

GESTURE BASED CARROZZELLA USING ANDROID

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ABSTRACT

This system is one of the best innovations of normal electric wheelchairs. Wheelchair is used by the people who cannot walk due to physically handicapped persons and this wheelchair is normally controlled by users via joysticks so cannot satisfy the needs of handicapped person. This method was developed based on curvature of a hand shape contour. This method is performing five different hand and head gestures control like as: forward & reverse, left & right. Normally, electric-power wheelchair in few functions are available but in our system we can include hand or head gesture recognition by using acceleration technology and android mobile application for control the wheelchair.

KEYWORDS: *Wheelchair, Micro-electromechanical systems (MEMS) Accelerometer, Infrared sensor, Bluetooth module, Android mobile, Arduino, Microcontroller*

I. INTRODUCTION

In that time, an estimated 1% of the world's population needs a wheelchair. An increased percentage of elderly and handicapped person who want to enhance their personal mobility, for them wheelchair is the best assistive device [4]. The wheelchair is an important way of transfer for disabled and aged person. A specially handicapped and aged person is usually moved the wheels of wheelchair with own drive. Intelligent wheelchairs, as a kind of reestablishment robots, play an important role in helping the elderly and handicapped person to live more independently at home and have a low cost on their healthcare. Many researchers have been developing intelligent wheelchairs due increasing requirement of safer and comfortable wheelchairs. A wheelchair has been designed and developed by using some input methods such as joystick, power controllers and motors instead of hand propulsion or a guardian, people with disabilities have been able to loco-mote with uncomfortable than before, not just in mobility but also in reduction of effort and discomfort. However, some physically challenged person is not able to use such devices as they may have difficulty in handling the controls. It's used as methods of non-verbal communication in our daily lives to represent meaning or emphasis on the idea while communicating, such communicating of speech-impaired instead people, controlling the traffic, etc. Now days, assistive robotic wheelchair can improve the life for elderly and disabled people. They allow user to move more efficiently and with greater ease based on hand gesture signals. An android app is become to use the mobile's sensors and Bluetooth modules of microcontroller to control the motor wireless. The android mobile is placed on the person's hand, and drive the wheelchair by simply learning the phone in the direction of the desired motion. The android mobile operates interfacing though bluetooth module wheelchair motors.

II. LITERATURE REVIEW

Our paper presents methodology for gesture controlled user interface (GCU). We represent approach obstacle infrared sensor detection, gesture based technique which controls the wheelchair using hand movements. This technique represents economical and small 3-axis wireless accelerometers based

system to manage the wheelchair using microcontroller. The systems are divided into two main components: gesture recognition with micro-electromechanical systems (MEMS) accelerometer and wheelchair control. In the gesture recognition system, the brain of the system is microcontroller. The MEMS accelerometer sensor which is attached to hand, is 3-axis accelerometer with analog output that senses the angle of the hand gesture movement, i.e. according to the hand movement, it gives voltages to microcontroller IC. The wheelchair control unit is controlled using microcontroller. The four movements that are achieved: are stop, backward, forward, left and right. The systems can recognize input gestures movement signal quickly with a reliable recognition technique. The users are capable to perform most of the typical interfacing tasks in virtual environment by this accelerometer-based device. [3]

Patients involved in physical injuries and handicapped disabilities with good mental strength to get through places using the conventional hand powered wheelchair. Android based gesture system enables an economic system in any existing wheelchair that becomes a smart system for automatic wheelchair control which can be controlled by any android mobile. The main concept involved is android smartphone which has Linux operating system java based android operating system which has android app for wireless interfacing to bluetooth module of microcontroller. The purpose of our project can be expanded to other mobile devices which have android based mobile handset by sharing the application that are became on Linux os java platform based android app which are now readymade available on the internet . The main other part of our system architecture is the microcontroller which can drive in the various directions of the dc motor for different directional movement of wheelchair and can power to the DC motor for linear motion of the wheelchair. The DC motor can manage front wheels for turning the wheel of the wheelchair while the pair of DC motor connected to the rear wheels enable linear motion. [2]

III. BLOCK DIAGRAM

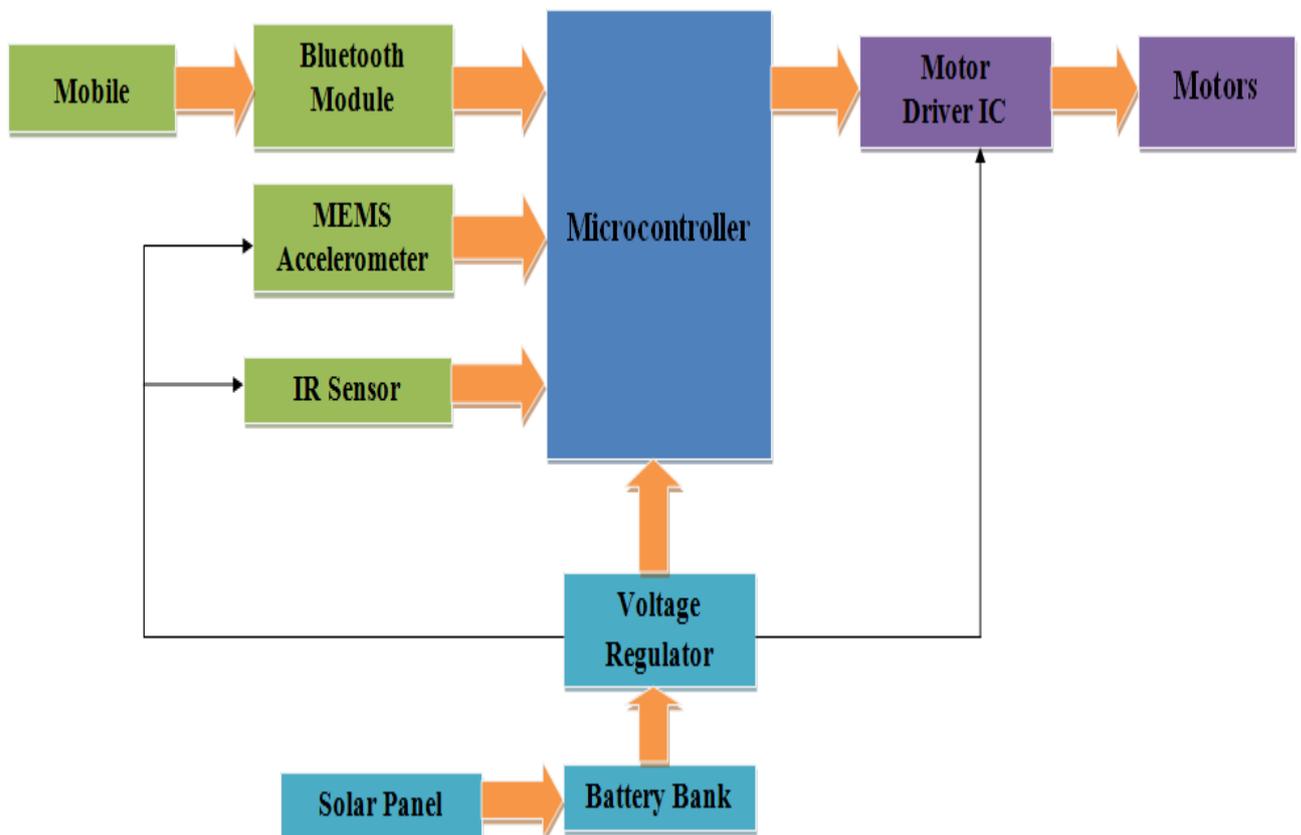


Figure 1. Block diagram of gesture based carrozzella using Android mobile

A. Microcontroller

Microcontroller is integrated device which is controlled the whole the electronics circuit. It is a chip which has a computer processor with all its support functions, memory (both ROM and RAM), & input/output port.

B. Mems Accelerometer

Mems accelerometer is a small, low power, 3-axis accelerometer which generates analog voltage signal outputs. The mems accelerometer measures acceleration signals with a minimum full-scale range of ± 3 g. It can measure static as well as dynamic acceleration of gravity resulting from motion, shock or vibration.

C. IR Sensor

Infrared sensor is an electronic device which is applied to sense some characteristics of its surroundings by either emitting and detecting infrared radiation.

D. Mobile

In this project, mobile is used for controlling wheelchair as alternative of mems accelerometer, is interfaced wireless through bluetooth module of connected input of microcontroller.

E. Solar Panel

The solar panels can be used solar energy even on cloudy days. On sunny days, it serves a dual power energy generation. To meet the user's digital needs, USB power ports are provided to charge electronics devices such as mobiles, GPS navigation, tablet, computers, etc.

F. Battery Bank

A battery bank can combine of a single, two or multiple interconnected batteries which work as one large battery at a required voltage and amp-hour capacity.

G. Voltage regulator

Voltage regulator is simply used for regulated voltage received from battery bank, is used for given input voltage to whole circuit components. For example; 5, 9, 12, 24 voltages.

H. Motor Driver IC

Motor driver IC is L293D IC which allows DC motor to drive in any surround direction. L293D is a 16-pin IC which can control the pair of two DC motors simultaneously in any direction. So that we can control DC motor with a single L293D IC. The L293D can drive small, medium and big motors.

IV. WORKING METHODOLOGY

There are two method controlling wheelchair which are as follows

- (a) Gesture based controlling of wheelchair
- (b) Android based controlling of wheelchair

Let's discuss each method in details

A. Gesture Based Controlling Of Wheelchair

In gesture based controlling of wheelchair, hand is attached to ADXL335 accelerometer. When hand is moved to downward forward side, then wheelchair is moved towards forward direction. But when hand is moved right side, then wheelchair is moved in right side direction. When hand is moved left side, then wheelchair is moved in left side direction. When hand is moved upper side, then wheelchair is moved in reverse side direction.

B. Android Based Controlling Of Wheelchair

In android based controlling of wheelchair, hand is not attached to ADXL335 accelerometer. Here, android mobile is used for controlling wheel of wheelchair. One java based readymade android app is

used for rotate wheel of wheelchair. Here, first android mobile is connected to bluetooth module of microcontroller& after that android app automatically detect to microcontroller interface. After detected microcontroller interface, android app can be fully control the wheel of wheelchair.

V. HARDWARE COMPONENTS & SOFTWARES DESCRIPTION

A. Hardware Components

1. Arduino Kit
2. Android mobile
3. Bluetooth module
4. ADXL335 accelerometer
5. Infrared sensor
6. Motor driver IC
7. DC motors

B. Software

1. Arduino software
2. Android application (**Note:** Android app is become on java platform using. But here, it is not requirement of java Platform for become android app.)

VI. ADVANTAGES & DISADVANTAGES

A. Gesture

Advantages

Using hand gesture, it can be rotate wheel of wheelchair forward, reverse, left, right side.

Disadvantages

Hand handicapped person cannot be used

B. Android

Advantages

Using touchpad android application, it can be rotate wheel of wheelchair.

Disadvantages

Some phones tend to lose efficiency if no of apps are installed.

C. Bluetooth

Advantages

Using Bluetooth module, wireless wheel of wheelchair can be controlled

Disadvantages

It only allows short range communication between devices.

VII. APPLICATIONS

1. In medical hospitals for patients.
2. Health care centers.
3. Old age home
4. Physically handicapped individuals.
5. Automatic alerting and detection of obstacles using infrared and ultrasonic sensor.

VIII. OBJECTIVES & FUTURE SCOPES

1. We can make a wheelchair which can be operated by a wireless remote. Output signal of sensor can be sent through wireless transmitter circuit and can be received at receiver circuit of wheelchair. So wireless operation can reduce wiring arrangements.

2. Instead of using acceleration motion (Hand movement), In future, we would be able to use eye retina using optical sensor to move wheelchair in different direction. Using eye retina movement, we would be able to drive a wheelchair.
3. Researchers are going on development of wheelchair using nervous system of human.

IX. CONCLUSIONS

In this topic, various methodologies have been analyzed and reviewed with their advantages and disadvantages under various operational and functional strategies. This paper is useful to control the wheelchair of handicapped disabled persons using hand gesture and android mobile. New improvements can be made by using various body gestures such as head movement, eye gaze and leg movement.

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