Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 03, March-2016

Android based Wheel Chair

Khushboo Pasari[1], Madhura Patil[1], Kalpana Rokade[1], Pranali Yawle[2]
[1]Project Student, Department of Electronics and Telecommunication, [2]Professor and Project Faculty member,
Department of Electronics and Telecommunication,
Bharati Vidyapeeth's College of Engineering for Women, Pune, Maharashtra, India-46

***Abstract*—The recent development in the robotics or sensor technology promises enormous scope for the development of an advanced and digital wheel-chair. The wheel chairs used by the patients earlier have some limited function such as manual locomotion and may be slip-offs from the slant passages or the staircases. In this project we are trying to include sensors with an android platform to develop an automated wheel chair which can help the patient to control the direction of the wheel chair based on accelerometer, to detect the obstacles, and touch recognition by using android software.**

Keywords— Accelerometer, Touchscreen, Bluetooth, ATmega32, IR sensors, Android application.

1. INTRODUCTION

An increased percentage of elderly and disabled people who want to enhance their mobility, the best assistive device is wheelchair. A disabled can find it convenient to move around using the help of a chair constructed on wheels which can either be moved forward by another individual or propelled either by physical force or electronically.

Traditional wheelchairs have some limitations in context to flexibility, bulkiness and limited functions. Our approach allows the users to use the technology by means of smart phones for the movement of the wheelchair so that they can use it with comfort and ease.

Some existing wheelchairs are fitted with the computers for the gesture recognition. But making use of it along with the chair makes it heavier and also increases complexity. This complexity is reduced by making use of the accelerometer, the size of which is very compact and can be placed on the fingertip of the patients.

2. BLOCK DIAGRAM

The system comprises of two main parts: Transmitter part and receiver part. In transmitter part the input is provided by the android based software application. This digital output is transmitted to the microcontroller by means of Bluetooth interfacing with the module. This module will be mounted on the wheel chair and then the command is transmitted to receiver side by the rf transmitter. Fig. 1 shows the block diagram of the overall device functioning. DC Motors which are interfaced to the controller by means of device drivers the direction of the wheelchair.

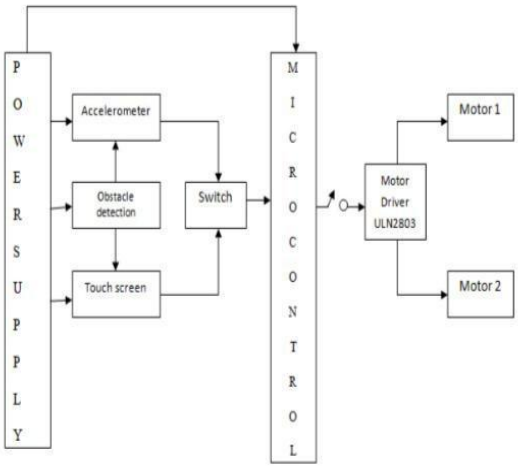

Fig. 2.1 Block diagram

3. DEVICE FUNCTIONING

The device functioning can be seen with three parameters.

1. Accelerometer
2. Touch Screen
3. Obstacle Detection

3.1 ACCELEROMETER

Accelerometer is basically a motion sensor which is used for measurement of acceleration applied to any device. Here we are using accelerometer in accordance with android application installed in the mobile phone. The movement of mobile phone will act as input to the accelerometer. The movement will lead to the change of X, Y, Z axis in three dimensional spaces. Ultimately, the accelerometer will work. Here the acceleration of the mobile phone will lead to the movement of wheel chair. The interfacing of accelerometer and wheel chair is done via Bluetooth.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 03, March-2016

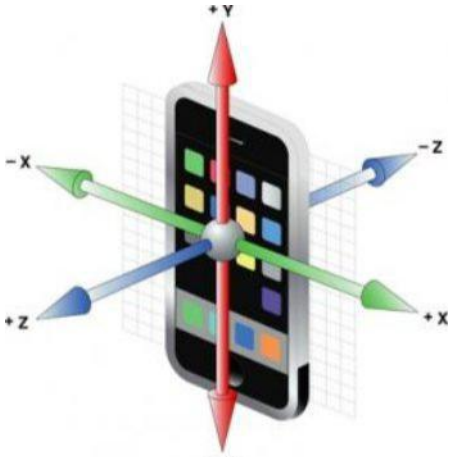

Fig. 3.1.1 Accelerometer used for the motion in 3-D spaces

3.2 TOUCH SCREEN

Touch screen software is developed on the eclipse IDE platform. The commands will be generated by means of the direction to which the wheel chair has to move. Here the obstacle detection path will be interfaced to both the units-accelerometer and touch screen mode. The table as per the locomotion of the device is given below. The following are keys and their associated letters stored in the buffer IC kit to move the wheelchair in the specified direction as tabulated in Table.3.2.1. The touch screen input used in the proposed system is a 5-wire resistive type. It consists of five keys. In addition a brake control switch is used to stop the wheelchair when used in this mode.

Key	Direction
2	Front
4	Left
6	Right
8	Back
5	Stop

Table 3.2.1 Direction Control Keys

When power supply is turned ON, the subject selects the type of input mode by using the input selection switch. The corresponding mode gets displayed on the Mobile phone. Here the touch screen mode is initialized and accelerometer is put on stop mode. This input when recognized in the microcontroller, it triggers the rear end motors of the wheelchair when command is performed. Thus the wheelchair moves in the touched direction key. Each key in the touch screen consists of a range of value for each direction that is coded in the microcontroller. This is displayed on the Mobile phone screen. When controller recognizes the particular value; the relay circuit is switched ON using a logic switch. This drives the DC motors of the wheelchair that are attached at the rear end. The wheelchair can be stopped with the help of a brake switch to avoid collision. When one wants to stop the wheelchair, the key 5 is pressed.

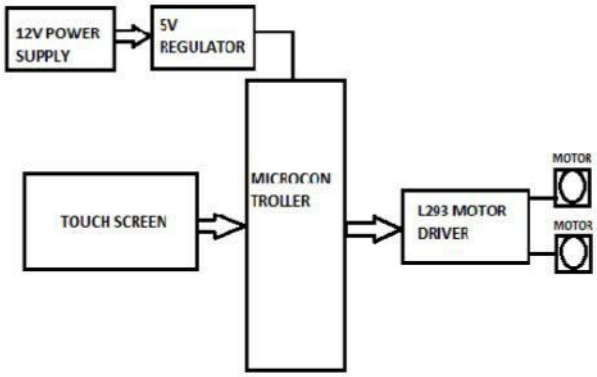

Fig. 3.2.1 Touch screen block diagram

3.3 OBSTACLE DETECTION

Obstacle detection is a major parameter in order to cross check any discrepancy in the path over which the device is moving. To detect the obstacle, IR sensor pairs are mounted on the front and the diagonal end. The front end IR sensor will detect the collision with respect to wall or any obstacle. The range of these IR pairs is predefined in the data sheet. The front end sensor pair can sense the obstacle at approximately 15cm for 2.8 V.

4. HARDWARE SPECIFICATION

4.1 TWO DC MOTORS

The principal of DC motor is that, when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. This is known as motoring action. If the direction of current in the wire is reversed, the direction of rotation also reverses. When magnetic field and electric field interact they produce a mechanical force, and hence the DC motor works.

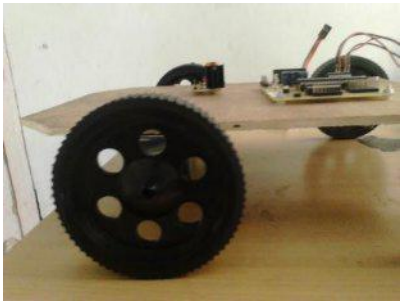

Fig. 4.1.1 DC motor and wheel assembly

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 03, March-2016

4.2 IC ATMEGA32 MICROCONTROLLER

Fig 4.2.1 ATmega32 IC

ATmega32 is an 8-bit high performance microcontroller of Atmel's Mega AVR family. Atmega32 is based on RISC architecture with 131 powerful instructions. Most of the instructions run in one machine cycle. Atmega32 can work on a maximum frequency of 16MHz. ATmega32 has static RAM of 2 KB, EEPROM of 1 KB and 32 KB programmable flash memory. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively.

4.3 IC MAX232 (TTL CMOS LOGIC LEVEL TO RS232 LOGIC LEVEL CONVERTER)

Fig 4.3.1 IC max232

The MAX232 IC is used to adapt the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontrollers with PC. The controller functions at TTL logic level (0-5V) whereas the serial communication in PC works on RS232 standards. This makes it difficult to set up a direct link between them to communicate with each other.

4.4 IC L293D (DC MOTOR DRIVER)

Fig. 4.4.1 IC L293D

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers function as current amplifiers since they take a low-current control signal and provide a higher-current signal. This is used to drive the motors.

4.5 CRYSTAL OSCILLATOR

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency.

4.6 POWER SUPPLY BATTERY

Fig 4.6.1 12V DC battery

A DC power supply is one that supplies a voltage of constant polarity (either positive or negative) to its load. Depending on its design, a DC power supply may be powered from a DC or from an AC source such as the power mains. Here 12V at maximum 5A supply battery is used.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 03, March-2016

4.8 2 IR PAIRS OF RANGE 15CM FOR 2.8 V (OBSTACLE AND DEPTH DETECTION)

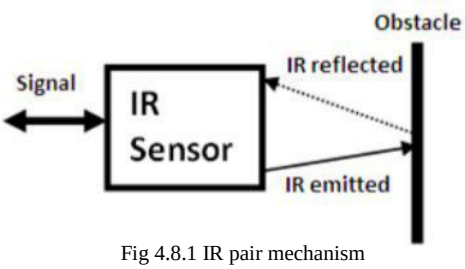

Fig 4.8.1 IR pair mechanism

The IR Sensor is a general purpose proximity sensor. It is used for collision detection. The module comprises of an IR emitter and IR receiver pair. The highly sensitive IR receiver always detects an IR signal. The module is designed with 358 comparator IC. The output of sensor is high whenever IR frequency and low otherwise. The on-board LED indicator supports the user to verify the status of the sensor without using any additional hardware. The power consumption of this module is low. It gives a digital output.

Pin configuration:

Pin No.	Connection	Description
1	Output	Digital Output (High or Low)
2	VCC	Connected to circuit supply
3	Ground	Connected to circuit ground

4.10 BLUETOOTH HC05 (INTERFACING)

Fig 4.10.1 Bluetooth HC05

C-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent serial connection arrangement. Serial port Bluetooth system is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3 mbps Modulation with 2.4GHz radio transmission-reception and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with Adaptive Frequency Hopping Feature. It has the footprint as small as 12.7mmx27mm.

SOFTWARE SPECIFICATION

i. Express PCB
ii. Eclipse IDE
iii. Android Studio

6. EFFICIENCY OF THE SYSTEM

The proposed model works under two specifications, namely-locomotion via accelerometer and touch screen mode. The basic common feature in the both the application is that we are using android smart phone. An android application is made and the created apk file is stored in the smart phone. Here as far as touch screen is concerned, the vehicle will move back-forth, right and left as these are the default direction notations to be installed while making the software. In order to move the vehicle in diagonal direction, one has to move the vehicle to back and accordingly the curve angle will be traced for how much degree the vehicle should move. As compared to the accelerometer application, the process is bit tedious because the accelerometer will move the vehicle directly to the diagonal angle with respect to the input provided. A set of the 3- dimensional values are stored in the software and it is easy to move the vehicle in desired direction with less effort. The efficiency of accelerometer based input system is much higher than that of touch screen mode.

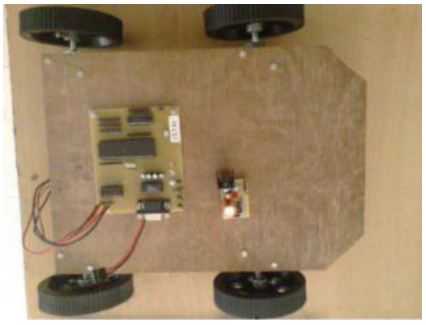

Fig 6.1 Wheelchair Mechanism

6. LITERATURE SURVEY

In this particular article the wheelchair is controlled by using hand gesture. Here mems sensors and wheelchair are two main units. Mems sensors are basically used here for gesture detection. After gesture detection the sensor converts it into 6 digit binary value. This value is then given to. Pic microcontroller and accordingly the wheelchair moves. Other controllers are used for the movement of wheelchair. [1]

In this article the wheelchair is controlled by voice commands as well as using hand gestures. Here there is a speech recognition model which use mems sensors along with a wheelchair control unit. Hidden Markov models are the main voice recognition commands. The mems sensors give the voltage to the microcontroller according voltage to the microcontroller according to the titration of hand. ARM controller is used in this article. [2]

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 03, March-2016

There are wheelchairs with joystick interface but many people are unable to use this facility. Navigation at low level can allow the users an efficient driving assistance. In this article the wheelchair consists of GUI i.e, graphic user interface, sensors and on-board computers. Here the wheelchair uses the indoor navigation facility and user interface for user abilities. [3]

This article has proposed an intelligent wheelchair which has dual control for navigation. The voice recognition and touch screen are two modes of input control commands. There are different values for different program on the screen. To move the wheelchair in various directions the user has to touch the screen accordingly. Voice control is also used in order to kove the wheelchair. The wheels move using brushless DC motors at the rear end and PWM technique is used for controlling it. [4]

In this paper a smart wheelchair is developed. This wheelchair is much easier to use than the standard power wheelchair. A smart wheelchair component system (SWCS) is developed which is created doing minimum modifications. Four different manufacturers are used for evaluation of SWCS prototype. [5]

This articles deals with WST i.e. wheelchair slow Transit system band elderly auxiliary travel model. Support, transit components and connection components are three fundamental composition frames involved in the system. Diverse conditions are adaptable ij this system. [6]

7. RESULTS

The principle of complete model is to move a vehicle by using the mobile phone system with the help of Bluetooth technology as the interfacing media and android application for the command action. An inbuilt accelerometer system is used here for the motion of the vehicle. This accelerometer is interfaced with the system by means of android platform.

ACKNOWLEDGEMENT

All the Authors are thankful to the Project Faculty member, Prof. Pranali Yawle and the management for their support in providing the necessary hardware as well as software and permission to present this paper in conference.

REFERENCES

[1] Diksha Goel and Dr. S.P.S Saini, '"Accelerometer based hand gesture controlled wheel chair" Dept. of Electronics and Communication Engineering, NGF College of Engineering and Technology (HR), IEEE-2013 (Received 15th may, 2013 Accepted 01st June 2013)

[2] K. Sudheer, T.V.Janardhana Rao, CH. Sridevi, M.S. Madhan Mohan, "Voice and Gesture Based Electric-Powered Wheelchair Using ARM" Department of Electronics and Communication Engineering, B.V.C. Engineering College, Odalarevu, AP, INDIA. E-mail: sudheer.kanuri@gmail.com,

[3] A. Yanco, "Wheelesley, a Robotic Wheelchair System: Indoor Navigation and User Interface" MIT Artificial Intelligence Laboratory,545 Technology Square, Room 70, Cambridge, MA 02139, Email id: holly@ai.mit.edu

[4] Aruna.c1, Dhivya Parameswari.a1, Malini.m1, Gopu.g2 "Voice recognition and touch screen control based wheel chair for paraplegic person" IEEE 2014 1) Project Students, Department Of Biomedical Engineering. 2) Professor& Head, Department of Biomedical Engineering. Sri Ramakrishna Engineering College, Coimbatore-641022

[5] Richard Simpson, "The Smart Wheelchair Component System" PhD, ATP; Edmund LoPresti, PhD; Steve Hayashi, PhD; Illah Nourbakhsh, PhD; David Miller, PhD University of Pittsburgh, Forbes Tower, Pittsburgh, PA; Assistive Technology Sciences, Pittsburgh, PA; Robotics Institute, Carnegie Mellon University, Pittsburgh, PA; University of Oklahoma and KISS Institute for Practical Robotics, Norman, OK

[6] YanLin, LiBaon "Wheel chair slow transit system-based elderly auxiliary travel mode" Department of Architecture, Southeast University, Nanjing210096, China