Wear and Click - Glove Mouse

[1]Chetan Jain, [2]Richa Bhadouria, [3]Tajinder Kaur
Computer Science and Engineering
Jaypee Institute of Information Technology
NOIDA, India
[1]*chetanjain.92r@gmail.com*
[2]*richabhadouria.20@gmail.com*
[3]*tajinder.kaur@jiit.ac.in*

Abstract— There are many ways for Human computer interaction. Out of these standard PC mouse has been in use for over 40 years. There are many limitations with the standard mouse. In this paper, a different method of interaction is proposed. For this Glove Mouse is designed for controlling the mouse movements on computer. The device is used for basic interface tasks like clicking, enabling and disabling. With the new device, the user can move the mouse cursor around the computer screen by just moving his hand. User can also perform clicks with this new device. The glove mouse senses the user actions via two types of sensors: accelerometers and finger contact pads. For processing and transmitting the signals, it uses microcontroller and RF module. This Novel approach enhances the user experience of interaction with computer even from very large distance.

Keywords- *Glove Mouse, Human Computer Interaction, RF module, Microcontroller, Sensors.*

*****

I. INTRODUCTION

The new generation computer technology is expanding and surrounding humans and computers communicating as naturally as a human with other human. There are many limitations with the standard mouse that it needs a contact surface for its operation. It does not allow user to operate computer with comfort. Also people with severe disabilities also find it difficult to operate computer with standard mouse. So, motivation of this project was to overcome the shortcomings of this standard mouse. An alternative for the standard mouse is a wireless Glove mouse. This device brings new level of comfort in the lives of people as it does not require surface for its operation , allows user to interact with a computer by moving her hand and user can operate system from fair distance. This device also improves the lives of people with severe physical disabilities by providing mouse pointer control comparable to what is available to normal people. The device can also be used by normal people as it is an inexpensive device. With the new device, the user moves the mouse cursor around the computer screen by just moving her hand. User can also perform clicks with this new device.

This paper is divided into various sections. Section 1 introduces the topic and its objective. Section 2 includes the methodology and the basic idea of system design, various components, working of the setup. Then in next section overall architecture of the system is covered. In the fourth section detailed implementation design is covered under the headings Hardware and Software design. Finally the conclusion is drawn and future aspects along with its applications are discussed.

II. BACKGROUND

A lot of research has been done for making a mouse that will not require surface for its operations [1][2][3][4].

In [1] research paper wireless mouse is created with the help of 3 axis accelerometer that will sense the tilt of hand. This setup consist of 3 axis accelerometer, PIC 16F 886 microcontroller, contact pads, a wireless transceivers, colored LEDs, glove. The accelerometer reads the tilt of each axis and outputs each as an analog voltage and sends it to MCU. After the microcontroller processes the input data then, each of the voltage value of tilt is converted to digital numbers and forwards a message to transmitter mounted in glove unit .wireless communication will take place transmitter and receiver of the base station.

In [2], mouse has been designed which works by the tilt of user's head. In this they have use Memsic 2125 accelerometer, BASIC Stamp 2 microprocessor which is a 8-bit 20MHz microprocessor programmed with a version of the BASIC language, PBASIC. To operate the head tilt mouse user moves the mouse cursor around the computer screen by tilting his head.

In [3] air mouse is made which would not need any contact surface for its operation. Device will work in two modes 2D and 3D mode in which they have to find planar and spatial coordinates for movements of the mouse pointer. It consist of non-echo ultrasonic system that works at 40 KHz,3 receivers ,micro-controller and one hand held transmitter. Hand held transmitter is used as mouse in this. Three receivers are paced at three different corners of screen and then measure distances from transmitter to their respective receivers and with the help of these coordinates mouse pointer is created.

In research paper [4] new wearable, real time and user friendly device for human computer interaction is made. This system consists of Flex sensors and Accelerometer for sensing hand gesture, ARM processor and ZigBee module for wireless transmission. The proposed system makes the use of flex sensors and accelerometer to sense hand gestures. The ARM processor will be configured to process the signals received from flex sensors and accelerometer. The ARM processor will send the processed data wirelessly by using ZigBee module.

III. METHODOLOGY

Research work has been carried out with different types of microcontrollers, accelerometers, wireless modules. The objective of this project was to make an inexpensive device. The design of wireless glove mouse consist of two units: base unit and control unit. Base unit will consist of RF receiver for wireless communication and USB connector. Control unit will consist of microcontroller Atmega16L, 3 axis accelerometer,

 ISSN: 2321-8169
3207 – 3210

and push buttons and RF transmitter for wireless communication as shown in figure1. The base unit will be connected to the computer via USB, which acts as the receiver. Another unit i.e. the control unit will be used by the user as a Glove Mouse.

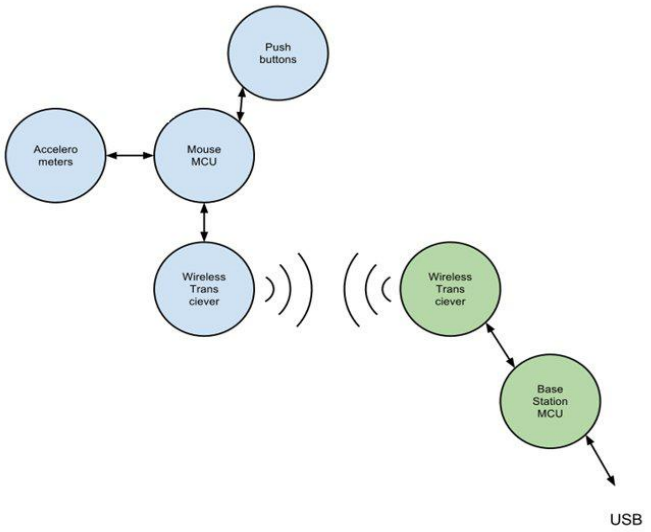

Figure 1- Logic map [1]

This wearable unit will consist of buttons on finger tips for click, an accelerometer inside the glove for sensing the motion and getting the direction of motion. This would be connected to a microcontroller and also a transmitter to communicate wirelessly to the base unit. The accelerometer reads the tilt of each axis and outputs each as an analog voltage. Push buttons are used for enabling and disabling the mouse and for making left click and right click. RF module is used to provide wireless communication.

A. Working of setup will be as follow:

The Glove Unit carries Atmega16L, 3-axis accelerometer, push buttons and RF transmitter. For moving the cursor on the computer screen user will tilt his/her hand right/left as shown in figure 2. Tilt will be sensed by accelerometer. In this device, the 3 axis accelerometer was used.

The 3-axis accelerometer [5] is a low cost accelerometer that works well with and is connected directly to microcontroller Atmega16L. Among other things, it senses tilt and tilt angle. Accelerometer will send information to MCU. MCU will read input and process the information and convert analog signal to digital signal. After that MCU send signal to RF transmitter and RF transmitter and send this signal to RF receiver. Wireless communication will take place between RF transmitter and RF receiver. RF receiver that is connected to computer through USB connector will send this digital signal to computer and then cursor will move on computer screen. The embedded push buttons are used to perform clicks and enabling/disabling the glove mouse and is connected directly to microcontroller Atmega16L.If user want to perform right/left click or enable/disable the mouse, user will press push button that are mounted on fingers. Push button will read this information to MCU and MCU will send process and transmit this signal to RF transmitter. Wireless communication will take place and digital signal will be send to computer and click will be performed on screen.

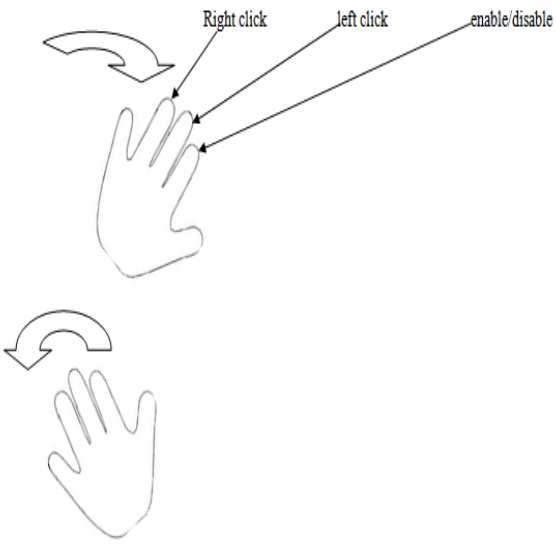

Figure 2- Cursor movement/clicks

IV. OVERALL ARCHITECTURE

The overall architecture of the system is shown in figure 3. It consists of various modules.

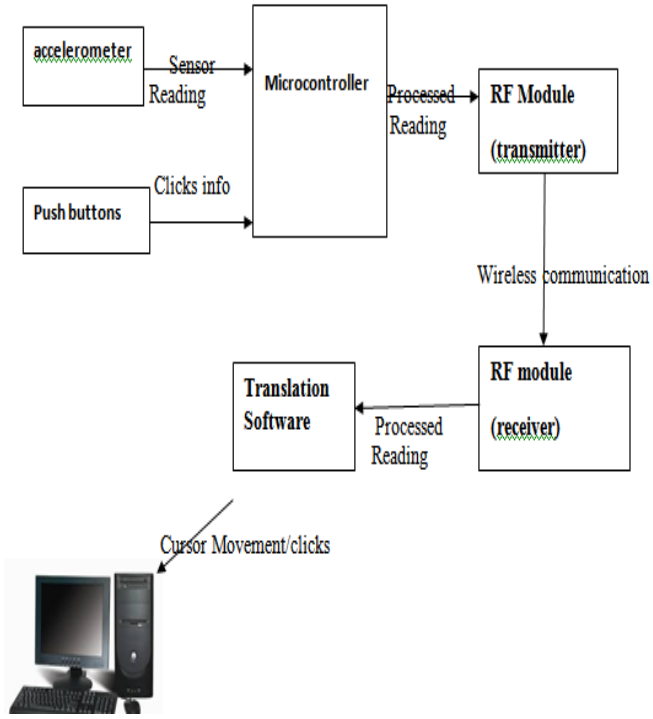

Figure 3 - Overall Architecture

A. Accelerometer

Accelerometer is basically used to identify the movements of hand across the three axis i.e. x-axis, y-axis, z-axis. Movement of hand causes dynamic acceleration which produces change in voltage. This reading is provided to Microcontroller.

 ISSN: 2321-8169
3207 – 3210

B. Push Buttons

They are used to enable and disable the mouse and to perform left and right click. This information about the clicks will be given to Microcontroller.

Right click left click Enabling/Disabling

C. Microcontroller- MCU

MCU [6] will make further processing of signals sent by the accelerometer and push buttons. After manipulating the signals according to program logic, it will send the processed data to RF transmitter module for wireless transmission.

D. RF Module

RF module [7] consists of RF transmitter and RF receiver. RF transmitter will transmit the data signals wirelessly from wearable hand glove device to base station RF receiver.

The data will be sent serially via radio frequency. In this paper, 433 MHz radio frequency radio module is used to send data serially. Modulating frequency is 433MHz and type is ASK. Whenever data is to be sent, encoder is used to convert the parallel data to serial.

E. Translation Software

In this 'Terminal.exe' and 'PC Control' [8] are used as translation software. They interpret the data received from control unit and convert it into action (cursor movement/clicks).

F. PC

Computer is attached to RF receiver through USB adaptor and computer has translation software. This software interprets the data received and performs cursor movement on the computer screen or performs left/right click in the computer

V. IMPLEMENTATION DETAILS

Implementation of the proposed system can be discussed under two heading: Hardware and Software Design.

A. Hardware design

The information from the 3 axis accelerometer is read by the microcontroller Atmega16L embedded in the tilt glove mouse and information about right, left clicks and enabling/disabling is also read by microcontroller. The microcontroller reads information from the accelerometer and push buttons, processes it, and sends it to computer wirelessly. The microcontroller Atmega16L is programmed with C language. In the hand tilt mouse the RF module. This is a low cost radio that works well with the microcontroller Atmega16L. The circuit diagram is shown in Figure. The accelerometer pin x is connected to PA0 (ADC0 pin 40), accelerometer pin y to PA1 (ADC1, pin 39), accelerometer pin z to PA3 (ADC2, pin 38) and is shown in the top right corner of the figure. The push buttons is connected to pins PB0 (pin1), PB1 (pin 2), PB2 (pin 3) and is shown in the top left corner of the figure. Push button at pin1 is for left click, pin 2 is for right click and pin 3 is for enabling/disabling the glove mouse. RF transmitter is connected to PD0 (pin 14) and PD1 (pin15) and is shown in the left bottom of microcontroller. Power supply is provide to microcontroller. Battery is used to provide to RF receiver and RF receiver is connected to computer using USB adapter.

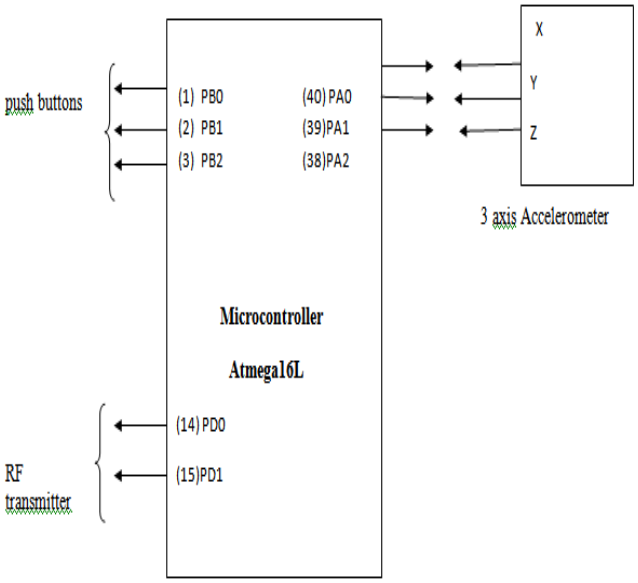

Figure 4- Hardware Design

B. Software Design

When RF receiver receives the data from RF transmitter and it sends data to computer through USB adapter. To interpret this data and to convert this data into cursor movement or to perform clicks, translation software is used. Translation software interprets the data received and converts into actions. For this MSCOMM32.OCX [7] is used which has Terminal.exe and PC Control application. Terminal and PC control are used to establish an initial one-time trust relationship between RF module on the hand tilt mouse and the computer. Once this relationship is formed, two COMM ports are created; one for incoming to the PC and one for outgoing to the hand tilt mouse. The microcontroller on the hand tilt mouse is programmed in C language to read data from the accelerometer and push buttons and send it over RF module.

VI. FUTURE WORK

- This is a technology of the future with great scope of development. With increased research and development on this system, it can further be extended to Virtual Control devices and might bring a new revolution in the field of gaming.
- We can improve the accuracy of cursor movement by using the more accurate accelerometer.
- The glove output is limited to a single hand and since hands differ in size and freedom of motion, therefore work can be done on this mouse so that the wearable hand glove mouse can be flexible for every hand size.
- Primarily, we believe that a smaller wearable unit would be more practical for everyday use. Our project is built with a small budget in mind and with easily usable, but not necessarily the smallest parts.

VII. APPLICATIONS

- Precise and easy control of the mouse cursor from some distance. This mouse overcomes the shortcomings of the previous versions of mouse as it eliminates the need of a flat surface for functioning and allows user to control the computer with comfort.
- The wireless glove mouse provides computer mouse cursor control for people with severe disabilities like carpal tunnel syndrome who cannot use a traditional mouse alternative to other users at a low cost without the need for specialized hardware.
- User can perform right click, left click and enable disable the mouse by simply pressing push up buttons on his finger.

VIII. CONCLUSION

Overall, the results of our project met our expectations outlined in our project proposal. Our final Prototype is able to effectively control cursor movement and clicking with user hand gestures. It is found that the static keyboard and mouse are having many limitations with them, while in the case with this device can be used for the same purpose removing certain limitations. The resulting found to be very good and efficient with real-time.

ACKNOWLEDGMENT

We would like to thanks all the anonymous reviewers who have given their valuable feedback which helped us successfully complete this paper.

REFERENCES

[1] Ferrol R. Blackmon , Michael Weeks, 2009. Target Acquisition by a Hands-free Wireless Tilt Mouse. Proceedings of the 2009 IEEE International Conference on Systems, Man, and Cybernetics San Antonio, TX, USA - October 2009, pp-33-38.

[2] Pankaj Aggarwal, Vaibhav Miglani, R. Prashanth, R.Abhinav, Sahil Kalyan, 2014. WIRELESS POINTING DEVICE. J. International Journal Of Engineering Research & Management Technology , ISSN: 2348-4039, Volume 1, Issue 2, March 2014.

[3] Anand Bora,Abrar Chapalgaonkar,Nikhil Dalshania, 2012. 2D and 3D Air Mouse. In: WOCN, pp-1-4

[4] Chetana S.Ingulkar , A.N. Gaikwad, 2013. Hand Data Glove: A wearable real time device for human computer Interaction. J. International Journal of Science and Engineering, ISSN-2347-2200, Volume 1, Number 2.

[5] ADXL3xx Accelerometer. http://arduino.cc/en/Tutorial/ADXL3xx. Accessed on Feb,2015

[6] Atmel ATmega16 ATmega16L . http://www.atmel.com/images/doc2466.pdf , Accessed on March 2015.

[7] http://www.buildcircuit.com/how-to-use-rf-module-with-arduino/. Accessed on Feb, 2015.

[8] https://support.microsoft.com/en-us/kb/158008. Accessed on March 2015.