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Voice and Accelerometer Controlled Wheel Chair

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Abstract: **Wheel chairs are the way of reincarnating life in the lives of physically disabled people.A dependent user recognition voice system and ultrasonic sensor systems has been integrated in this wheelchair. In this way we have obtained a automatic wheelchair which can be driven using voice commands and with the possibility of avoiding obstacles by using ultrasonic sensors . The wheelchair has also been developed to work on movement of accelerometer which will help for the person whose limbs are not working. Accelerometer can be attached to any part of body of physically disabled person which he can easily move like head , hand etc. It has also provision of joystick for disabled person who can easily move his/her hand. Electronic system configuration, a sensor system, a mechanical model, voice recognition control, accelerometer control and joystick control are considered.**

Index Terms— **Accelerometer, Voice recognition, Ultrasonic sensor**

I. INTRODUCTION

In the following paper of Accelerometer and Voice controlled wheel chair we intend to find a cost effective design to build a wheel chair for paraplegic and quadriplegic people, who would find hard to use their energy in moving the wheelchair for their displacement. For handicapped people human found a wheel chair which can be moved by using hands for those who dont have legs. But the peoples who dont have legs as well as hands cannot move their wheel chair self. They need some other person to move their wheel chair. But sometimes such person faces so many problems if they didnt get any person to move their wheel chair. This project Auto Wheel Chair aims to resolve the above mentioned issue. In this project we are going to make a wheel chair which can be controlled automatically as well as manually. This wheel chair controlled manually through head of the person sitting on it. He/ she just need to move his/her hand into the direction it wants to move by using accelerometer. In automatic control user just need to press keys for saved destination. The proposed Speech Recognition Based Wheelchair Operation allows physically isabled person to control the wheelchair easily without the need to use handsThe movement of the powered wheelchair depends on the motor control and drive system which consists of microcontroller and motor driving. Once the voice recognition system recognizes the voice commands in comparison to the stored memory, the respective coded digital signals would be sent to the microcontroller which then controls the wheelchair accordingly.

II. LITERATURE REVIEW

The goal in developing the Automated wheelchair is to try to provide the user with an appropriate level of motion assistance that allows them to independently operate a powered wheelchair. The thought of realizing Automation in a wheelchair at lower cost lead us to study various papers related to automation of wheelchair. Some of the points which caught the sight from referred materials are listed below. _ The NavChair Assistive Wheelchair Navigation System[1] The NavChair has application to the development and testing of shared control systems where a human and machine share control of a system and the machine can automatically adapt to human behaviors. The NavChair shares vehicle control decisions with the wheelchair operator regarding obstacle avoidance, safe object approach, maintenance of a straight path, and other navigational issues, to reduce the motor and cognitive requirements for operating a power wheelchair. _ Touch Screen Based Direction and Speed Control of Wheel Chair for Physically Challengedl[2] This paper describes an intelligent motorized wheel chair for handicapped person using touch screen technology. It enables a disabled person to move around independently using a touch screen application which is interfaced with motors through micro-controller. When we want to change the direction, the touch screen sensor is modeled to direct the user to required destination using direction keys on the screen and that values are given to micro-controller. Depending on the direction selected on the touch screen, micro-controller controls the wheel chair directions. The speed controller works by varying the average voltage sent to the motor. This is done by switching the motors supply on and off very quickly using PWM technique.

III. METHODOLOGY

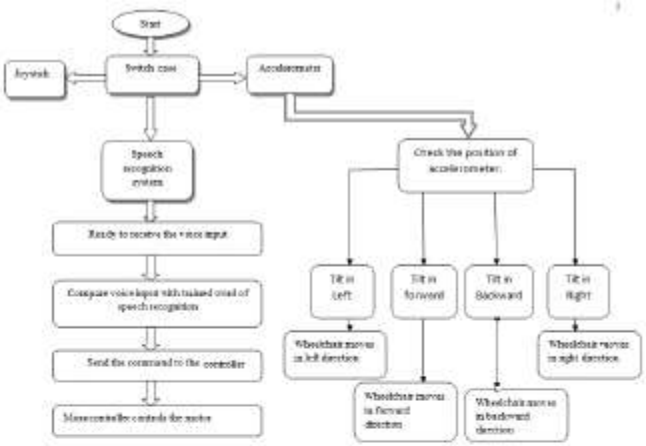

Fig. 1. Flow chart

The methodology consists of a thorough study and analysis of electric powered and joy-stick controlled wheelchairs, and the control law used to maneuver these vehicles. The methodology followed is as follows

_ The Wheelchair operates with head or hand movement, taking action as an input signal for the movement of wheelchair in a particular direction. An Accelerometer (Motion Sensor) is used to track these movements. This sensor is tied as a band to hand/head.l[3]

_ The wheelchair also operates based on voice input given by the user. The voice recognition kit (HM2007) is used to recognize voice uttered by the userl[4] .

_ The variations of the sensor are trapped and those signals are fed as inputs to the signal conditioning circuit

. Now based on these variations the micro-controller is programmed to take decisions which in turn control the movement of wheelchair.

IV. IMPLEMENTATION OF WHEEL CHAIR

Based on the proposed sketch of algorithm and its flow, we now propose a detailed block level design. This section defines the functional ideas required in designing the chair. The block level design is shown below.

4.1. Block Level Design

4.1.1. MEMS accelerometer unit

This unit is the sensing unit. Here based on the direction in which the motion sensor is moved there will be change in output voltage. This output voltage is given to signal conditioning circuit.

4.1.2. Voice Recognition Kit

The voice recognition kit REF stores the voice command in memory. Then analog voice signals are converted into digital signals using ADC. This digital input now should have the voice commands in binary form which is given as an input to the micro-controller.

4.1.3. Interfacing circuit

The interfacing circuit consists of a differential amplifier. The output voltage of MEMS accelerometer is given as input to non inverting terminal of differential amplifier. The differential amplifier compares the input voltage with reference voltage and gives the output. This output voltage is given to micro-controller.

DIAGRAM.png

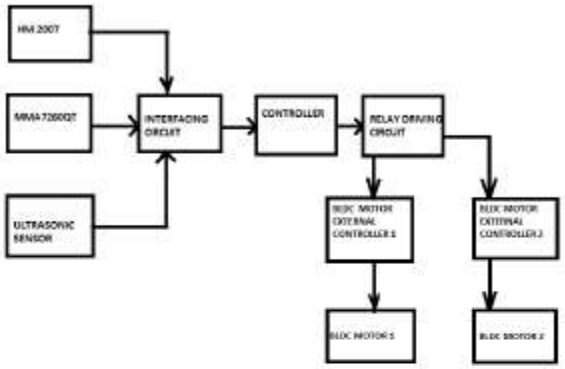

Fig. 2. Block Representation of Detailed Design

4.1.4. Micro-controller

The output of interfacing circuit is given to micro-controller. The micro-controller gives the output signal to motor driving

circuit based on fixed program stored in ROM.

4.1.5. Relay driving circuit

The output of micro-controller is given to relay driving circuit.

The relay switches based on signal given by microcontroller.

4.1.6. BLDC motor

The output of relay driving circuit is given to BLDC motor external controller for low voltage interfacing. Based on the signal given by relay driving circuit the controller switches the motor accordingly. The ultrasonic sensor senses obstacle and sends a signal to micro-controller to stop the chair .

V. RESULTS AND DISCUSSION

5.1. Accelerometer

After completion of our design,first the wheel chair was tested by using MEMS motion sensor. Here based on the gesture of the hand the wheel chair moved in front, left, right and backward direction . Here in this mode the wheel chair worked properly without any problems.

5.2. Voice recognition

The voice recognition system was initially tested in a quiet room with a single user. All words were correctly recognized.

Next we tested the system in a noisy room by turning on some music in that room. When the music was light there was no problem in correctly recognizing the words but when we turned the volume high the recognizer found it difficult to recognize the users voice and often took commands from what it heard in the song.

5.3. Manual mode

The manual mode through joystick control was fullproof and worked perfectly in all cases with no problems.

5.4. Obstacle detection

Initially the chair was first tested indoors using easy to spot obstacles like chairs, flower pots, walls and people. With these objects the obstacle avoidance worked without any error.

Fig. 3. Prototype model

CONCLUSION

In this paper, we have addressed the problem of wheelchair for physically disabled people. Our design shows that the motion and voice controlled wheelchair can guide the paraplegic

Fig. 4. Final product

command wheelchair. Thus, we conclude that in this paper

_ We have provided a design that is efficient in helping the quadriplegic and paraplegic people without putting their strengths and efforts to pull the wheelchair, by commanding it on their voice.

_ We have also shown that it can be controlled even in the uneven case of events by providing a manual control of the wheelchair.

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