Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X
IMPACT FACTOR: 6.017

IJCSMC, Vol. 7, Issue. 6, June 2018, pg.175 – 180

Design of Gesture Based HCI Modules

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Abstract— Nowadays things are becoming simpler and easy which are performed by humans to make the operations simpler, here we are presenting a paper with advancement of hand GESTURE. This paper presents two applications 1) movement of cursor and 2) control of home appliances using hand gesture. Here the hand gesture consists of accelerometer connected to LPC2148. At the transmitter side accelerometer receives the hand motion which is analog data. Further serial digital data is transmitted through zig-bee, at the receiving side the zig-bee will receive the digital data and sent to the microcontroller to process the sense data (i.e directions, motions), finally received by other transceiver and displayed on LCD screen.
Keywords— Accelerometer, Gesture, LPC2148, Zig-bee, HCI.

I. INTRODUCTION

The increase in human-machine interactions in our daily lives has made user interface technology progressively more important. Physical gestures as intuitive expressions will greatly ease the interaction process and enable humans to more naturally command computers or machines. For example, in tele robotics, slave robots have been demonstrated to follow the master's hand motions remotely. Other proposed applications of recognizing hand gestures include character-recognition in 3-D space using inertial sensors gesture recognition to control a television set remotely, enabling a hand as a 3-D mouse, and using hand gestures as a control mechanism in virtual reality. Moreover, gesture recognition has also been proposed to understand the actions of a musical conductor. In the project carried out system is been built using MEMS accelerometer based gesture recognizing system, enabling hand as a 3-D mouse and controlling desktop application using MEMS technology.

The work that is carried out focuses on the invention of a hand-operated computer mouse that employs tilt sensors placed in the handset to determine hand position and to function as simple hand operated computer mouse. One tilt sensor detects the lateral hand motion to drive the left or right displacement of the mouse.

The system uses accelerometers to detect the user's hand tilt in order to direct mouse movement on the monitor. The clicking of the mouse is activated by the flex sensor. The keyboard function is implemented by allowing the user to scroll through input data given by the accelerometer. It is an interface system that would allow a paralysed user to interact with a computer with almost full functional capability, it might be used by a quadriplegic individual also.

A gesture is a form of non-verbal communication or non-vocal communication in which visible bodily actions communicate particular messages, either in place of, or in conjunction with, speech. Gestures include movement of the hands, face, or other parts of the body. Gestures differ from physical non-verbal communication that does not communicate specific messages, such as purely expressive displays, or displays of joint attention. Gestures allow individuals to communicate a variety of feelings and thoughts, from contempt and hostility to approval and affection, often together with body language in addition to-words when they speak. There are different gesture recognition models now-a-days. 'Template matching based gesture recognition model'. It is been used

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in the work being carried out. As it is more accurate and efficient than other models. When the sensing system is switched on, the accelerations in three perpendicular directions are detected by the MEMS sensors and transmitted to a PC via zigbee protocol. The gesture motion data then go through a segmentation program which automatically identifies the start and end of each gesture so that only the data between these terminal points will be processed to extract feature. Subsequently, the processed data are recognized by a comparison program to determine the presented gestures. Flex sensors are used to control desktop applications.

II. METHODOLOGY

A. System block diagram

There are two sections:
1. Human Interacting section.
2. Computer Application Interface section.

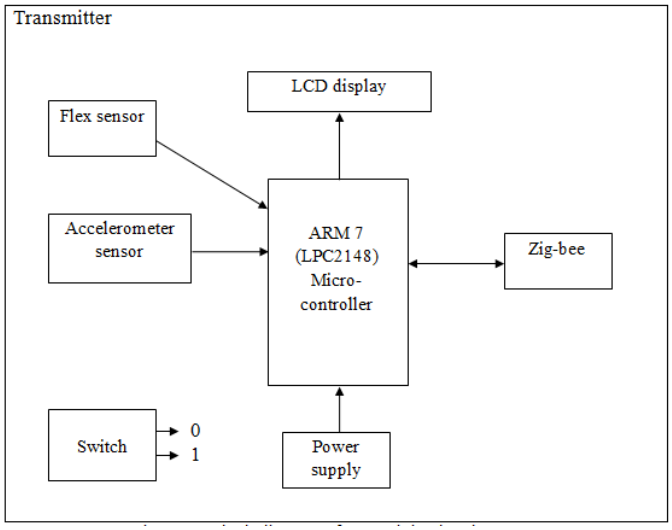

Fig.1 Block diagram of Human Interacting Section

The explanation of system level block diagram is as follow:

- **MICRO-CONTROLLER:** Microcontroller is the heart of any embedded system. This is the key element of the system which take cares about all the executions. It is responsible to control all the peripherals attached to it. In this proposed system LPC2148 IC has used, which belongs to the family of ARM 7. The IC is a 32-bit microcontroller generally used for high end applications. The operating frequency is 60 MHz.

- **LCD DISPLAY:** 16X2 Liquid Crystal Display is used for monitoring the data and result. In this system complete view for user and robot interaction can monitor in LCD display. Advantage of this device for using in a system is bright adjustment.

- **ZIGBEE:** The recent wireless technology called ZIGBEE, the full duplex wireless data transmission device is ZIGBEE (CC2500). For communication between robot and robot administrative (robot monitor person) can be achieved using this device. It uses RF technology at 2.4GHz and 9600 data transmission rate.

- **POWER SUPPLY:** DC power supply is used for most of electronic devices. In our proposed system we required 12V DC supply with 2A current. The lead acid battery is used for fulfil the requirement and corresponding voltage regulator and protection circuits like LM317 are used.

- **ACCELEROMETER SENSOR:** The 2-axis MEMS accelerometer is used in this design, through which the data has been sent to the receiver circuits, 5v DC power supply is used.

- **FLEX SENSOR:** The flex sensor is used to operate the desktop applications.

- **SINGLE POLE DOUBLE THROW SWITCH (SPDT):** 0/off- shifts to human mouse, 1/on- shifts to control home appliances.

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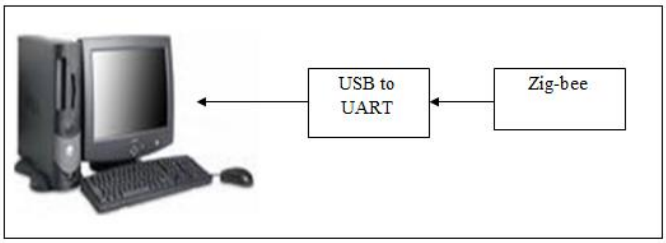

Fig.2 Block diagram of Computer Application Interface section of human mouse

- **USB to UART converter:** Here RS232 USB to UART converter is used to receive the data from receiver zigbee, which is sent by accelerometer through transmitter zigbee.

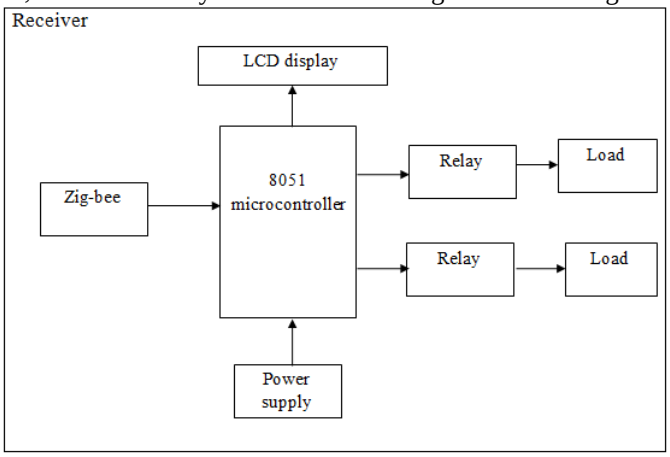

Fig.3 Block diagram of Computer Application Interface section of home appliances.

- **RELAY:** The relay board module is used for control of higher current load from the Micro-controller development board.

III. DESIGN AND IMPLEMENTATION

A. FLOW CHART OF HUMAN MOUSE

The flow chart of the application is shown in fig.4, where the methodology of design is described.

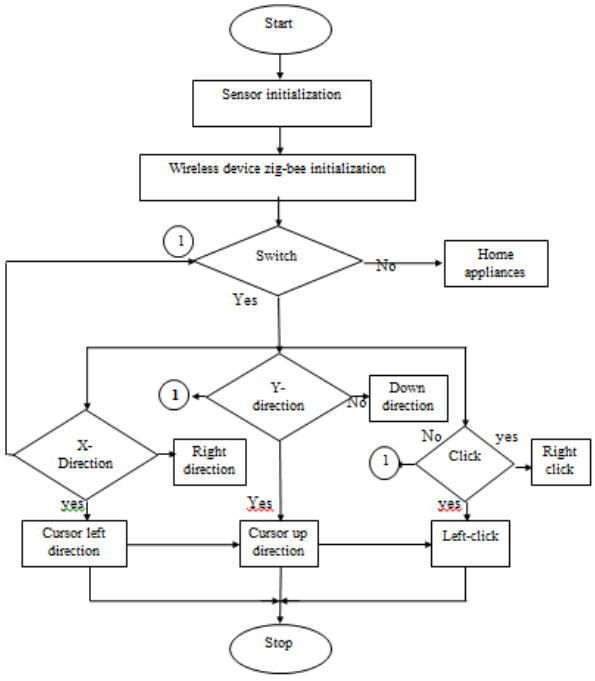

Fig. 4. Flow chart of hand gestured mouse control.

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When the sensing system is switched on, the accelerations in three perpendicular directions are detected by the MEMS accelerometer sensor and sent to ADC to convert analog signal to digital signal. Digitally converted acceleration values are sent to microcontroller for processing, Keil C/Embedded C programming language is used for processing. The acceleration values obtained are compared with standard values stored in controller and accordingly characters are sent and the cursor moves on the desktop screen according to the directions specified in the program corresponding to the character detected. The processed signals are sent to PC via Zigbee protocol. The Java software is used as frontend, using Swing (Java) processing is done of the signal coming from Zigbee. According to the character detected the cursor moves on the desktop according to the directions specified in the program. The gesture motion data then go through a segmentation program which automatically identifies the start and end of each gesture so that only the data between these terminal points will be processed to extract feature. Subsequently, the processed data are recognized by a comparison program to determine the presented gestures. The flex sensor is used for the desktop applications, and to click right and left. The output is given to logic circuit for controlling desktop applications, such as file opening and closing operations.

1. Flow diagram of home appliances:

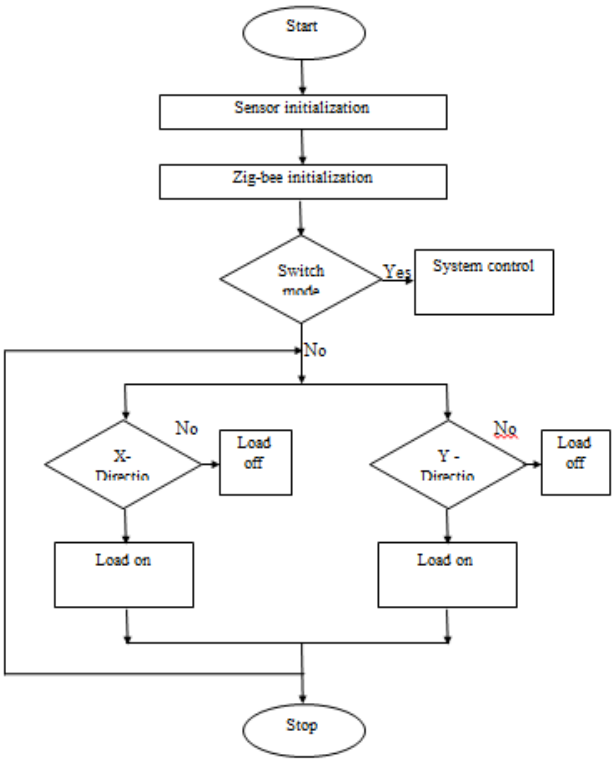

Fig. 5. Flow diagram of home appliances.

Same procedure follows in the case of home appliances control as that of human mouse. The data from the accelerometer is sent to the microcontroller 8051 which is in another receiver, received by the zigbee and sent to controller, then the micro-controller give inputs to the relay, through which the loads are controlled. The design is codded in embedded C using keil software and dumped on flash magic tool.

IV. RESULT AND DISCUSSION

The overall design consists of two 12V 2A DC supply is used to power up, sequence of activities that are carried out is mentioned below.

Once the device is power up, the "hand gesture device" displays on 16X2 LCD display as shown in Fig.6 as the switch is 0 or off.

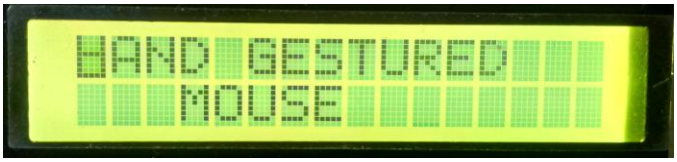

Fig. 6. First step when device is powered on

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Second stage: During this stage, cursor moment is done as per the accelerometer sensor's data shown in fig 6 and the direction of moment is displayed on lcd display.

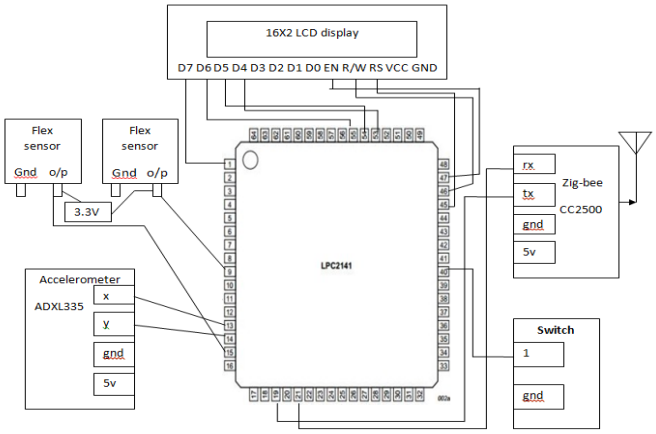
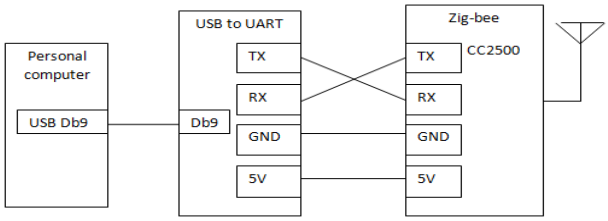


Fig. 7. a) Hand gesture human mouse



b) Cursor movement in computer

Third stage: Switch, in the transmitter shifted to 1 or ON stage then the accelerometer send data to the home appliances device the message is displayed on 16X2 LCD display as shown in fig. 10.

Fig. 8. Message on LCD display for controlling home appliances.

The working figure of home appliances is shown in fig. 9

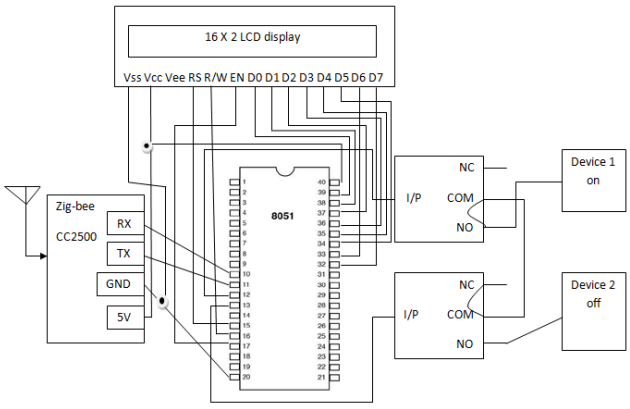


Fig. 11. Control of home appliances

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Two devices are connected to the circuit namely device 1 and device 2 respectively. The result can be known by the bulb which is connected to device 1 and 2, will ON or OFF also it is displayed on LCD display.

V. CONCLUSION

The work that is carried out focuses on the invention of a hand-operated computer mouse that employs tilt sensors placed in the handset to determine hand position and to function as simple hand operated computer mouse. One tilt sensor detects the lateral hand motion to drive the left or right displacement of the mouse. The system uses accelerometers to detect the user's hand tilt in order to direct mouse movement on the monitor. The clicking of the mouse is activated by flex sensor. The same tilt is used to control home appliances by using another receiver model. This interface system that would allow a paralysed user and disabled persons to interact with a computer with almost full functional capability. So the project proposes efficient system for disabled persons and physically challenged persons to operate the computers easily.

References

[1] Parth B. Panchal, Vimal H. Nayak "*A Hand Gesture Based Transceiver System for Multiple Application*" 2nd international conference on electronics and communication system, 978-1-4788-7225-8/15/$31.00 ©2015 IEEE.

[2] Pomboza Junez Gonzalo, Holgado-Terriza Juan A "*Control of Home Devices based on Hand Gestures*" 5th International Conference on Consumer Electronics Berlin. 978-1-4799-8748- 1/15/$31.00©2015 IEEE.

[3] Horatiu-Stefan Grif, Cornel Cristian Farcas "*Mouse Cursor Control System Based on Hand Gesture*" 9th International Conference Interdisciplinary in Engineering, INTER-ENG 2015.

[4] Harpreet Kaur, Jyoti Rani "*A Review: Study of Various Techniques of Hand Gesture Recognition*" 1st IEEE International Conference on Power Electronics. 978-1-4673-8587-9/16/$31.00 ©2016 IEEE

[5] Pei Xu∗ "*A Real-time Hand Gesture Recognition and Human-Computer Interaction System*" arxiv:1704.072961vl [cs.CV] 24 Apr 2017.

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