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Smart Voice Controlled Wheelchair

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ABSTRACT

Voice Controlled Wheel chair is a mobile wheel chair whose motions can be controlled by the user by giving specific voice commands. The speech recognition software running on a PC is capable of identifying the 5 voice commands 'Run', 'Stop', 'Left', 'Right' and 'Back' issued by a particular User. This system controls the wheel chair as well as read the parameters of patient.

Keywords : PIC-Microcontroller, DC Motor,Microphone,MATLAB,LM-35.

I. INTRODUCTION

There are many reasons for the people may not be able to travel freely due to spinal injuries and amputation. Wheelchair is a mechanical device that can often assist. It effectively uses wheels and mechanical support to overcome a loss of legs or leg control. Manual wheelchairs can be operated by persons who have the use of their upper body or someone available to assist. Powered wheelchairs have been developed for when either of these cases does not apply. However, these devices typically require a high level of user control and this is something precluded by many severe forms of disablement. Our Endeavour's are aimed at creating 'intelligent' devices that can sense information from their environment and respond in useful ways. In this paper, we describe our effort in designing and building an economical voice controlled wheelchair that automatically avoids obstacles in real-time and patient monitoring system is provided to monitor the patient's blood pressure, temperature and heartbeat using GSM technology. The direction of the wheelchair is controlled by the ARM processor which receiving the voice command from the user and make use of motor it can control the direction of the microphone is used to receive the commands from the user. The collision avoidance can be done by the use of ultrasonic sensor . In addition with the wheelchair the keypad, obstacle sensors are used to operate the wheelchair and also if any abnormal conditions are monitored it can be intimated to their caretakers or doctor's through GSM Technology.

II. IMPLEMENTATION

The project involves designing and developing a transmitter and receiver section that can be used for Wheel chair. The transmitter section is actually equipped with microphone and PC interface for mathlab with and transmitter are equipped with microcontroller. The speech recognition software is speaker dependant. The special feature of the application is the Ability of the software to train itself for the above voice commands for a particular user[1]. The Graphical user interface running along with the software provides a very convenient method for the Users to train. It also provides many other facilities in operating the wheel chair. The receiver captures these signals; micro controller will decode and analyze it[2]. The chair is controlled by using voice.

Speech Recognition In this unit we capture the speech signals coming from the microphone attached to the PC. The Software running on PC processes the signals to recognize the voice commands 'Run', 'Stop', 'Left', 'Right' and 'Back'. The software also provides a facility to train itself for the above Commands. For training we use Artificial Neural Networks[3]. The software is written using MATLAB. The mobile wheel chair platform consists of three wheels and forward two wheels are coupled to the two geared DC motors. The rest wheel can free rotate with its own axis[4]. The wheel chairs capable of forward, backward, turn left and turns right motions and onboard motor driver circuit with L298 IC is used to Make those motion controls .

Heart Rate Sensor and Temperature Unit It consists of LED (light emitting diode) and LDR (light detection resistor) which are placed parallel to each other. LED emits IR (Infrared) rays so that, when the finger is placed in between LED and LDR so that there exists some systolic pressure LED emits IR rays which are travelled through finger and blood flows with arteriole pressure. Whenever systolic pressure is applied, normal pressure of blood flow is disturbed at fingertip which is high and IR rays penetrate through blood and are received by LDR. The signals are analog which are converted into digital by ADC (Analog-Digital Converter), suitable for the MCU. LM35 temperature sensor is used to measure the temperature and connected to MCU. This sensor unit works under low power DC input of 5V which is controlled by a mini transformer[5]. When ever a change in heart beat or temperature is monitored the system will send a message to the phone.

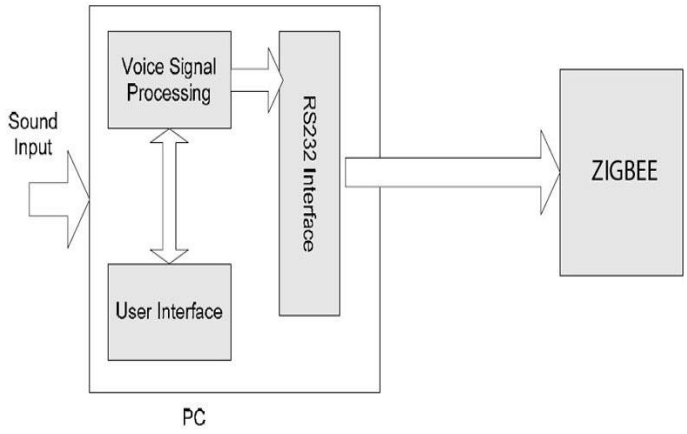

Figure 1. Transmitter Side

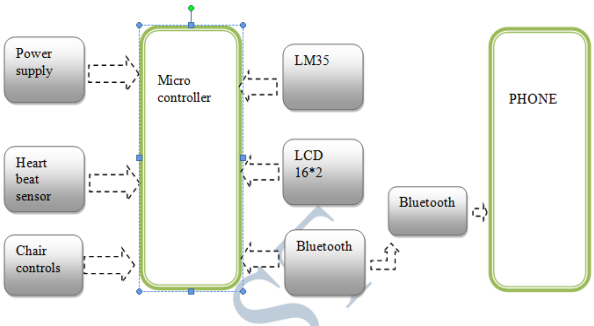

Figure 2. Receiver Side

MICROPHONE

The Fig.3 shows the cross section of the microphone. The microphone is used to pick up the commands from the user. The commands such as left, right, forward and reverse.

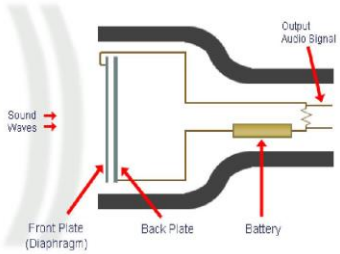

Figure 3. Cross Section of Microphone

The microphone is like a capacitor and it has two plates. The plate vibrates when struck by sound waves, changing the distance between the two plates and therefore changing the capacitance. It generates the voltage between them depending upon the sound waves. The generated voltage pulse amplified using the amplifier then it is given to microcontroller. Depending upon the pulse rate the microcontroller sends control signals to the microcontroller.

DRIVER CIRCUIT

This circuit is used to drive the wheelchair based on the input obtained from the micro controller section. This section consists of number of transistors to produce the 12V required to operate the relays. The transistor is triggered only at the high voltage level. Each driver circuit consists of two relays to produce the required voltage to drive the DC motor. Each motor is operates in the direction based on the directions given by the microcontroller. The different directions of motions possible are:

- ✓ Forward: Both the motors in forward direction
- ✓ Reverse: Both the motors in the reverse direction
- ✓ Left: Left motor stopped/Right motor in the forward direction
- ✓ Right: Right motor stopped/Left motor in the forward direction
- ✓ Stop: Both motors are in stop position.

TEMPERATURE SENSOR

Thermistor is a temperature sensor. It is used to measure the temperature of the patient. Thermistor is nothing but temperature sensitive resistor. There are two type of thermistor available such as positive temperature co-efficient and negative temperature co- efficient. Here we are using negative temperature co-efficient in which the

resistance value is decreased when the temperature is increased. Initially the reference voltage is set to room temperature level. When the temperature is increased above the room temperature level, the thermistor resistance is decreased so variable voltage is generated.

HEARTBEAT SENSOR

It is used as a tool to measure heart rate through fingertip, in this case. The blood volume inside a fingertip slightly changes with heart beat as the blood is being pumped. This change in blood volume inside the finger artery is detected with a simple optical sensor system and then further amplified using appropriate signal conditioning circuit to generate a pulse of magnitude +5V. These pulses are later counted and the measured heart rate is displayed in the LCD. The normal rate of heartbeat range is 60 to 135.

III. CONCLUSION

The progress in science and technology is a non-stop process. The proposed system based on PIC micro controller is found to be more compact, user friendly, which can readily be used in order to perform several tedious and repetitive tasks. Due to the probability of high technology used this Voice controlled wheelchair with patient monitoring system using GSM is fully automatically controlled. The voice controlled wheelchair assist system was developed with an idea of serving the people affected with high level Quadriplegia. In this case, the assist system has proven to be of a simple implementation and of low cost. The result obtained clearly implies that the system is easy to handle by the patients and it is easy to their caretakers to handle the patients.

IV. FUTURE WORK

The system can be extended by using HM2007 voice Recognition IC instead of MAT LAB. It is capable of providing better voice recognition and it store up to 20 words. The GPS position can be also included with the wheelchair.

V. REFERENCES

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