Accelerometer Based Gesture Recognition System

Nimiya Majeed[1], Jinto Mathew[2], Shilpa Paul[3], Krishnapriya K C[4], Bimi Varghese[5]

Assistant Professor, Dept. of ECE, MBITS College, Kothamangalam, Kerala, India [2]

UG Student, Dept. of ECE, MBITS College, Kothamangalam, Kerala, India [1,3,4,5]

ABSTRACT: Hand gesture based electronic device control is gaining more importance nowadays. Most of electronic devices focus on the hand gesture recognition algorithm and the corresponding user interface. This project presents an accelerometer mostly based on hand gesture recognition algorithm which is used to control electronic/electrical devices. The hardware module consists of an accelerometer, PIC microcontroller, ZigBee module for sensing and collecting accelerations of hand motions. Users can use this hardware module to control the home appliances by making hand gestures. The hand gestures made are determined by the accelerometer and are transmitted wirelessly to a target device. Dynamic hand gesture tracking and recognition system can simplify the way humans interact with consumer electronic equipments. With the development of modern technology and Android smart phone, people are benefited more and more. ZigBee technology, which aims to exchange data wirelessly in a considerably large distance and targeted at the wide development of long battery life devices in monitoring applications. With dramatic increase in smart phone users, smart phones have become an all-purpose portable device and is helping people for their daily use.

KEYWORDS: Accelerometer, PIC microcontroller, hand gesture, ZigBee

I. INTRODUCTION

Gesture is defined a motion of limbs or any other body part which are made to emphasize speech. It can also be defined as an act or a remark made as a sign of attitude. A gesture is scientifically categorized into two distinctive categories: dynamic and static. A waving hand means goodbye is an example of dynamic gesture and the stop sign is an example of static gesture. It is necessary to explain all the static and dynamic gestures over a period of time in order to understand full message. Gesture recognition is interpretation of human motion by computing device. Hand gesture can be detected by controller that contains accelerometers to sense tilting and acceleration of movement.[1]

The basic purpose of this system is to provide a means to control electronic devices (capable of ZigBee communication) using hand gestures. Thus, this system will act like a remote control for operating all the consumer electronic devices present in a house, but this will be achieved through hand gestures instead of pushing buttons. Gestures can be recognized by using sensors, accelerometer etc. Accelerometer-based gesture recognition performs matching or modeling in time domain. The detected and recognized hand gestures are used as the command signals for controlling devices.

Hand Gesture Based Remote control is a device to replace all other remotes used in households and perform all their functions. Normally in homes, remotes are used for appliances like TV, CD player, Air Conditioner, DVD Player and Music System. Remotes are also used for lights ON/OFF control, Door Opener etc. The XBee wireless technology is set to revolutionize the way people perceive digital devices in our homes and office environment. This wireless technology is useful in home environment, where there exists an infrastructure to interconnect home appliances. This technology is suitably used for home automation in a cost-effective manner.[4]

Nowadays, it is almost impossible for home inhabitants to go for a day without interacting with the home appliances. Although remote control of home appliances such as TV, DVD, windows, lights, etc. serves well for ordinary people with acceptable physical or emotional comfort, they can provide more for the dignity, security, and well-being of elderly or disabled people. One can imagine a situation where a person has lost some of his/her physical mobility. In the absence of suitable controls, he/she would need a caregiver to assist with the operation of home appliances, with the

attendant expense and loss of independence and privacy. But with adequate assistance, this person might be able to live independently at his/her home.[3]

In this paper we proudly present home automation using ZigBee wireless technology, which replaces the older communication technologies such as IR and Bluetooth which has short operating range.

II. HARDWARE AND SOFTWARE

Here we mainly use Accelerometer, PIC microcontroller, ZigBee, LCD and relays as the hardware components. Now we can go in detail about each components.

1) **Accelerometer:** It is used for making hand gestures.we use ADXL335 here.
2) **PIC microcontroller:** The microcontroller used here is PIC16F883 and we make use of 28 pins. The data to be transmitted is given to micro-controller through accelerometer. Then the data is converted into digital form with the help of inbuilt A/D Converter present in micro-controller. The digitized data is then transmitted through ZigBee (XBee). It has high performance RISC CPU.
3) **ZigBee:** The XBee and XBee-PRO RF Modules were engineered to meet the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of data between devices. The modules operate within the ISM 2.4 GHz frequency band and are pin-for-pin compatible with each other and has a baud rate of 9600.[4]
4) **LCD:** A liquid crystal display is a thin, flat panel used for electronically displaying information such as text, images, and moving pictures. Among its major features are its lightweight construction, its portability, and its ability to be produced in much larger screen sizes than are practical for the construction of cathode ray tube (CRT) display technology. Its low electrical power consumption enables it to be used in battery-powered electronic equipment. We use 16*2 LCD.[1]

III. BLOCK DIAGRAM

A) TRANSMITTER SECTION

In this section the tilt in hand gesture are recognized by the accelerometer (ADXL335), which is fed to PIC16F883 which is the heart of this paper. The signal which is to be transmitted according to the hand gesture we have made is fed the ZigBee module (transmitter), and the corresponding status can be observed on the LCD display.[2]
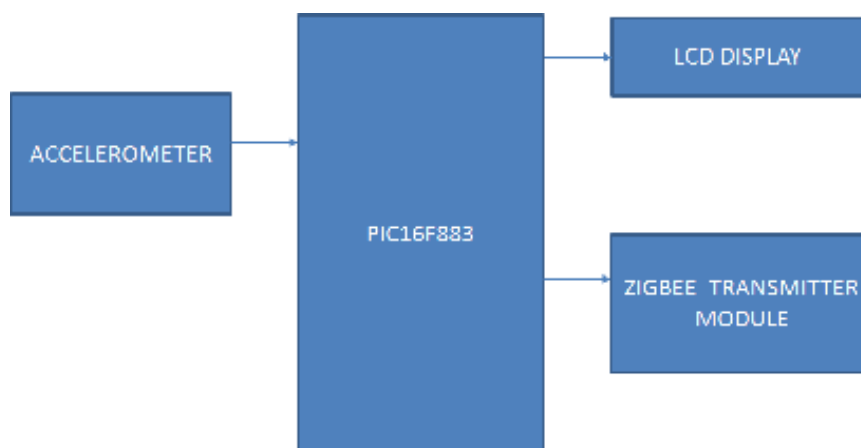

Fig. 1: Block diagram for the transmitter section

B) RECEIVER SECTION

The ZigBee module receives the signal from the transmitter section and the corresponding data's are given to PIC16F883.The status can be displayed on the LCD and the corresponding devices are actuated through the relays.[2]
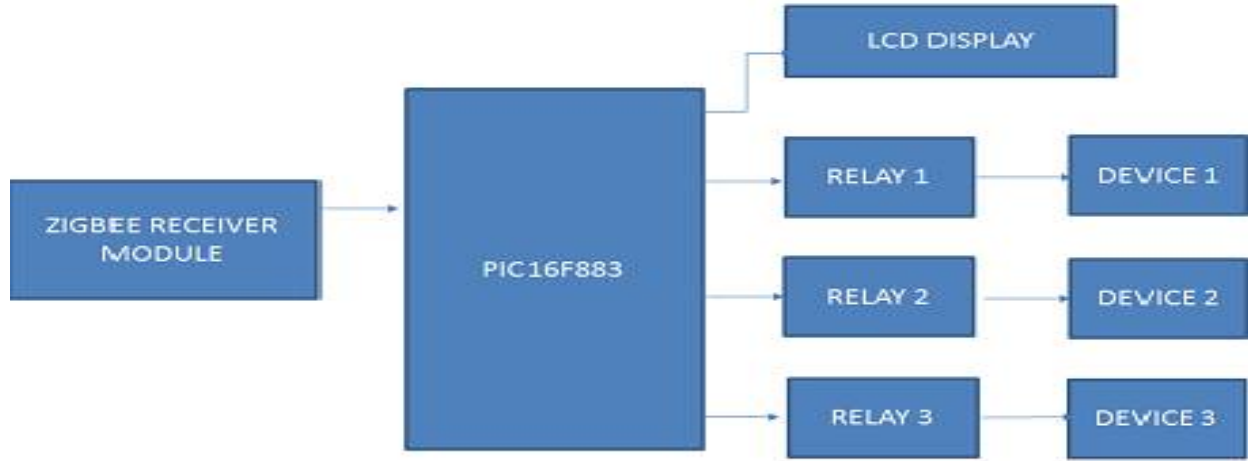
Fig. 2: Block diagram for receiver section

IV. SIMULATION RESULTS

Here we have the simulation results:
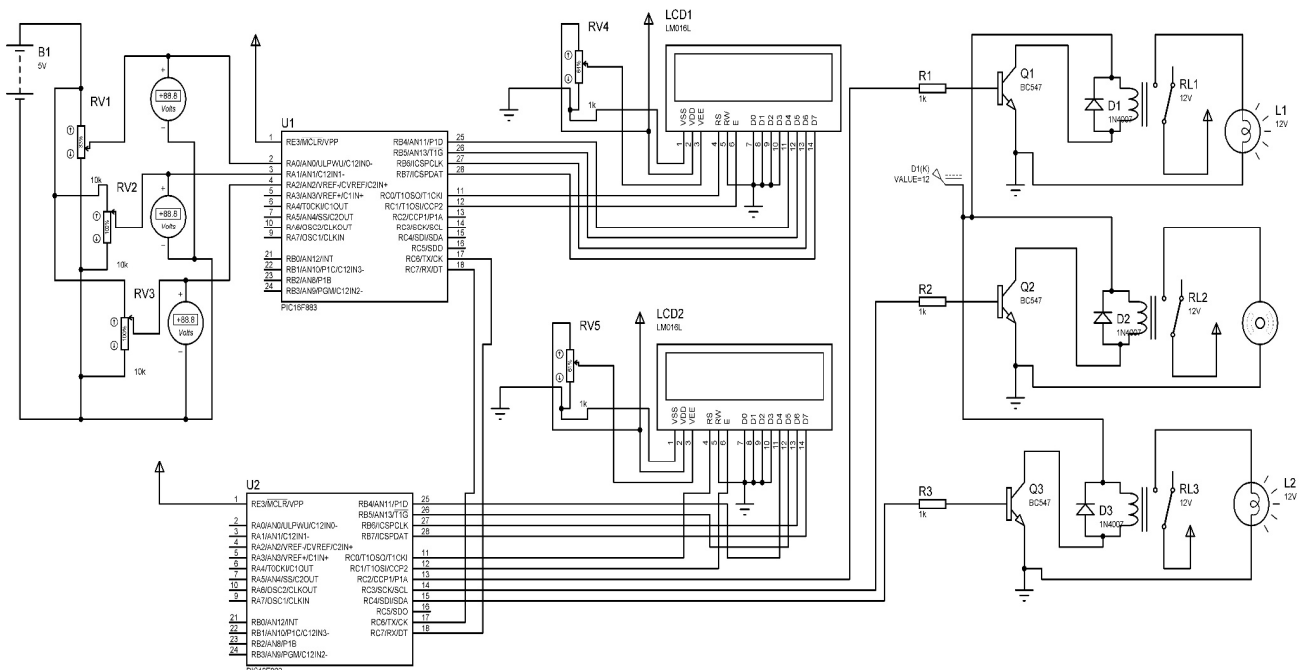In this the appliances that we have used for controlling are bulbs and motor.

Fig. 3: Simulation Results

V.   ADVANTAGES

When we are considering the present scenario we know that most of the people are looking for shortcuts rather than the straight paths, and as far as physically challenged people are concerned its very hard for them to switch ON and OFF the devices. So we have come up with a paper which has got lots and lots of advantages. So the first and foremost is its

simple circuitary. Earlier we have been using large circuitary which makes the system complex and costlier, here we require only basic components. Next, it consumes **low power** and provide **higher security**. Compared to the earlier projects it has got **long range application**, that is IR and Bluetooth were replaced by the **ZigBee** module which provides more than 100's of meter communication[3].

VI.CONCLUSION

In this paper we can easily control the home appliances using zigbee wireless technology. Here we have mainly focussed on its wide range of application. Compared to the previous works on home automation it provides lots of advantages such as: low cost , higher security etc. It provides a higher comfort zone for the physically impaired people where by they can control all devices with a tilt in their gestures.

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