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Design and Implementation of Air Mouse

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Abstract:

In this modern world, computers are being used by a large number of people and its demand is still growing day by day. Over the years many devices are being designed to make an easy interaction between human and computer interaction has made user interface technology more important. We know that the presenters always need somebody to help him/her to control the power point or they personally have to walk back to their computer/PC and do the changes accordingly, which waste a lot of time and also it is a kind of interrupt to the presentation. So, our idea is to design a wireless wearable mouse, which is small and light and helpful to the presenters to control computer/projector screen away from their PCs even without desk!

Keywords: Wireless wearable mouse, Arduino, Computer screen, Hand gestures, Accelerometer, Bluetooth mouse, Human Computer Interaction (HCI),

1. Introduction

In a simple language, with the rapid development of technologies, smart and intelligent product are the necessities of human, so we have to focus on how to improve the interaction between machine and human is a key topic.

Human computer interaction is same as man-machine. Interaction is referring to the reaction between human operator and compute, since the role of human operator is very important in operating machine two main characteristics should be considered when designing HCI system i.e. functionality and usability. Any system that achieve a suitable result is combination of the two power concepts so that can be considered as powerful system.

This paper designed and implemented a Bluetooth air mouse, Bluetooth is one of the simple interface to connect with computer devices. The technology of hand gesture is used to detect the user's operation. In gesture recognition, the issue of small body movement was improved.

In our project the issue of small hand movement detection is used to control the screen of computer. The Bluetooth air mouse is combination of some hardware and software. It uses the hand detection to control screen.

The system has been designed with help of Arduino Microcontroller the accelerometer. Accelerometer is a motion sensor used to detect hand motion and Arduino map these C output values and gives digital output.

2. Literature survey

There are already exist many methods of hand gesture as summarized below. As mentioned in [3] Satjakarn Vutinuntakasame , We can see a hand gesture-based interface communication for the people with speech and hearing disability. The user's hand device in a system wireless sensor glove equipped with file Hex sensors and a 3D accelerometer. The hand gestures translated into sound and thus it provides authentic gesture recognition system.

As mention in [2] the technology of 3D image recognition and finger gesture recognition are used to detector user operation. In gesture recognition the movement detection signal is emulated as Bluetooth mouse

information to computer devices. The user can move this finger to control the system cursor, it provides a convenient and intentional operation interface.

To interface our project with computer we realized that we would be required to implement a USB device driver. During the planning stages, we searched different ways implementing a USB HID and discovered that we could proceed it by using hardware and software support. We come to conclusion that we need microcontroller in our base station in order to receive message, with this in mind we decided to use Arduino.

3. System Architecture

The below figure gives you the detailed idea of various connections established between microcontroller and other
The below figure gives you the detailed idea of various connections established between microcontroller and other sensors for proper functionality. The physical design of our project includes two main parts:

3.1) A hand mouse unit
3.2) A base station.

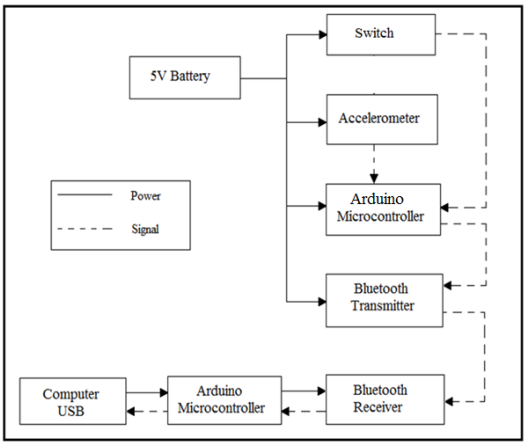

Fig -1: Block Diagram

3.1 Hand Mouse Unit

This Unit as shown in Fig, this unit mainly processes the information from sensors and transmit the user input to the base station. It is the set of hardware that the user physically wears during operation of the Mouse. It carries PIC microcontroller mounted onto a custom PCB. Connected to the Accelerometer & Switch. The user of the Wireless Mouse has primary modes of operation. The primary modes of input are hand orientation for mouse movement control and buttons for mouse clicks and control over movement enabling. Hand orientation is sensed by the 3-axis accelerometer in terms of tilt, and outputs an analog voltage connected to the internal analog-to-digital convertors and are converted to a digital value. Button presses are sensed by microcontroller placed on the side. All these packets are transmitted to Bluetooth transmitter by PIC microcontroller.

3.2 Base Station

The base station as shown serves one important purpose: to receive packets sent from the input Unit, wrap them in a proper HID format, and forward mouse commands to the user side computer.

3.3 Hardware

3.3.1 Accelerometer

Fig -2: Accelerometer

The ADXL335 is a small, thin, low power, complete 3- axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis. The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package (LFCSP_LQ).

3.3.2 Arduino

Fig-3: Arduino Board

The Atmel 8-bit AVR RISC-based microcontroller combines 32 kb ISP flash memory with read-while-write capabilities, 1 kb EEPROM, 2 kb SRAM, 23 general purpose I/O lines and 32 general purpose working registers. The device operates between 1.8-5.5 volts. ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Nano models.

The Atmega328p is an 8 bit, 28 pin microcontroller belonging to the AVR family. It has 23 digital input/output pins and 6 analog inputs. Six of the input/output pins can be used as PWM outputs. It has a RISC based architecture with 131 powerful instructions, most of which execute in a single clock cycle. Additionally, it has 32 Kbytes of In- system self-programmable Flash program memory, 1 Kbytes
EEPROM and 2Kbytes Internal SRAM

Fig-4: ATMega328 Microcontroller

3.3.3 **Bluetooth**

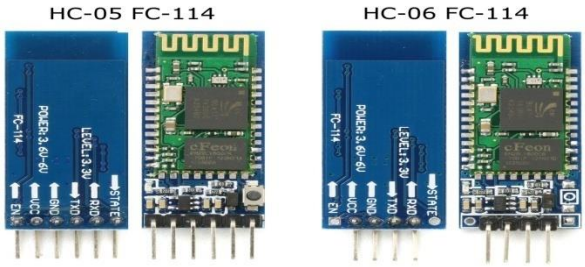

Fig -5: Bluetooth Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Bluetooth Transmitter:
Bluetooth transmitter on the user's hand will be controlled by an Arduino microcontroller and transmit the raw data from sensor that is accelerometer to the Bluetooth receiver. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.
Bluetooth Receiver: The Bluetooth receiver will receive the data from transmitter and then pass it to the microcontroller (Arduino). Its power will be supplied from the computer via the USB.

3.4. Software

3.4.1 Arduino

Arduino is a single-board microcontroller designed to make the process of using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open-source hardware board designed around an 8-bit Atmel AVR microcontroller, though a new model has been designed around a 32-bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller. The Arduino board is made up of an Atmel AVR microprocessor, a crystal or oscillator (a crude clock that sends time pulses at a specified frequency to enable it to operate at the correct speed) and a 5V voltage regulator. To program the Arduino, the Arduino IDE is used which is free software that enables programming in the language that the Arduino understands. In the case of the Arduino, the language is based on C/C++ and can even be extended through C++ libraries.

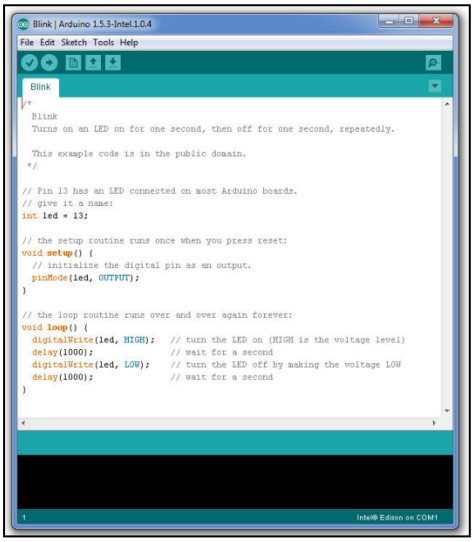

Fig-6: Arduino IDE

Proteus 7.8

We use Proteus software for Interfacing of Accelerometer with Microcontroller and Also Interfacing Of Bluetooth Transmitter with Microcontroller.

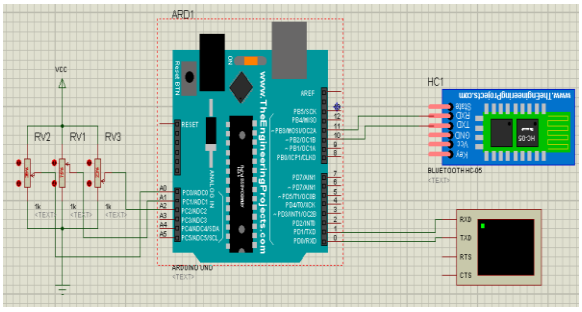

Fig-7: Interfacing Diagram

3.5 Transmitter & Receiver

Flow of Program

1. Start
2. Set analogue reference to 3.3v
3. Read from pin A0
4. Map the values from 10 bit to 8bit inside microcontroller
5. Change the output of X variable
6. Read from pin A1
7. Map the values from 10 bit to 8bit inside microcontroller
8. Change the output of Y variable, read from pin A2
9. Map the values from 10 bit to 8bit inside microcontroller
10. Change the output of X variable
11. Send the string accordingly to Bluetooth HC05
12. Receive on the other side of Bluetooth through Arduino
13. Receive inside the PC, process it using .net framework/java.
14. End

4. Results

Successful Interfacing of Arduino with Accelerometer and Bluetooth module. The results are as shown in fig:

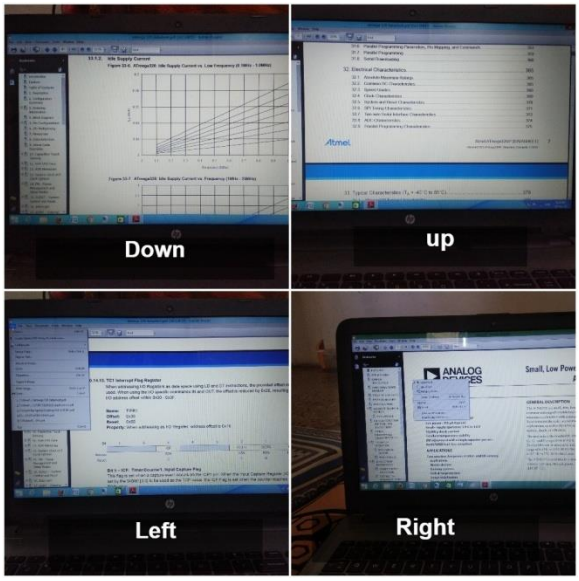

Fig-8: PDF reading results

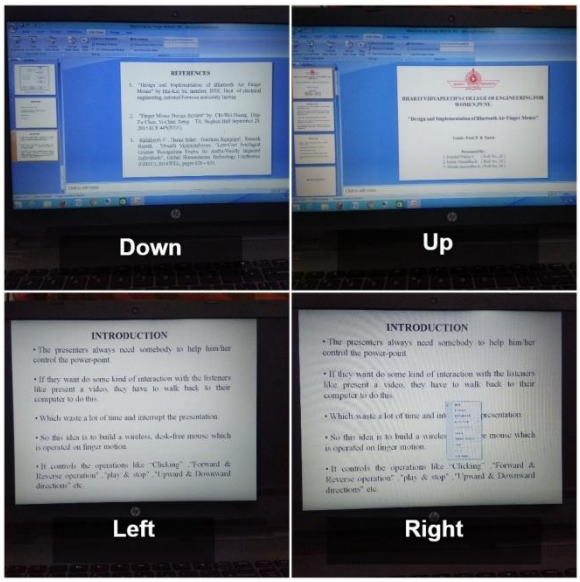

Fig-9: Presentation Results

5. Advantages

- This wireless mouse will be a battery-powered device. It can control the computer screen by hand motions, including curser “Moving” and “Dragging”.
- Small, light, and easy to bring.
- Wireless and can be operated on any kind of surface, even without a desk.
- It will be more convenient for speakers or lecturers to use when they are on stage.
- No wearing and tearing problem of clicking button, that is, longer lifetime.

6. Acknowledgement

It gives us great honor and satisfaction in presenting this project on "Design and Implementation Of Air Mouse". We take great honor in presenting this idea to our Principal Prof.Dr.H.V.Vankudre. We will always be thankful to our project guide Prof.P.R.Yawle for her advice and guidance in this work and his tireless support in ensuring its completion. We would also like to show our real concern for project members, staff and all our friends who have made it a scalable job by providing us the most modern and latest information.

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