

Voice and Gesture Based Wheelchair Implementation Using PIC and Android

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Abstract:

Wheelchairs are used by the people who cannot walk due to physical illness, injury or any other disability. Now a day's development promises a wide scope in developing smart wheel chair. This paper is implemented a home navigation system, which comprises of a wheelchair which works on the inputs such as voice commands via Bluetooth to an android phone and navigates according to command. Gesture recognition commands sent through Reed switch. Where tongue movements are used to control a powered wheelchair thus providing users, with high level spinal cord injuries, full control of their wheelchair. The sensors are used such as IR, Temperature sensor. In this method IR sensors are used to detect any obstacle in the wheelchair direction. This system is based on grouping of RF transmitter and receiver and an android phone to PIC microcontroller.

Index terms: PIC microcontroller (16F877A), Bluetooth module, L293 Motor Driver, RF transmitter and receiver, Gesture recognition, IR and Temperature sensor

Introduction:

Back ground:

By statistical report the World Health Organization(WHO) and world bank jointly says that there are 70 million peoples are handicapped in the world unfortunately day by day it will be increasing due to due to road accidents as well as disease like paralysis peoples. If a handicapped person is dependent on other person for his day to day work like transport, food, orientation etc.

The aim of this project is to use wheelchair work in automatically and operate by using voice control and tongue gesture moving forward, backward, left, right and stop by smart phone. Quadriplegics and multiple sclerosis patients have severe disabilities and cannot move traditional joystick based wheelchair.

A wheelchair is connected with an obstacle sensor, temperature sensor, DC motor, L293 motor driver and Android phone to help handicapped people to achieve some independent mobility.

By simply tilting tongue through reed switch in user the wheelchair can be moved in 4

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directions. This approach allows the user to use human voice movement via smart phone, tongue gesture movement via reed switch and synchronize with the movement of wheelchair so that they can use it with comfort. The complexity of the system will be reduced by using of smart phone so this wheelchair is very compact.

In some kind of handicapped peoples like cannot walk and talk persons are can drive wheelchair by gesture movements using tongue gesture through reed switch. Using advantages of technological development to increase the quality of life for handicap people and live their life in normal person. [10] discussed about an eye blinking sensor. Nowadays heart attack patients are increasing day by day."Though it is tough to save the heart attack patients, we can increase the statistics of saving the life of patients & the life of others whom they are responsible for.

In case of any emergency in handicap people the panic button will be attached to the wheelchair and the buzzer will blow the wheelchair.

Existing Method:

- (a) K.Sudheer, T.V Janardhanarao, Ch.Shridevi M.S MadhanMohan(2012) voice and gesture based electronic powered wheelchair using ARM. In this speech recognition module, hidden markov model are used. The MEMS sensor is used and it is senses the angle of hand. For voice recognition the voice IC will be used.
- (b) M.Prathyusha, K.S Roy, Mahboob Ali sheikh(2013) Voice and touch screen based wheelchair. In this paper describes,

the speech recognition system uses programmable speech recognition circuit. The speech controller works by varying average sent to the motor.

- (c) Rakhi A. Kalautri, D.K Chitre(2013) Used automatic gesture recognition system based on acceleration sensor here used in 2-axis. By calculating amount of tilt and output of tilt will decide to more in which direction.
- (d) Jinhua Zeng, Yaoru sun, Fang wangA natural hand gesture system for intelligent human-comput interaction and medical assistance. The hand gesture vocabulary in the system consist of 5 keys static hand gesture and 3 dynamic components. The hand motion in the vocabulary is limited to metacarpalangealjoint(MCP) abduction and adduction of index finger, ring finger and little finger and the thumb basal joint(TBJ) radial abduction and adduction of the thumb.

Applications of the wheelchair:

- Hospitals
- Sports
- physically handicapped individuals

Implementationplatform :

- Hardware Requirements
 - Reed switch
 - Encoder and Decoder
 - RF transmitter and receiver
 - PIC microcontroller (PIC16F877A)
 - Android phone or smart phone
 - Sensors
 - Temperature sensor-LM35
 - IR sensor

- L293D motor driver IC
- Bluetooth controller-HC05
- Power supply
- Software Requirements
 - Keil for embedded Programming
 - Eagle for PCB Design
 - Eclipse for Android Application Design

Proposed System:

In this project I have to make 2 modules such as transmitter and receiver module. The transmitter module is used for gesture operation using reed switch to control the location of wheelchair and receiver module is used for voice operation using smart phone to control the location of wheelchair.

The system is controlled by PIC microcontroller (PIC16F877A) which is also controls the Temperature, IR sensors.

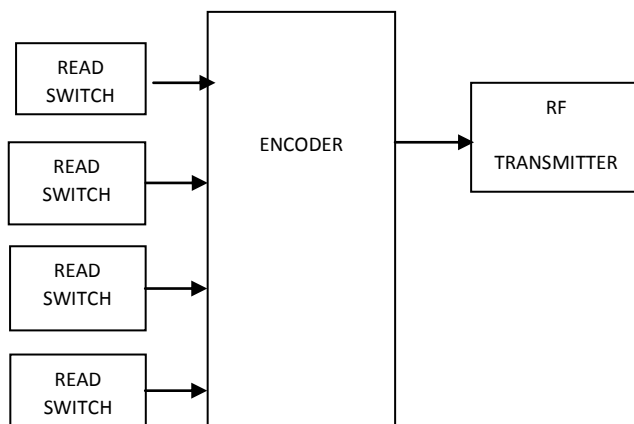


Fig (1): Block diagram of transmitter module

In real time the transmitter module of the reed switch is fixed in tongue and it will operate in corresponding tongue movement. The tongue movement signal is passed

through RF transmitter and it will pass the signal into RF receiver.

The received signal is controlled by using PIC microcontroller and the output produced in DC motor fixed wheels. Another operation is voice recognition based operation. This operation is performed via paired Bluetooth of android and also wheelchair Bluetooth. The Pic microcontroller and Bluetooth module are communicating over RS232.

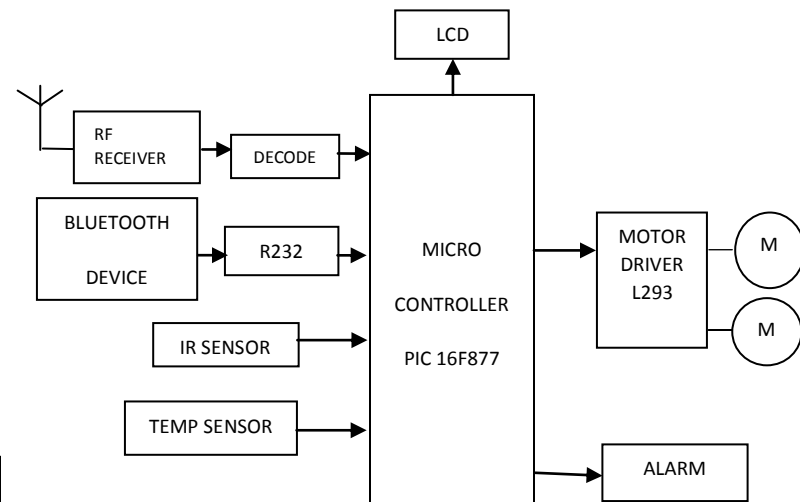


Fig (2): Block diagram of receiver module

DC Motor:

A dc motor is electrical energy into mechanical energy and it is interaction of magnetic fields and current- carrying conductors. The input of a DC motor is current/ voltage and its output is torque (speed).



Fig (3): DC Motor

The DC motor consists of two parts: one is rotating part that is called armature and another one is stationary part that includes coils of wire called field coils and also called as stator. The ends of each coil of wire on the armature are terminated at one end of the armature. The termination points are called the commutator, and this is where the brushes make electrical contact to bring electrical current from the stationary part to the rotating part of the machine.

Motor Driver (L293D):

The motor driver used here is L293D motor driver. It works on the concept of H-Bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. Hence H-Bridge IC is driving a DC Motor in a single L293D chip. In this chip there are two H-bridge circuit inside the IC which can rotate two DC motors independently.

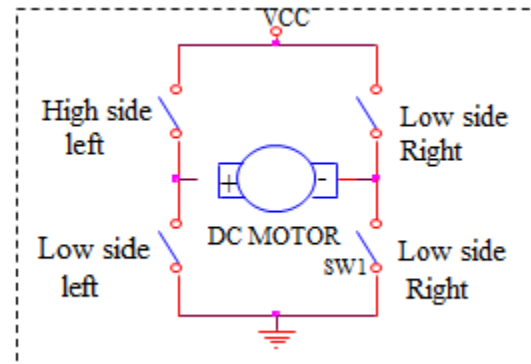


Fig (4): H-bridge(DC motor driver)

PIC microcontroller (PIC16F877A):

A microcontroller is an 'all in one' processor, the processor, RAM, ROM, IO all on the one chip. Microcontroller is specific purpose device PIC16F877A- is the microcontroller being used. It is a low power, high performance CMOS 8-bit microcontroller with 4K bytes of Flash programmable and erasable read only memory (PEROM).

It has 35-Instruction only and it has supports the protocols such as SPI, CAN, URAT for interfacing with other peripherals. They are reliable and malfunctioning of PIC percentage is very less.

Bluetooth module:

Bluetooth is wireless communication it can be transmit signal via air medium. Bluetooth has only 4pins: 5V, GND, TX and RX. The 5V pin and the GND pin are used for power and the TX and RX pin implemented a serial interface. The Bluetooth module is connected to PIC via RS232 serial interface.

Specifications of HC-05:

1. Typical -80 dBm sensitivity.

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2. Up to +4dBm RF transmitter power.
3. Low power 1.8V operation, range is 1.8 to 3.6V
4. UART interface with programmable Baud-rate.
5. Integrated antenna
6. Edge connector HC-05 Bluetooth Module.
7. Range is up to 100 meters in distance

Advantages:

1. User Friendly.
2. Helpful for the paralysis stroke people who do not have much stamina in the hands.
3. Reduces human activity.
4. Reduces physical strain
5. Less Expensive.
6. Two modes to control the wheelchair.
7. Easy to implement on existing wheelchair and doesn't require sophisticated components

Disadvantages:

1. Batteries need to be recharged periodically.

Application instructions:

-First make connection between HC-05 Bluetooth module is paired with the Android mobile.

-The default password for pairing is "1234".

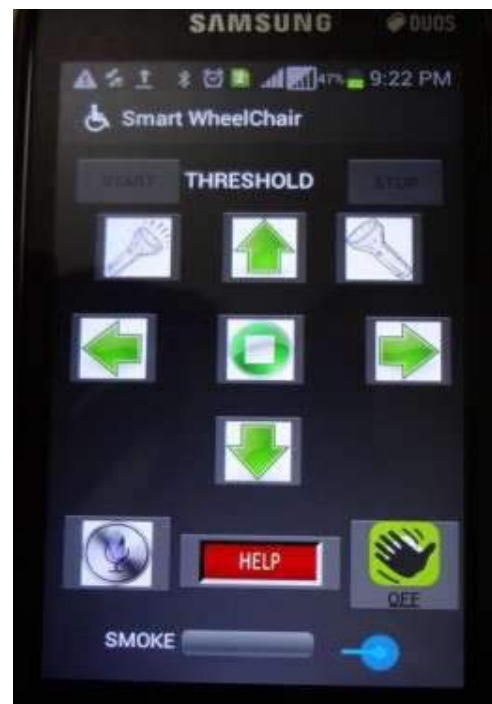
-Click on the device icon to pair with Bluetooth module.

Results:

This paper hardware implementation is done. Fig (5) shows that reed switch based gesture and android based voice command wheelchair. Fig (6) shows that Android application of voice command operation.



Fig (5): hardware set up of this project



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Fig (6): Indicates the Android app for the operation of Wheelchair. Android operating system is based on the Linux kernel. The project responsible for developing the Android system is called the Android Open Source Project (AOSP) and is primarily lead by Google.

Features of Android:

- Opensource
- MediaSupport
- Hugememory
- Fastprocessor
- BuiltinI/Odevices
- Nativesupportformore sensors
- Improvedbatteryefficiency
- Multitasking
- Haveopensourcesoftwaredevelopment

Conclusion:

Controlling technique is unique and quiet simple in our proposed system. In proposed work, this project will be successfully developed and implemented voice and tongue gesture based wheelchair with the help of PIC and Android for the handicapped person. The system will provide better performance and accuracy in above mentioned real time application.

Future Scope:

-The efficiency of voice command based wheel chair can be imported by neural

based algorithm and in future the proposed system using various gesture and commands.

-Instead of using gesture recognition can use eye retina using optical sensor to move wheel chair in different directions.

-To enhance the speed of the wheelchair dc motor can be replaced by servomotors.

Acknowledgement:

We are sincerely thankful to the principal Dr.Ramasamy.K, the UG Coordinator, Prof.B.Dhanamand My project guide Prof.Suersh Pandiarajan .P for their support.

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