Gesture Controlled Wheel Chair with Home Automation for Physically Disabled People Prototype

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Abstract— for those "Physically Challenged" it's of Extreme Priority to get easy mobility in case of emergency or need. Many engineering solutions have already looked into this and some much for those physically deprived. But it's interesting rather sad to note that there is by far no real engineering attempt made to address the mobility requirement of a Specific Segment in Physically Handicapped "Those Who have Amputee Arms". We all know that the handicapped vehicle which has been used now days mainly works on joystick and it uses battery control system to change direction by joystick and this can only be used by those who are having hands. But our control over the directional motion is very simple. The vehicle we decided to design is Four-Cycle Model, in which we have two wheels at the front and other two wheels at rear. The basic shape of this vehicle is similar to the wheelchair for the handicapped as it's a well-proven and safe design.

Key words: Gesture, Wheel Chair, Accelerometer Sensor, Micro-Controller, Zigbee, DC Motors, Home-Automation

I. INTRODUCTION

People with physical disabilities every time find it complicated to navigate through their house without the assistance of someone. But to navigate through one's own home without contribute of any one all time can be demoralizing for the person as well. It can be handled wirelessly with hand gesture methods Gesture control wheelchair is divided into two parts:

- Transmitter: the Hand gesture
- Receiver: the wheel chair [1]

The project will also provide home automation facilities to the person sitting on chair i.e. the person sitting on chair will also be able to have access on daily electronic appliances by means of gesture. Example: light, fan, etc. Here a mode switch is used to switch from wheelchair mode to Home automation mode.

II. TECHNOLOGIES REQUIRED

ZigBee is a technology of data transfer in wireless communication networks. The name comes from erratic pattern of bees between flowers which symbolizes communication between nodes in a mesh network. It is designed for wireless control and connectivity between small packet switch devices.

Zigbee technology follows 3 topologies:

- Star
- Cluster tree
- Mesh

In star topology there is one coordinator and several end devices or nodes. In this topology, the end device communicates only with the coordinator. Any exchange of packet between end devices should go through the coordinator [2].

The ADXL202/ADXL210 are low cost, low power, complete 2-axis accelerometers with a measurement range of either ±2 g/±10 g. The ADXL202/ADXL210 can measure both dynamic acceleration (e.g., vibration) and static acceleration (e.g.:gravity)[3].

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two Dual DC with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC).[4]

This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into an 40- or 44-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. The PIC16F877A features 256 bytes of EEPROM data memory, self-programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/ compare/ PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I²C™) bus and a Universal Asynchronous Receiver Transmitter (USART). All of these features make it ideal[5].

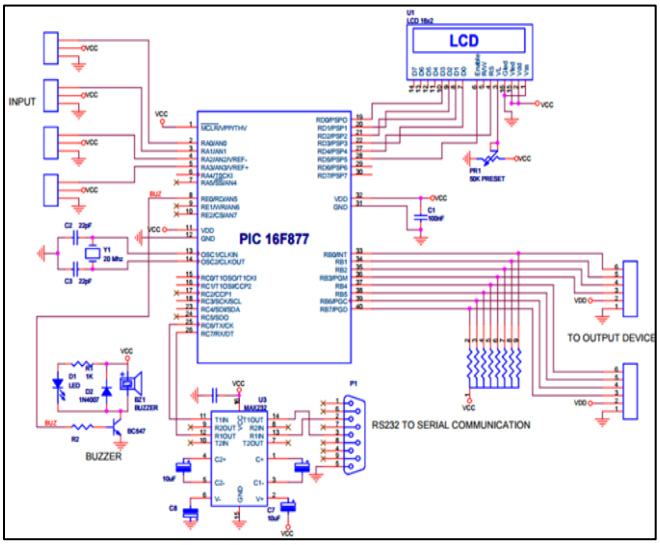

Fig. 1: Micro-controller Interfacing

III. METHODOLOGY

A. Implementation Details

Here we use a Gesture recognition module to control performance of the micro controller. Gesture recognition module is trained by giving the 4 commands i.e. Forward, Reverse, Left and Right. These 4 commands are stored in 4 address locations of microcontroller. When command is given the program in the corresponding and thereby controls the movement or rotation of the motor. This is the basic working principle of the 'Gesture controlled wheel chair'. Gesture is given to the Gesture recognition module through address location is executed and chair moves accordingly. By using mode switch we can switch into the home automation mode and here also 4 commands are used to control home appliances such as light, fan and many others. The 4 commands are turn ON light, turn OFF light, turn ON fan, turn OFF fan.

B. Communication of ZigBee's with each other

We have used Zigbee for wireless communication. Mesh networking provides a powerful way to route data from transmitter to receiver. Range is extended by allowing data to hop node to node and reliability is increased by self-healing, the ability to create alternate paths when one node fails or a connection is lost[4.]

C. Logic Conversion

MAX232 is a Bidirectional IC and it is used for logic conversion. It converts TTL to CMOS logic on transmitter side and vice-versa on receiver side.

D. Coding language an d programming software

Language used for coding is PIC basic. Programming software used is PICKIT3.

IV. CONCLUSION

Our project is able to control the wheelchair as well as home appliances for disabled people by means of hand gesture. In future improvements can be made by using various body gestures such as eye gaze, leg movement or head movement accordingly.

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