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Design of Tilt Sensing Mouse Glove Device using Arduino Uno

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Abstract - *Computers are used on a daily basis. To use them, it is essential to interface with a user interface (UI) system. Signal acknowledgment or gestures can be viewed as a route for PCs to start the comprehension of human non-verbal communication therefore fabricating a wealthier extension amongst machines and people. The mouse glove is a new hand gesture input device that recognizes hand gestures and interprets them into computer signals using mathematical algorithms. This device is based on tilt sensing using a three-axis accelerometer. This paper gives an account of the outline and advancement of a PC pointing gadget with accelerometer based development control.*

Key Words: Accelerometer, Gesture Recognition, User Interface, Human computer Interface, Arduino

1. INTRODUCTION

Computers are used on a daily basis. To use them, it is essential to interface with a user interface (UI) system. UI system may be text-based or graphical based as used in UNIX shell or Microsoft Windows family of operating systems respectively. Signal acknowledgment or gestures can be viewed as a route for PCs to start the comprehension of human non-verbal communication therefore fabricating a wealthier extension amongst machines and people [1]. The mouse glove (see Fig. 1) is a new hand gesture input device that recognizes hand gestures and interprets them into computer signals using mathematical algorithms.

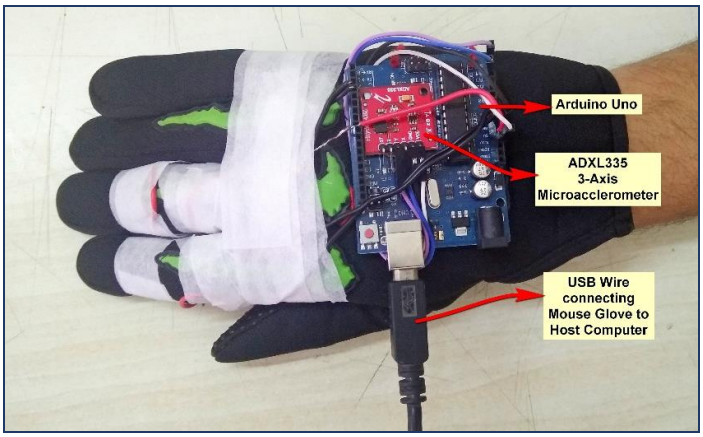


Fig -1: Mouse Glove Hardware

This device is based on tilt sensing using a three-axis accelerometer [2]. The key elements are the microacclerometer and an Arduino microcontroller board that is mounted to a thin and lightweight glove [3]. Mouse Glove enables the client to wear a glove and control the cursor through various hand placements and finger presses. Clients can work their PCs with their hands in mid-air without the bother of work areas surfaces. Mouse Glove interfaces with a PC utilizing standard USB. The PC's should have Windows, Mac, or Linux OS's having java installed. As the software implementation is java based, it can run on any computer hardware, as it makes a java virtual machine on that specific machine. The java program converts various gesture or signals to native mouse control codes. Once coded, utilizing just a single hand, the glove can undoubtedly be utilized without looking, making it ideal for installed/wearable conditions.

2. SYSTEM ARCHITECTURE

Mouse Glove system (see Fig. 2) consists of the following components:
1. Arduino Uno Microcontroller: Arduino is an open source hardware and software platform for making interactive projects that can sense and control the physical world. It is used for connecting the real world with the computer [4] [5].
2. 3-Axis Microacclerometer: It is a sensor for getting the analog inputs corresponding to physical acceleration and tilt of the hand [2]. We used the module ADXL335 (see Fig. 3(a)) from Analog Devices. It quantifies acceleration with full-scale scope of ±3 g. Here it is used in tilt-detecting application for quantifying the static acceleration of gravity.

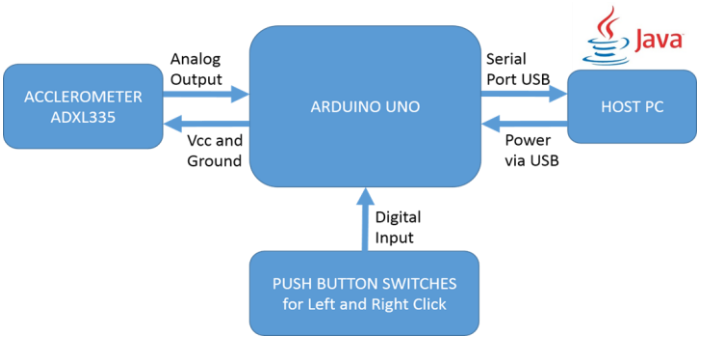
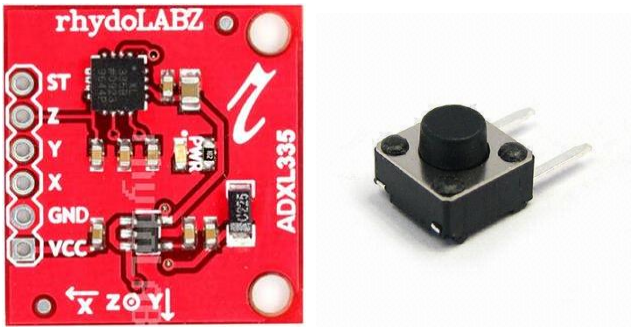


Fig -2: Mouse Glove System Architecture



(a) (b)

Fig -3: (a) 3-Axis Microacclerometer
(b) Push-Button switches

3. Push-Button switches: Two push button switches (see Fig. 3(b)) are used to input – left and right clicks from the mouse glove.
4. Java Application on host computer: To interpret the serial data coming from Arduino and convert it into mouse control codes Java program is used. The data arriving in the host PC is interpreted by a java program using RxTx library and java native access library.

3. METHODOLOGY

Our design plan comprises of two principle parts: a glove and a microcontroller board (Arduino Uno). Operation of our gadget starts with the glove. A client wearing the glove can utilize hand tilt placement and button presses to work the glove. As the hand tilts, the values of the X, and Y axis from the accelerometer are changing and it can be read in the form of analog inputs of the Arduino microcontroller board. The glove detects these client activities through two sorts of sensors: accelerometer and push button switches. After the Arduino (glove's microcontroller) forms the information by processing the input data, it transmits the data serially to the host PC [4] [5]. The Mouse Glove uses Arduino Uno microcontroller board that is connected serially to the host PC via USB wire. ADXL335 microacclerometer senses physical tilt and sends the analog output to the Arduino [2]. For sensing left and right mouse clicks it uses push button switches that are connected to pull-up resistors. Push button switches give digital inputs to the Arduino. Arduino Uno takes these physical signals from accelerometer and switches, applies appropriate mathematical algorithm [2] and then sends the data serially to the host PC. The data arriving in the host PC is interpreted by a java program using RxTx library and java native access library (see Fig. 4). The java program changes over the information received serially from the Arduino into a PC HID easy to use organization and moves the PC cursor fittingly and imitates left and right clicks.

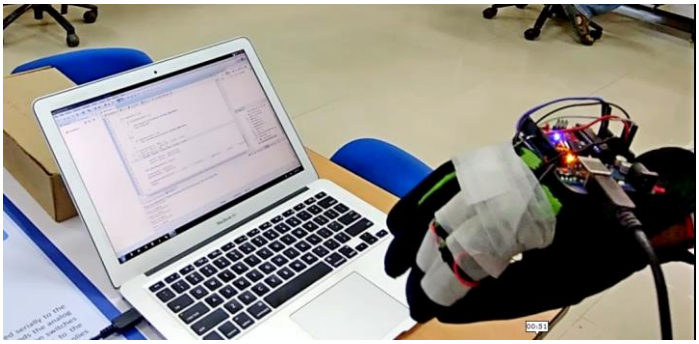


Fig -4: Mouse Glove Java Application in action

3. CONCLUSIONS

This paper gives an account of the outline and advancement of a PC pointing gadget with accelerometer based development control. Accelerometer is used for tilt sensing using only X and Y axes to form a plane of motion. Tilt movement of mouse glove in specific direction moves the mouse pointer on the screen accordingly. Push button switches are used for left and right click events. The point of the project was to make an info gadget – an input device, so clients can work their PCs with their hands in mid-air without the bother of work areas surfaces.

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