resistor for each Darlington pair for operation directly with TTL or 5V CMOS devices

## V. Conclusion

By using this system physically handicapped people find easy way to navigate within the house using wheelchair without the external help. This provides ease of operation. A prototype of system has been developed which is believed to provide good control to people with severe disabilities. This system use gesture as the input signal to control the robotic wheelchair. The experiment shows great accuracy in gesture segmentation using the method this paper proposed. The results of our controller show very accurate performance with accuracy of approximately 99%. Further we are using the ultrasonic sensor for obstacle detection.

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