VOICE CONTROLLED WHEEL CHAIR

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Abstract:-

Today, the whole world is using technology; even one should say that the imagination of livelihood without it is almost impossible now these days. With the emerging technology, now a new trend has been started, called Automation. The automation proved to be a boon to human life. This paper discusses a graduate level project, based on automated Wheelchair concept. The paper discusses an idea to provide a medium for a disabled (paralyzed) person to interact with his/her wheel chair. The disabled person can move wheel chair by his/her voice command using wireless modules like Bluetooth. Using this technology disabled persons can interact with their wheel chair and able to execute commands to their machine as per their requirements.
Mechanical parts have been used to provide platform as well as a medium to control the motion or functioning of machine. The machine device finds its sources of word suggestion from internet, as it uses an android device to provide an interacting medium between the machine and the operator. Our machine includes devices (electrical) and equipment (mechanical/electrical) which derives its complete functionality. Accelerometer was used just below the wheel chair to detect inclination. Wheels are connected to the gear motors which initiate as per IC instruction to provide motion as per the voice command.
The project is totally emphasized to provide a very ease of access for the disabled person as well as their family. This project is an outcome of "Automation" at its best, as it was fully automatic machine which seeks command only.

1. INTRODUCTION:-

A low technology device is preferred for its simplicity and ease of use. A wheelchair will prove to be beneficial if it reduces the physical requirements to move the chair. With available integrated information technology packages, wheelchairs have become commercially viable.

The wheelchair discussed in this paper works by using an android based application. It mainly works on Microcontroller which initiates the working as well as Bluetooth connectivity. This application provides an interface between the android device and Bluetooth module (HC-05). Once Bluetooth connection is setup, the sound of the speaker is transmitted to the Bluetooth module. Then the signal is sent to the microcontroller (ATmega 16) which matches the command in its library.After this, the signal is transmitted to the relays through the IC (ULN 2003). The relays actuate the motors and hence the action in a particular direction takes place. Mechanical parts such as wheel, shafts, bearings, platform, chair etc have been used and assembled. We have use Roller thrust bearings to provide support to chair.

Internet is utilized from android device for word for

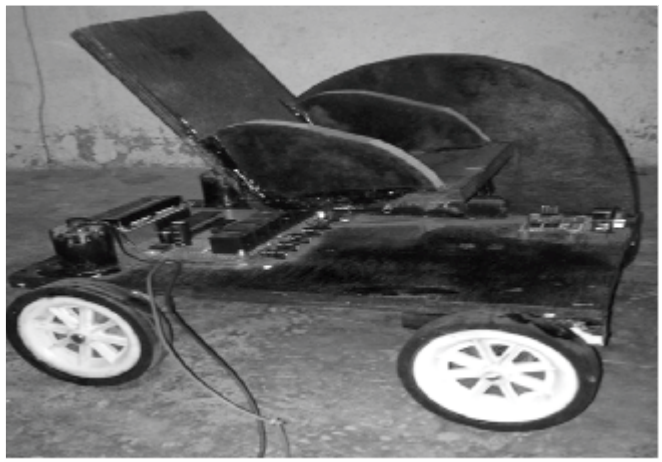

Figure 1. Working Model of VCWC

word suggestions such as Move Back, Move Front, Move Right or Move Left etc. The wheelchair is operable for these four directions. A complete mechatronic system drives its functionality.

2. DETAILED DESCRIPTION OF THE ELECTRONIC PARTS:

It mainly works on Microcontroller that is programmable which initiates the working as well as a Bluetooth connectivity to have interface between user and the wheelchair. The working model and circuit diagram of wheel chair is as shown below in Figure 1 and Figure 2 as shown below.

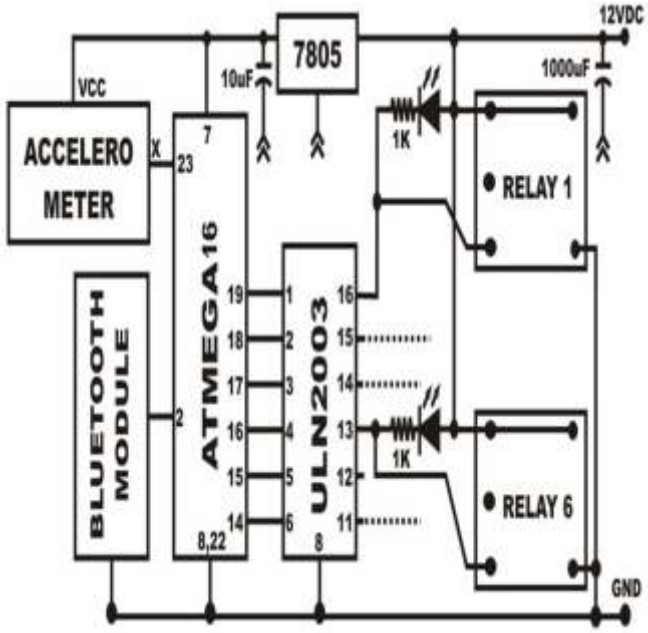

Figure 2.Circuit Diagram for VCWC.

i. Microcontroller:-

The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC

Architecture.By executing powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz, allowing the designer to optimize power consumption versus processing speed.

The ATmega16 provides the following features: 16 Kbytes of In-System Programmable Flash Program Memory with Read-While-Write capabilities, 512 bytes EEPROM, 1 Kbyte SRAM, 32 General purpose I/O lines, 32 general purpose working registers, a JTAG interface for Boundary scan, On-chip Debugging support and programming, three flexible Timer/Counters with compare modes, Internal and External Interrupts, a serial programmable USART, a byte orientedTwo-wire Serial Interface, an 8-channel, 10-bit ADC with optional differential input stage withProgrammable gain (TQFP package only), a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the USART, Two-wire interface, A/D Converter, SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The pin description of Atmega 16 is as shown in Figure 3.

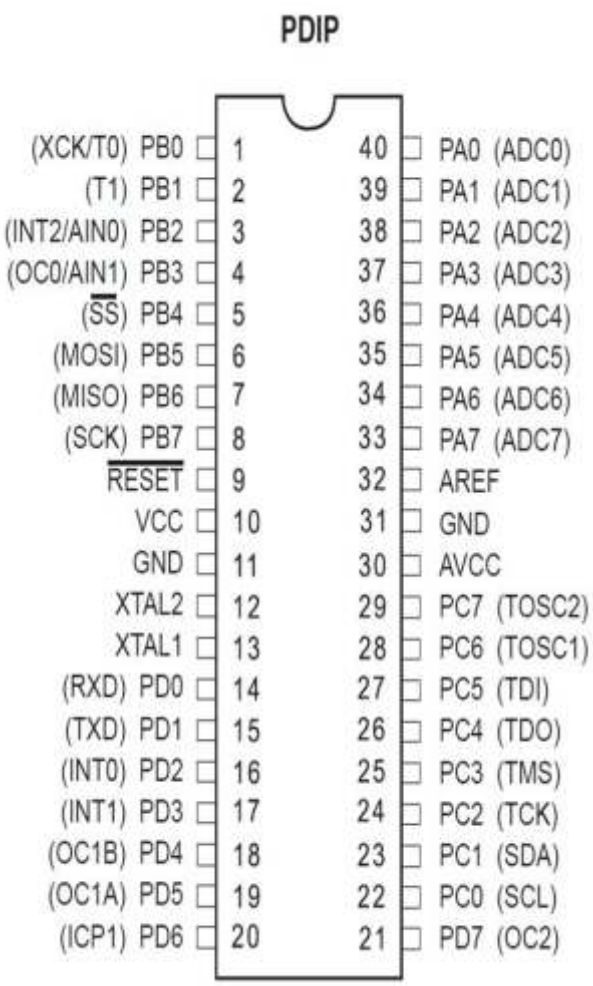

Figure 3: Pin description of Atmega 16

ii. Bluetooth Module:

HC serial Bluetooth products consist of Bluetooth serial interface module and Bluetooth adapter, suchas:

(1) Bluetooth serial interface module:

Industrial level: HC-03, HC-04(HC-04-M, HC-04-S)

Civil level: HC-05, HC-06(HC-06-M, HC-06-S)

HC-05-D, HC-06-D (with baseboard, for test and evaluation)

(2) Bluetooth adapter:

HC-M4

HC-M6

Bluetooth serial module is used for converting serial port to Bluetooth. These modules have two modes: master and slaver device. The device named after even number is defined to be master or slaver when out of factory and can't be changed to the other mode. But for the device named after odd number, users can set the work mode (master or slaver) of the device by AT commands.

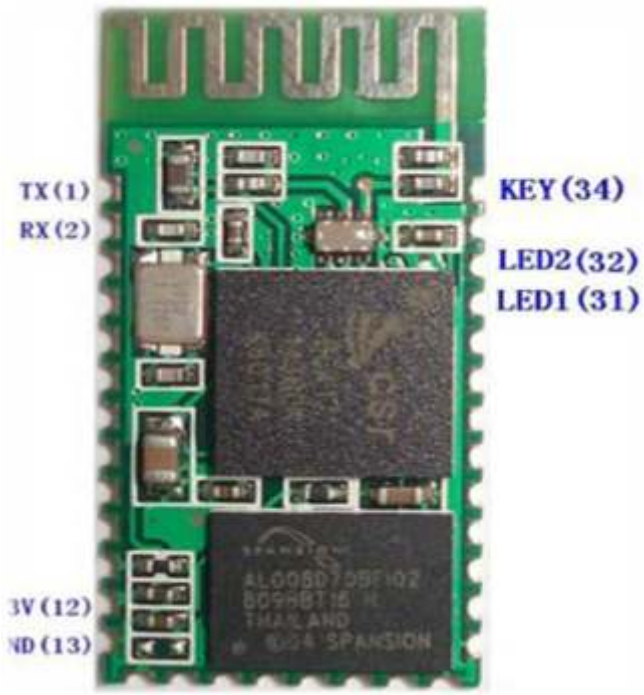

Figure 4: Bluetooth device HC-05

The detailed pin description of Bluetooth device is as shown below in Table 1:

Table1: Pin description of Bluetooth Device

PIN 1	UART_TXD, Bluetooth serial signal sending PIN, can connect with MCU's RXD PIN
PIN 2	UART_RXD, Bluetooth serial signal receiving PIN, can connect with the MCU's TXD PIN, there is no pull-up resistor in this PIN. But It needs to be added an eternal pull-up resistor.
PIN 11	RESET, the reset PIN of module, inputting low level can reset the module, when the module is in using, this PIN can connect to air.
PIN 12	VCC, voltage supply for logic, the standard voltage is 3.3V, and can work at 3.0-4.2V
PIN 13	GND
PIN 31	LED1, indicator of work mode. Has 3 modes: When the module is supplied power and PIN34 is input high level, PIN31 output 1Hz square wave to make the LED flicker slowly. It indicates that the module is at the AT mode, and the baud rate is 38400; When the module is supplied power and PIN34 is input low level, PIN31 output 2Hz square wave to make the LED flicker quickly. It indicates the module is at the pair able mode. If PIN34 is input high level, then the module will enter to AT mode, but the output of PIN31 is still 2Hz square wave. After the pairing, PIN31 output 2Hz square ware. Note: if PIN34 keep high level, all the commands in the AT command set can be in application. Otherwise, if just excite PIN34 with high level but not keep, only some command can be used.
PIN 32	Output terminal. Before paired, it output low level. Once the pair is finished, it output high level.

PIN 34	Mode switch input. If it is input low level, the module is at paired or communication mode. If it's input high level, the module will enter to AT mode. Even though the module is at communication, the module can enter to the AT mode if PIN34 is input high level. Then it will go back to the communication mode if PIN34 is input low level again.

iii. ULN2003

The ULN2003 IC is a Darlington array IC which is a high voltage and current array. It is used for 5V TTL and CMOS logic devices. The IC is used as a relay driver to drive a wide range of loads, line drivers, display drivers etc. It is mainly used to drive the stepper motors and can withstand 600mA. In the pin configuration, the inputs and outputs are connected reverse to each other. To drive inductive loads, a suppression diode is provided to each driver to dissipate voltage spikes.

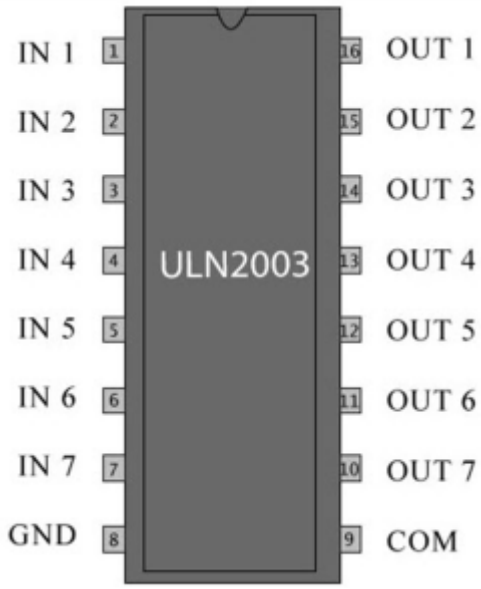

Fig 5: Relay Driver IC ULN2003

iv. 7805

This IC mainly functions as a voltage regulator. It maintains the exact voltage which is followed by power supply. It not only converts the AC power supply into constant DC but also upholds the unregulated DC voltage to a constant voltage if the input DC voltage has significant alterations. The IC contains bypass capacitors to check small period spikes on input and output level and if found these are straightly directed into the earth.

A circuit diagram having regulator IC and all the above discussed components arrangement revealed in the figurebelow in 6.Table 2 show the functions and usual value of different components of an IC 7805.

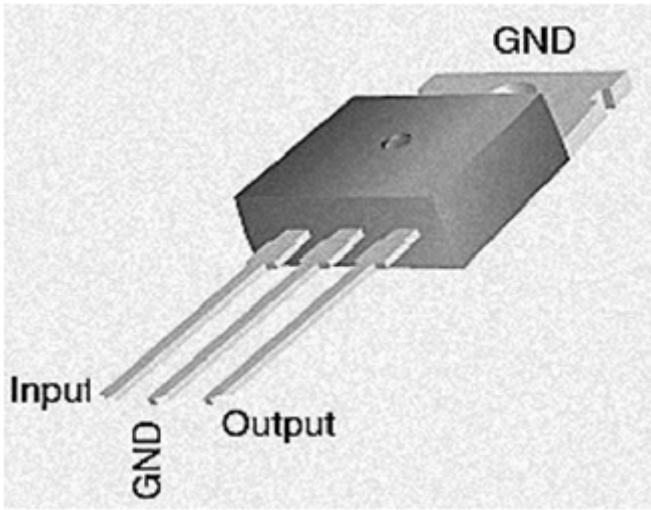

Figure 6: Voltage regulator 7805 IC

Table 2: Detailed overview of components of voltage regulator 7805 IC

Compo-nent	Function	Value
C1	It is a bypass capacitor that directs tiny voltage spikes to earth.	0.1mfd
C2	It is a filter capacitor to steadily slow down the voltage applied at the input.	1000 mfd
C3	It is a filter capacitor to steadily slow down the voltage at output.	1000 mfd
C4	It is a bypass capacitor that directs tiny voltage spikes to earth.	0.1 mfd
U1	It is an IC that holds the outputvoltage to a constant value in spite of major deviations in input voltage.	Positive DC Regulator 7805

Input Pin	IC positive unregulated voltage is given the regulation	
Ground Pin	This pin is neutral for input and output	
Output Pin	The output of regulated 5V is taken out.	

3. METHODOLOGY:-

The methodology of voice operated wheel chair is well explained with the help of flow chart as shown below in figure .

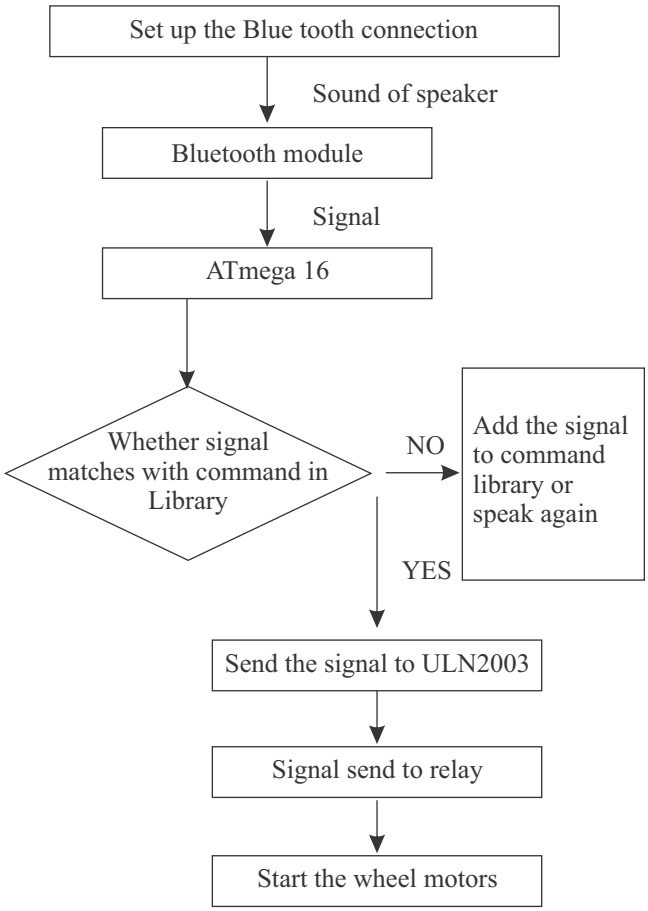

Figure 7: Flow chart of methodology

4. COST ANALYSIS

The most important factor is financial aspect and analysis of expenditure. Following are the expenditure analysis of our project.

Table 3: Cost analysis of proposed project

Conting-encies cost	1. Designing 2. Model Presenting	Around 5000
Purchasing of raw material	Microcontroller, Blutooth Module, Integrated Circuit, Accelerometer, Battery, Charger, Motors, Wheels, Transistors, LCD, Relay, AVR Programmer, Frame, Programme Burner etc	Around 30000
Product development cost	Welding, Cutting, Bending, Assembling, Painting, Finishing and Fabrication etc.	Around 8000
Other Expenditure	Travelling, Marketing, Testing if any parts has to be replaced and Presenting etc.	Around 3000
	Total	**Around 46000**

Since the project demands an expenditure of 46,000 INR, the authors being B.Tech students have tested the compatibility of the wheelchair with its prototype in real conditions.

CONCLUSION

The project contributes towards an ease of access for the disabled person as well as their family. This project is an outcome of "Automation" at its best, as it was fully automatic machine which seeks command only using Android Device as well as it has Automatic Seat Adjustable system.It can be utilized in Hospitals and Rehabilitation Centers so that the disabled person can independently without seeking help of hospital staff. Infact the proposed wheelchair can be voice controlled by family members of disabled person if his/her voice is not that much clear. It has automatic chair structure which adjusts itself according to the inclination of the surface to prevent falling of the seated person. Thus it provides a comfortable seat in an inclined platform. The authors have tested the prototype in real conditions and believe in its potential to

compete with the present day scenario of automation.

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