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Wheel Chair Automation over Voice Commands

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ABSTRACT

This Wheel Chair Automation over Voice Commands helps to control Wheel Chair through voice commands received via android application. The integration of control unit with Bluetooth device is done to capture and read the voice commands. Robotic vehicle then operates on the command received via android application wirelessly. For this Atmega328 microcontroller is integrated in the system which makes it possible to operate the vehicle via android application. In this project controlling device may be any android based Smartphone/tab etc having an android OS. The android controlling system provides a good interactive GUI that makes it easy for the user to control the vehicle. Transmitter uses an android application required for transmitting the data. The receiver end reads these commands and interprets them into controlling the robotic vehicle. Android device sends commands to move the vehicle in forward, backward, right and left directions. After receiving the commands, the microcontroller then operates the motors I order to move the vehicle in four directions. The communication between android device and microcontroller is sent as serial communication data. The microcontroller program is designed to move the motor through a motor driver IC as per the commands sent by android device. We Also have added IR sensor pairs, to detect obstacle and halt the motion right on the spot until the person on wheel chair commands to move.

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I. INTRODUCTION

In today's time, an estimated 1% of the world's population needs a wheelchair. An increased percentage of elderly and disabled people who want to enhance their personal mobility, for them wheelchair is the best assistive device. A disabled or an invalid individual (usually the disability of the lower part of the body) can find it convenient to move around and manoeuvre using the help of a chair constructed on wheels which can either be pushed by another individual or propelled either by physical force or electronically. Such a chair is called as a Wheelchair. Today's world comprises of a large variety of people. Some of them depend on others for their living. But in today's fast world, everyone is busy and there are less people to care for the increasing number of elderly and the physically challenged peoples. Some existing wheelchairs are fitted with pc for the gesture recognition . But making use of the pc along with the chair makes it bulkier and increases complexity.Having known about these facts, our aim was to bring an automated navigation system which can be used by both the elderly and the physically challenged people in a user friendly manner using voices, touchpad and hand gestures for operation. The proposed system helps people to overcome these defects easily by assisting with the intelligent wheel chair system. In the proposed triple input system, touch screen control and voice recognition using Google API and Accelerometer control using inbuilt Accelerometer sensor. In addition IR sensor is provided to avoid collision. To achieve the movement of all direction in the wheel chair, microcontroller is coded with a range of digital values

II. LITERATURE SURVEY

From previous survey to be visible that in 2011 autonomous control of eye based electric wheel chair with obstacle Avoidance and Shortest Path Findings Based on

Dijkstra algorithm by Kohei Arai. Autonomous Eye Based Electric Wheel Chair: EBEWC control system which allows handicap person (user) to control their EWC with their eyes only is proposed [1]. In 2012 Voice and Gesture Based Electric Powered Wheelchair Using ARM by K.Sudheer. A voice and gesture based system has been developed to control a wheelchair using voice commands and moment of hand i.e. Mems sensor is connected to hand [2]. In 2013 Accelerometer Based Hand Gesture Controlled Wheelchair by Diksha Goyal. Gesture based wheelchair which controls the wheelchair using hand movements. The system is divided into two main units: Memes Sensor and wheelchair control. The Mems sensor, which is connected to hand, is an 3-axis accelerometer with digital output (I2C) that provides hand gesture detection, converts it into the 6- bit digital values and gives it to the PIC controller. The wheelchair control unit is a wireless unit that is developed using other controller [3]. In 2014 Voice Recognition and Touch screen Control based Wheelchair for Paraplegic persons by Divya Parameswari. The proposed intelligent wheelchair system uses dual control for navigation in familiar environments. The two modes of input control to the wheelchair are voice recognition and touch screen. When one want to change the direction, the touch screen sensor is modelled by pressing finger against the various quadrants on the touch screen, which has different values programmed for different direction. This can also be controlled through simple voice commands using voice controller. By storing a single letter in voice recognition kit for each direction control, the recognition time is reduced drastically and thus quick reach to destination is obtained. The wheelchair consists of DC brushless motors at the rear end and it is controlled by using PWM technique. A brake control mechanism is included to control the wheelchair [4].

III.PROPOSED SYSTEM

Figure.1 shows that block diagram of transmitter and receiver section of the system. In transmitter section three inputs which are voice, touch screen and accelerometer to android application. Android application interface with microcontroller which is at receiver section through Bluetooth, the communication is wireless. Then microcontroller performs the different controlling actions with different signal from application. We have also added Light and fan for user.

3.1) Atmega32L Microcontroller

It is a low power CMOS 8-bit microcontroller based on AVR enhanced RISK arch. By excluding powerful instructions in a single clock cycle. This empowers system designed to optimize the device for power consumption verses processing speed 130 Powerful Instructions and Most Single-clock Cycle Execution. It is having 32 × 8 General Purpose Working Registers. High Endurance Non-volatile Memory segments – 32Kbytes of In-System Self-programmable Flash program memory and 1024 Bytes EEPROM. 16bit timer/counters with separate prescaler and one compare mode. One 16-bit Timer/Counter with Separate prescaler, compare Mode and Capture Mode. It is cheaper than PIC and ARM Microcontroller.

3.2) L293D

L293D is a quadruple high-current half-H bridge driver designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. The L293D designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications. All inputs of L293D are TTL-compatible. Each one output is a complete totem-pole drive circuit with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs with drivers 1 and 2 enabled by 1,2EN and drivers 3,4 enabled by 3,4EN. When we enable the input high, the related drivers are enabled and their outputs are active and in phase with their inputs. External high-speed output clamp diodes must be used for inductive transient suppression. When the enable input is low, those drivers are disabled, and their outputs are off and in a high-impedance state till input high. With data inputs, each pair of drivers form a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

3.3) Bluetooth

HC-05 is a Bluetooth module easy to use as a Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. HC-05 uses CSR Blue core in which 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

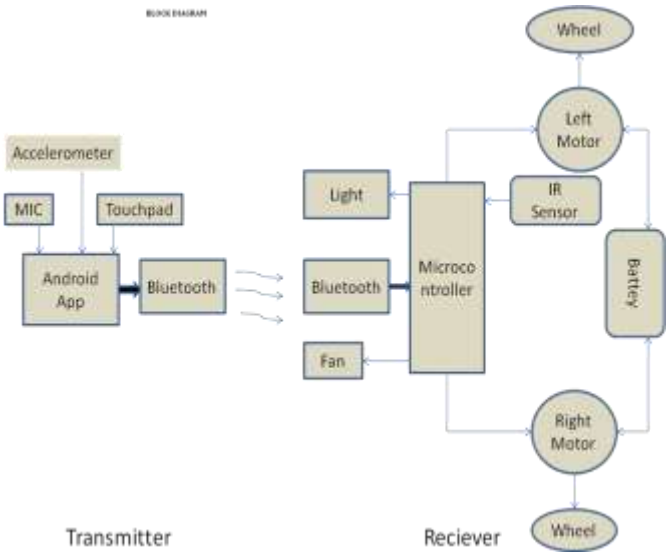

Fig 1: Block diagram of Wheel Chair Automation Over Voice Commands [3]

3.4) DC Motor

A **DC motor** is a class of electrical machines which converts DC electrical power into mechanical power. Most common types rely on the forces produced by magnetic fields. A DC motor is having a fixed set of magnets on the stator and an armature with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field. Most types produce rotary motion, a linear motor produces force and motion in a straight line.

3.5) ULN2803

The ULN2803A device IC is a high-voltage, high-current Darlington transistor array. The device IC consists of eight NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of each one Darlington pair is 500 mA. Darlington pairs may be connected in parallel for higher current Types of Logic capability.

3.6) IR Sensor

An infrared sensor is the type of sensor is used to sense certain radiation of its surroundings by either emitting and detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted/spread by an object and detecting motion. The range of IR sensor is up to 50 cm object it can detect.

3.7) MAX232

The MAX232 is an integrated circuit that converts signals from (RS-232) serial port to signals suitable for use in TTL-compatible digital logic circuits. The MAX232 is a dual transmitter / dual receiver typically is used to convert the RX, TX, CTS, RTS signals. The drivers provide RS-232 voltage level outputs (about ±7.5 volts) from a single 5-volt supply by on-chip charge pumps and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any other voltages. The receivers reduce RS-232 inputs, which may be as high as ±25 volts, to standard 5 volt TTL levels. These receivers have threshold of 1.3 volts and a typical hysteresis of 0.5 volts.

IV. SOFTWARE FLOW

Fig 2 shows the flow of the accelerometer control of wheel chair. In which the device position in space, the x, y and z axis. Take a look at the image below to better understand what I'm referring to. The x axis defines lateral movement, while the y axis defines vertical movement. The z axis is trickier as it defines movement in and out of the plane which are defined by the x and y axes.

First when Smartphone is at normal position which is called Halt position where z value is at maximum which is greater than threshold value z=5 then another x and y values less than threshold values x=5 and y=5 respectively. At that time chair will be at stop position, no any movement will occurs. When we slightly tilt the Smartphone in either right or left side with an some angle that time x value cross the threshold which is x=5 in right direction or x=-5 in the left direction, according to that the wheel chair will turn either in right or left direction. While tilting up or down direction with an angle we get y value greater than threshold value y=5 or y=-5, by keeping x and z values less than their threshold values, then wheel chair move forward and backward direction respectively. When z<=5 the chair will stop instantly.

From those values accelerometer sensor reads these values according to position of the Smartphone and stores in the vector table. In the vector table it compares all values with each other. Next step is the feature extraction from comparison which decides the action to be taken by the microcontroller on the motor. In movement analysis application creates the different code for microcontroller to take the different actions. These codes send to microcontroller via Bluetooth channel. The microcontroller receives the codes to perform the different action on the motor, then microcontroller control both motor direction in either in forward or reverse direction.

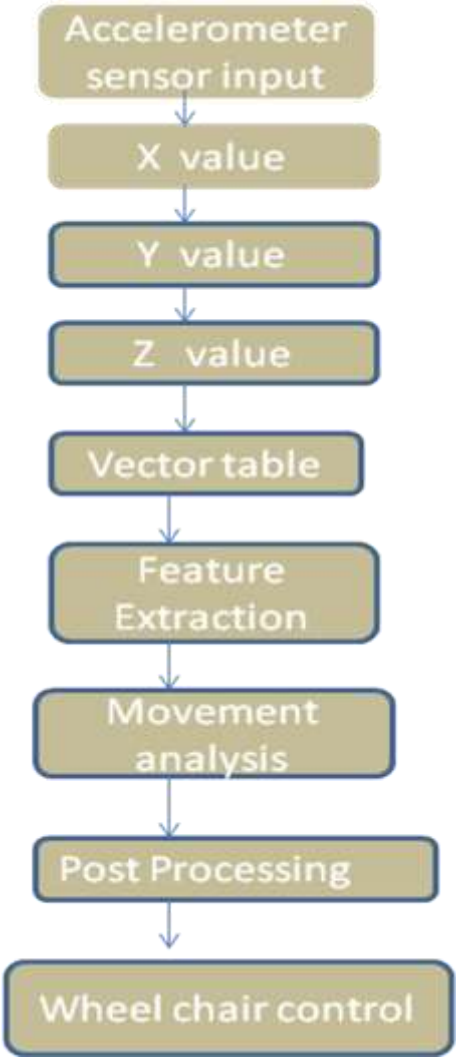

Fig 2: Accelerometer Flow

V. IMPLEMENTATION

Figure 3 show the final module implementation of wheel chair in which we have implemented one 12V and 5V power supply. Atmega32L microcontroller to controller various operations performed on the chair. In which two dc motor used for moving the chair. L293D motor driver IC which is used for the rotate the motor in both forward and backward direction. Three IR sensors for detecting obstacle if any in front left side and right side of the chair. According to that sensor values microcontroller controls the actions. Another we have added fan and light on the chair for user.

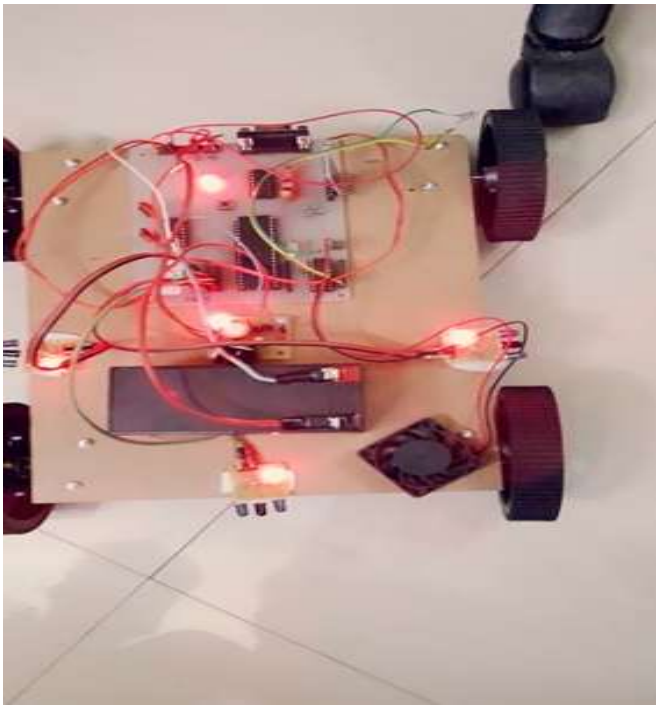

Fig 3: Final Module

VI. CONCLUSIONS

From the system proposed, it is observed that the touch screen and Accelerometer control has high accuracy when compared to voice recognition system. This paper described the system which is driven by the voice commands, Accelerometer sensor and touch sensors. Further advancements can be done by decreasing the time delay in voice mode and sensors can be attached to the wheelchair to avoid collision.

In Future, by including GPS, position of the wheelchair can also be known. Wheel chair can be fitted with direct mind reader. For example, if a person is paralyzed and cannot move his body parts, in that case it can be used.

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REFFERENCES

[1] Dr. Mohd Yunus B Nayan1, Aryo Handoko Primicant 2009. Hybrid System Automatic Meter Reading.

[2] Kwang-il Hwang 2009. Fault-tolerant ZigBee-based Automatic Meter Reading Infrastructure. Journal of Information Processing Systems, Vol.5, No.4, pp:221-228.

[3] H.G.Rodney, Tan IEEE, C.H.Lee and V.H.Mok, 2007 Automatic Power Meter Reading system using GSM Network. The 8th International Power Engineering Conference, pp: 465-469.

[4] Md. Wasi-ur-Rahman, Mohammad Tanvir Rahman, Tareq Hasan Khan and S.M. Lutful Kabir 2009. Design of an Intelligent SMS Based Remote Metering System.

[5] Huibin sui, Honghong Wang, Ming-Shun Lu and Wei-Jen Lee 2009. An AMI System for the Deregulated electricity Markets. IEEE Transaction on Industry

