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Independent interface for an intelligent wheelchair

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***Abstract*— This paper describe how user command can be adopted to control the movement of wheelchair to be used by handicapped, elderly and elderly people. When command from the user are sensed by voice input by Easy VR module, eye movement it provide information to the microcontroller unit. This unit is interfaced with motor driver which is in turn connected to 2 DC motor to control the direction of wheelchair. To perform the task controller is loaded with intelligent program written using embedded c language . Human fall detection, staircase sensing and external switch key make it more intelligent. If any anomaly appears whether in physiological, environmental or used command and last for more than predefined time , then alert signal are evoked through GSM facility. In that case outsiders can take remedial action to help the user.**

Keywords— embedded system; intelligent wheelchair; MCU(Microcontrollerunit);EasyVR(Voice Recognition).

I. INTRODUCTION

To meet the challengers in today's world of global computing, fast technology, increasing old age people researchers have been trying to switch from traditional modes of navigation to fully automated modes of navigation. A wheelchair is a mobility aided device that helps disabled, handicapped and elderly person.

II. LITERATURE SURVEY

Researches in the area of wheelchair are still going on. By surveying it was found that in eye controlled wheelchair has adopted to guide wheelchair by Human Computer Interface, but powered wheelchair is not an option for large number of disabled people because of their disability to use conventional interface as a result of motor disability. In Autonomous robot based wheelchair target place where estimated by GPS system, but the algorithm to determine was too complicated .In voice controlled wheelchair they make use of android phones and computer system and the data is transferred by Bluetooth module. Since the data cannot be transferred over a wide range and any failure in smart phone disables the whole system . It is more suitable application than HM2007IC.Being using any interfaces alone have their limitation ,so we can adopt a wheelchair with different interfaces to make it intelligent.

III. PROPOSED MODEL

Proposed model aim to control wheelchair by different interfaces such as voice input, eye movement input. It also measure some of physiological parameter such as heart beat ,blood pressure. Human fall detection , Staircase sensing and external switch keys are also included. If any un towards happening to the person of wheelchair alert messages are provided by GSM facility.

IV. BLOCK DIAGRAM

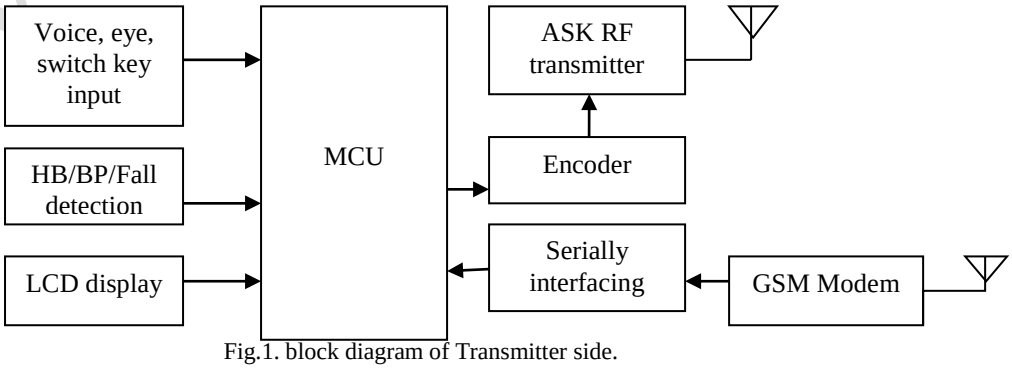

Fig.1. block diagram of Transmitter side.

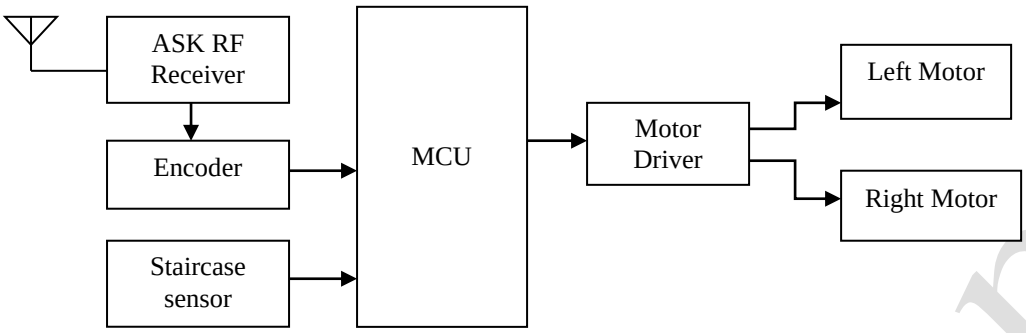

Fig .2.block diagram of Receiver side.

A. Voice input

The working of voice robot input is mainly dependent on Easy voice recognition module. Easy VR is a DSP based chip having inbuilt as well as preloaded commands. By recognizing the commands from Easy VR it is interfaced with MCU via USART. Initially training must be provided and if the voice sample matches to any of samples corresponding commands controller will control the wheelchair movement.

B. Eye movement input

Camera is fixed on the wheelchair and the laptop system will track the user eye. The image of particular movement captured is processed by Mat lab. The microcontroller will take the USB output from laptop and convert the digital output to electrical signal that will be sent to the wheelchair wheel for movement. finally we obtained a signal triggered wheelchair.

C. Microcontroller unit(PIC)

Here we are using 2 microcontroller PIC 18F2550 and PIC 16F883.PIC 18F2550 is used in the transmitter side. It is 24 i/o pins with individual directional control. Along with synchronous serial ports, Full speed USB are available. So any inputs can be used at necessary time.PIC 16F883 is used in the receiver side. It is CMOS flash based 8 bit controller with 28 pin IC package.

D. Fall detection

Human fall detection can be sensed by using MEMs accelerometer sensor(ADXL335).The principle behind this work is detection of motion of an individual using sensor which tracks the acceleration changes in 3 orthogonal direction. This measured acceleration due to motion is proportional to analog voltages. This analog voltage is given to ADC port of PIC.

E. Staircase sensor

If the person in wheelchair is unable to express the command we can automatically stop the wheelchair using staircase sensor(IR Sensor). The principle behind IR sensor is transmission and receiving of IR light. Sensor contain elements IR LED and photodiode. The IR LED transmit IR light an, which is reflected on the floor and received by photodiode. When IR sensor sense these light corresponding digital voltage can be developed which is interfaced to the PIC .

F. Ask RF Encoder and transmitter

Ask RF Encoder HTI2E IC receive the input signal either voice or eye input from the microcontroller and convert into a coded form before giving into Ask RF transmitter which transmits the signal.

G. Ask Receiver and Decoder

Ask RF Receiver receives the transmitted signal and give to Decoder HT12D IC to recover the original data.

H. Physiological parameter(HB and BP)

Digital BP Monitoring equipment measures the heart beat , systolic and diastolic pressure . It is easy to use wrist style because it eliminates pumping. It is directly interfaced to microcontroller via USART.

I. GSM Modem

The purpose of GSM modem is to send messages to the pre stored mobile number in any emergency situation. Here we use SIM 300 Module and it provide direct interface to the microcontroller via MAX232 IC.

*J. 16*2 LCD display*

Heart beat rate, systolic and diastolic pressure are displayed on the LCD display

K. Motor driver

Output from the receiver controller is given to motor through Motor driver IC(L293D IC) which act as current amplifier. Thus any low current signal is converted to high current signal and is used to drive the motor.

L. Motor

Motor is used to drive the wheelchair. Here DC geared motor is used because they have lesser rpm like 45 or 60 and have sufficient torque to drive the mechanical load.

M. Switch key

External switch key are provided for left, right, forward, backward, stop command.

V. WORKING

Generally we are using 2 controllers, PIC18f2550 in transmitter side and PIC 16f883 in receiver side. Voice , eye input are given to the transmitter controller and code corresponding to the commands are checked. The receiver controller receives the data. Further it is interfaced to the 2 d c motor through motor driver IC which in turn courses the wheelchair to move. HB , BP and fall detection measured are directly interfaced to the transmitter controller. The microcontroller is to process the data compared with the stored threshold value for normal condition. If the value measured is more then alert message are provided through GSM . IR sensor used in receiver side makes the wheelchair to stop in emergency situation. External switch key for forward, backward, left, right and stop command are also included in transmitter side to make the wheelchair more intelligent.

VI. .CONCLUSION

This project embarked to design and construct an intelligent wheelchair with a great degree of versatility and maneuverability to assist the physically disabled person. It make the people self dependent and more self confident . The intelligent wheelchair lead their life in an uncomplicated way ,hence it is really a boon for general public.

A. FUTURE WORK

The system can be enhanced by finding away to automatically charge the battery with the help of direction of motion or solar panel so that we can use in outdoor application also.

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