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Wireless Hand Gesture Based Wheelchair Control With GPS And GSM Module

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Abstract

In the modern electronics, automation is the basic need. The growth of automation field is increasing rapidly. Recent technological inventions revel that robots can be helpful to humans. Keeling this in mind it is observed that the problems faced by handicapped people for movement and the problems faced by workers in industries to move raw materials we are introducing a fantastic and reliable system named Wireless Hand Gesture Based Wheelchair Control With GPS And GSM Module. It is helpful for handicapped people to interact with chair by themselves as well as industrial.

Index Terms: *GPS Module, GSM Module, RF Transceiver, PIC Microcontroller, DC Motor etc.*

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1. Introduction

This wheelchair is mainly divided into two types transmitter side and receiver side. Transmitter side consists an accelerometer sensor and RF transmitter. Accelerometer sensor is used to detect gestures made by hand. It operate on the principle Micro Electro Mechanical system which has 3-axis to sense the direction. When the sensor is move forward the wheelchair will move forward, backward move to move wheelchair backward, left move to move wheelchair left, right move to move wheelchair right, and hold sensor still to stop wheelchair. The output of accelerometer sensor is connected to RF transmitter. The receiver side consists of RF receiver to receive the data transmitted by RF transmitter, and microcontroller to process the received data, Motor driver IC to control DC Motors and motors to move wheelchair. Also we have connected GPS module and GSM module to the UART of microcontroller. When the switch is pressed GPS module will detect the current position of the system and with the help of GSM module the registered user will get the message of wheelchair location. The purpose of this paper to implement a wheelchair which will move accordingly with the directions of hand and also a

combination of GPS and GSM Module which will provide the location of wheelchair to the registered user.[1]

2. Need Of Project

In this project we have to develop a wheelchair which is useful to the handicapped person with his hand gesture reorganization. With the help of the wheelchair handicapped person would able to move himself to the desired location with the help of hand gestures which controls he movement of the wheelchair. In case of emergency also he can send his location to registered mobile user.

3. Literature Review

Paper Name	Author	Hardware	Conclusion
Wireless Hand Gesture Controlled Wheelchair	*DikshaGoyaland Dr. S.P.S. Saini*	flex sensor MMA7660 FC, PIC Microcontroller, I2C, RF Module	This system uses I2C protocol. Using a simple I2C chipwe can connect up to 128 chairs using a single remote.
Accelerometer Based Hand Gesture Controlled Robot	Mr.Pravin Vaishnav, Mrs.ShaliniTiwari	Accelerometer sensor MMA7361 L,AT 89C51,RF Module RF433-RX, DC Motors, DC Power Supply.	It is an intelligent spy robot project has been designed for the spying purpose .it is radio controlled and can be operated at a radial distance of 100m radius.
Android Mobile Phone Controlled Wi-Fi Robot	ManishaB .Bansode, Prof.J.K.Singh	.Android Smart Phone, WiFiModule, Temperature Sensor, Gas Sensor, ARM7 processor.	In this system to detect motion an android smartphone is used to control robot.Sensors placed on robot to update the temperature and gas values
GPS & GSM based tracking system using google map	Prof. Vishal V. Pande, Miss.NikitaS.Ubale	*GPS, GSM, Atmega microcontroller MAX 232, 16x2 LCD*	In this system a MAX232 used for GSM, GPS and microcontroller. This system is directly linked to a system on web named as web application for location detection.
Accelerometer Based Gesture Controlled wheel chair with emergency system	Nakul k Patel, Saurabh b Patel, Mansurimo. Ammar	GPS Module, GSM Module, RF Module, Accelerometer Sensor	In this paper For the finding the exact location of the wheel chair we developed navigation system in visual basic software.

4. Design

The method used for implantation is as follows :

4.1 Block Diagram & It's Description

The system comprises of two main parts: Transmitter part and receiver part. In transmitter part the hand gesture is recognised by the accelerometer sensor, this data is in analog form so a PIC microcontroller is used to convert the analog data in digital form. This digital

output is transmitted to the RF transmitter. Fig. 3.1.1 shows the block diagram of the transmitter unit.[4]

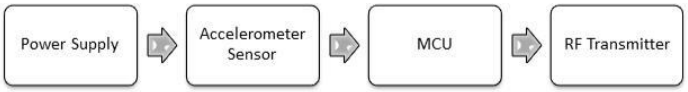
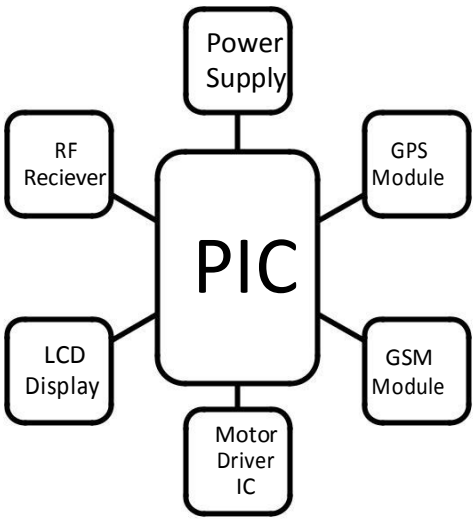


Fig 4.1 Block Diagram Of Transmitter

When the hand is moved the movement is detected by accelerometer sensor which is processed by the microcontroller and sent through RF transmitter. The same data is received at receiver side by the RF receiver. DC Motors which are interfaced to the controller by the motor driver controls the direction of the wheelchair. And in an emergency when the switch is pressed the current location is detected by the GPS and the current location is transmitted through GSM Module to the registered mobile number of the user. Fig.4.2 shows the block diagram of the receiver unit.



5. Implementation

Implementation is basically divided into two sides:

I. Transmitter Side

ii. Receiver Side

i. Transmitter Side

Transmitter side consists of an PIC16F8771A microcontroller connected to 9V power supply, RF Transmitter, Accelerometer sensor, Reset and Voltage regulator IC.

Power Supply: - The power supply unit consists of HIW Hi – waote 6F22 9V battery for transistor radios which is used to supply 5V power to accelerometer sensor, PIC16F877A microcontroller and RF transmitter.

Accelerometer Sensor :- According to the gesture in which the user directs his hands to move the wheelchair, direction signals are generated, which are unique for each direction. For instance, if the user wishes to progress the robot in the reverse direction, a small voltage proportional to the gravitational field acting when the accelerometer sensor is produced when the reverse gesture is given. Different sets of values in X, Y and Z axes when other gestures are used. These command signals are then transmitted wirelessly to the RF transceiver module (LR43312) via the RF transmitter present in the transmitted side i.e. on the hand. A Gesture Controlled wheelchair is a kind of robot which can be controlled by hand gestures not by old buttons.[5]

RF Transmitter :- An RF transmitter module is a small size PCB capable of transferring a radio wave and modulating radio wave to carry data. RF transmitter module is used with a PIC 16F877A micro controller, which will offer data to the module which can be transmitted.

Microcontroller :- The control signals generated by the accelerometer sensor are analog but RF transmitter is use digital signals to transmit. So a microcontroller (16F877A) with inbuilt ADC is used to convert analog signals from accelerometer sensor to digital signals for RF transmitter.

ii. Receiver Side:- The receiver side consists of RF receiver, PIC Microcontroller, 12V Battery, GPS Module, GSM Module, LCD Display. 2 10rpm DC motors.[6]

RF Receiver:- 425 MHz crystal base RF receiver module receive the RF information from transmitter and send the information to the PIC microcontroller. The RF receiver module will receive the data which is transferred by the gesture device.

PIC Microcontroller :- 5V power supply is given to the microcontroller unit. GPS and GSM modules are connected to the UART port of microcontroller. LCD display is also connected to the microcontroller. Microcontroller is responsible to process all the signals received by RF receiver. And depending upon that control action will be taken. Also when the switch is pressed GPS module will be initiated it will detect the location of wheelchair and it is given to microcontroller. The microcontroller will send the co-ordinates to the registered number.

GPS Module :- The GPS module is used to detect the location of the wheelchair. GPS module operates in two mode first mode is NMEA mode and other mode is binary mode. In NMEA mode we can trace date, time as well as current location while in binary mode we can detect only the current location.[7]

GSM Module:- It is connected to the transmit pin of the microcontroller. It will send the co-ordinates to the registered user via text message.

LCD Display :- It requires 5V power supply and a potmeter to adjust the brightness level. It is use to display the directions of moving vehicle as well as the longitude as well as latitude detected by GPS module.

Power Supply :- The power supply unit consists of 12V DC rechargeable battery which is directly connected to the DC motors. A 7805 voltage regulator IC is connected to the battery. PIC microcontroller is connected to it.

DC motors :- Two DC motors are used along with one free wheel at front side to move the wheelchair in anu direction. These are 10 rpm dc motors with gear.

6. Results

In the race of human v/s robots, hand gesture controlled vehicle comes as an e.g. of companionship of man and machine. Taking the technology to the next level from speech recognitions and wired connections, the technology of wireless hand gesture control is used. There is a rapid growth on application development considering gesture recognition system. So in this paper, a model of a robot based on "Human Machine programmer" can also control a robot quickly and in a natural way.

7. Future Scope

Presently in the system RF transceiver is used for transmission which restricts the vehicle to a small range. To overcome this restriction we can by Wi-fi or Zigbee module to increase the range and also cameras can be attached for video transmission.. Various sensors can be attached to it as per user's requirement like metal detectors for detecting metals below small tunnels, gas sensors to detect gas leakage in remote areas in industries. By attaching a robotic arm on it, it can be used for picking and transporting various objects, as well as it can be used for working in hazardous conditions. Similarly by attaching an extinguishing cylinder it can be used as fire extinguishing robot. This concept can be used in home automation.

8. References

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