ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 13, March 2016

Human Computer Interaction For Controlling Devices Using Hand Gestures

Rebekah.SM.E(E.S.T)
Holycross Engineering College
rebekahselvam@gmail.com

ABSTRACT:There are lot of home appliances and personal computers around us. However, few of the user interfaces are designed on user-centric approaches. In this project, as an interface focusing on the ease of use, a system to control devices at a remote place by applying the natural behavior of human is developed. In a place where human cannot enter to perform a job, robots are sent and controlled by hand gestures. These robots perform the replica of the human gesture done at the source computer. Research issues include the definition of the association between the PC operations and gestures, the recognition of hand gestures, the adjustment of the error of the gestures, and how to realize the system. The association of the PC (source computer) operations used very often is defined with hand gesture of human. The acceleration value of a gesture is collected by the accelerometer and transmits the value to a source computer by means of wireless communication. On the source computer, control commands of gestures are managed. Through a network these gesture controls are transferred to a destination computer at remote place to which the hardware to be controlled is attached. Here it is experimented with controlling typical applications in a motor by hand gestures for evaluating the system.

I.INTRODUCTION

GESTURES can originate from any bodily motion or state but commonly originate from the face or hand. With rapid improvement in technology, gesture recognition can be seen as a way for computers to begin to understand human body language. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly. This could potentially make conventional input devices such as mouse, keyboard and even touch screens are redundant. Using these hand gestures instead of pointing on a computer screen to act as a cursor it has been extended that to a next level that these hand gestures at one end have been adapted by a robot or a machine at the other end through networking. Thus the robot or machine at the other end will behave as a replica of human gestures done at one end.

II.TRANSMITTER SECTION

Research issues include the definition of the association between the PC operations and gestures, the recognition of hand gestures, the adjustment of the error of the gestures, and how to realize the system. The association of the PC (source computer) operations used very often is defined with hand gesture of human. The acceleration sensor (ADXL335) worn in hands collect the acceleration value of a gesture and transmits the value to a PC through a wireless transceiver. The acceleration sensor which gets the acceleration values of the hand gesture which transmits these acceleration values as analog signals to the microcontroller (ATmega328). The microcontroller now transmits the value to a computer through a FSK RF modulator.

III.RECEIVER SECTION

Now these values are received by a FSK RF demodulator which then feeds the data to the source computer.On the source computer control commands of gestures are managed. Through a network these gesture controls aretransferred to a destination computer at remote place to which the hardware to be controlled is connected.

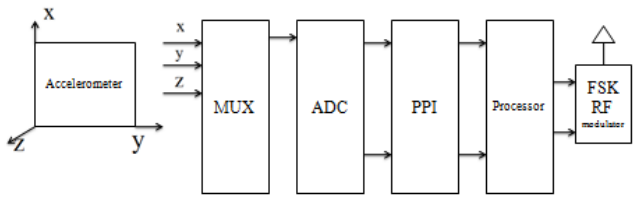

Fig1.Block representation of the transmitter

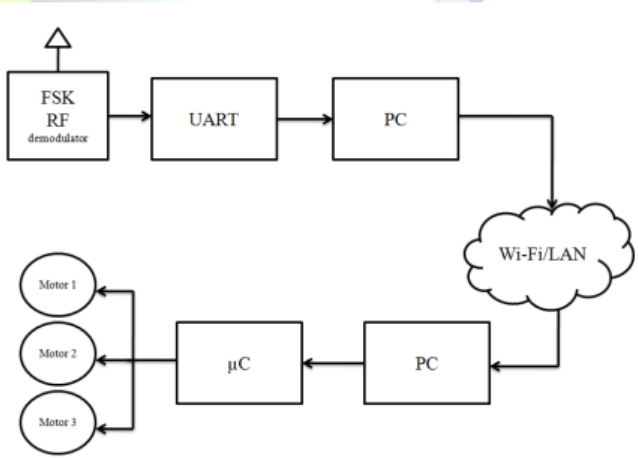

Fig2.Block representation of the receiver

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 13, March 2016

IV.NETWORKING

A network is a group of two or more computer systems linked together.Here a network is used to connect the two computersthe one which is used at the end where gestures are done that collects the gesture values and the other at the remote end where the robot or the machine to be controlled is located.The geometric arrangement of a computer system is called topology. Common topologies include a bus, star, and ring. The protocol defines a common set of rules and signals that computers on the network use to communicate. One of the most popular protocols for LANs is called Ethernet. Another popular LAN protocol for PCs is the IBM token-ring network.

(i).IP ADDRESS

An Internet Protocol address (IP address) is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol for communication. Its role has been characterized as follows: "A name indicates what we seek. An address indicates where it is. A route indicates how to get there."

The designers of the Internet Protocol defined an IP address as a 32-bit number and this system, known as Internet Protocol Version 4 (IPv4), is still in use today. However, because of the growth of the Internet and the predicted depletion of available addresses, a new version of IP (IPv6), using 128 bits for the address, was developed.

(ii).STATIC AND DYNAMIC IP

When a device is assigned a static IP address, it does not change. The device always has the same IP address. Most devices use dynamic IP addresses, which are assigned by the network when they connect. These IP addresses are temporary, and can change over time. Most users do not need static IP addresses. Static IP addresses normally matter more when external devices or websites need to remember your IP address.

(iii).DHCP

Computers use the Dynamic Host Configuration Protocol to request Internet Protocol parameters from a network server, such as an IP address. The protocol operates based on the client–server model. As of 2011, modern networks ranging in size from home networks to large campus networks and regional Internet service provider networks commonly use DHCP. Most residential network routers receive a globally unique IP address within the provider network. Within a local network, DHCP assigns a local IP address to devices connected to the local network.

When a computer or other networked device connects to a network, the DHCP client software sends a broadcast query requesting necessary information. Any DHCP server on the network may service the request. The DHCP server manages a pool of IP addresses and information about client configuration parameters such as default gateway, domain name, the name servers, and time servers. On receiving a request, the server may respond with specific information for each client, as previously configured by an administrator, or with a specific address and any other information valid for the entire network and for the time period for which the allocation (lease) is valid. A client typically queries for this information immediately after booting, and periodically thereafter before the expiration of the information. When a DHCP client refreshes an assignment, it initially requests the same parameter values, but the DHCP server may assign a new address based on the assignment policies set by administrators.

(iv).SOCKET PROGRAMMING

Client/ server describes the relationship between two computer programs in which one program, the client, makes a service request from another program, the server, which fulfills the request. Whenever a client and server want to be connected through internet the client must know the IP address of the server system. Once the client gets a connection with the IP address of the server the server allocates a local port address for data transfer between the client and the server and the client is intimated about the local port. Now the server keeps on listening whether the client has requested for any connection at the assigned port number. When the client request for a connection then the server close all its other ports and accepts the request. Then transfer of data between the client and the server takes place.

V.PROTOCOL & ENCRYPTION

When the acceleration values are collected from the sensor it arrives in a serial manner where the computer cannot distinguish the values of x, y, z axis from the sensor. So a protocol is designed to distinguish the values with a starter and delimiter for each axis.

In cryptography, encryption is the process of encoding messages or information in such a way that only authorized parties can read it. Encryption does not of itself prevent interception, but denies the message content to the interceptor. In an encryption scheme, the intended communication information or message, referred to as plaintext, is encrypted using an encryption algorithm, generating ciphertext that can only be read if decrypted.AES (Advanced Encryption Standard) is a symmetric encryption algorithm. When the gesture values are transmitted through the network inorder to avoid the data being hacked and used by others it has been encrypted during data transfer and being decrypted at the client end. This adds security to the data when it is being transferred over the network.

VI.ATMEGA328 PROCESSOR

It is a high Performance, low Power Atmel AVR 8-Bit microcontroller family with advanced RISC architecture having 131 powerful instructions. Most of these instructions are with single clock cycle execution. The microcontroller has 32 x 8 general purpose working registers with fully static operation up to 20 MIPS throughput at 20 MHz. It has On-chip 2-cycle multiplier and also with high endurance non-volatile memory segments with upto 32kbytes of In-System Self-Programmable flash program memory – The microcontroller has Write/Erase

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 13, March 2016

Cycles: 10,000 Flash/100,000 EEPROM with a data retention capability of 20 years at 85°C and 25 years at 100 °C .Two 8-bit Timer/Counters with separate prescaler and compare mode and one 16-bit Timer/Counter with separate prescaler, compare and capture mode. Real time counter with separate oscillator and six PWM channels with 8-channel 10-bit ADC is also present. Programmable Serial USART with Master/Slave SPI having Byte-oriented 2-wire Serial Interface is available. Programmable watchdog timer with Separate On-chip oscillator and On-chip analog comparator with interrupt and Wake-up on Pin change are also its special features.

VII.ACCELEROMETER (ADXL335)

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.

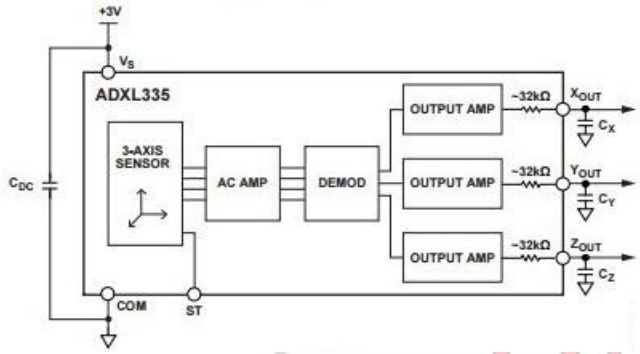

Fig3.Functional block diagram of Accelerometer

VIII.SERVO MOTOR

Servo motors have been around for a long time and are utilized in many applications. Servo motors are used in industrial applications, robotics, in-line manufacturing, pharmaceutics and food services. The servo circuitry is built right inside the motor unit and has a positionable shaft, which usually is fitted with agear. The motor is controlled with an electric signal which determines the amount of movement of the shaft. Servos are controlled by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse, and a repetition rate. A servo motor can usually only turn 90 degrees in either direction for a total of 180 degree movement. The motor's neutral position is defined as the position where the servo has the same amount of potential rotation in the both the clockwise or counter-clockwise direction. The PWM sent to the motor determines position of the shaft, and based on the duration of the pulse sent via the control wire; the rotor will turn to the desired position. The servo motor expects to see a pulse every 20 milliseconds (ms) and the length of the pulse will determine how far the motor turns. For example, a 1.5ms pulse will make the motor turn to the 90-degree position. Shorter than 1.5ms moves it to 0 degrees, and any longer than 1.5ms will turn the servo to 180 degrees.

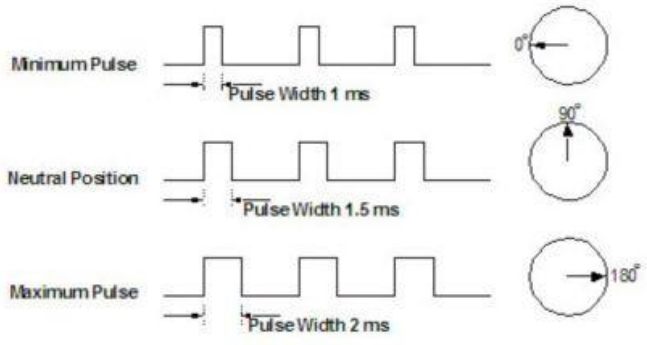

Fig4.Variable pulse width controls servo positions

IX.CONCLUSION

The paper presentedthe hand gestures that controls machines at remote end with a transmitter section which transmits the data of the acceleration sensor based on the hand gestures made and the receiver section at the remote end in which the motor is being controlled done withthe networking part for transfer of data regarding gesture control from source computer to the destination computer at remote end is done by means of socket programming with client and server technology including encryption successfully.

REFERENCE:

[1] Emi Tamaki (2010) 'A Robust and Accurate 3D Hand Posture Estimation Method for Interactive Systems' Graduate School of Interdisciplinary Information Studies The University of Tokyo, Tokyo, Japan

[2] Federico Lorussi, Enzo Pasquale Scilingo, Mario Tesconi, Alessandro Tognetti, and Danilo De Rossi (2005) 'Strain Sensing Fabric for Hand Posture and Gesture Monitoring' IEEE Transactions On Information Technology In Biomedicine, Vol. 9, No. 3

[3] HaithamHasan, S.Abdul Kareem (2012) 'Human Computer Interaction for Vision Based Hand Gesture Recognition : A Survey' International Conference on Advanced Computer Science Applications and Technologies University of Malaya, Kuala Lumpur, Malaysia

[4] Jamini Prasad Burman (2015) 'Novel Design of Low Cost Flex Sensor For Automatic Controlling Of Robotic Car' International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 4, Issue 3

[5] Lei Jing , Yinghui Zhou ,Zixue Cheng, Junbo Wang (2011) 'A Recognition Method for One-stroke Finger Gestures Using a MEMS 3D Accelerometer' IEICE Trans. Fundamentals/Commun./Electron./Inf. & Syst., Vol. E85

[6] Lei Jing, Zixue Cheng, Yinghui Zhou, Junbo Wang, Tongjun Huang (2013) 'Magic Ring: A Self-contained Gesture Input Device on Finger' Conference paper

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 13, March 2016

[7] Shantanu K. Dixit, Nitin S. Shingi (2012) 'Implementation of Flex sensor and Electronic Compass for Hand Gesture Based Wireless Automation of Material Handling Robot' International Journal of Scientific and Research Publications, Volume 2, Issue 12
[8] Stephen A. Mascaro, and H. Harry Asada (2004) 'Measurement of Finger Posture and Three-Axis Fingertip Touch Force Using Fingernail Sensors' IEEE Transactions On Robotics And Automation, Vol. 20, No. 1
[9] Takayuki Iwamoto and Hiroyuki Shinoda(2007) 'Finger Ring Device For Tactile Sensing And Human Machine Interface' Conference Paper
[10] Use'Koji Tsukada and Michiaki Yasumura(2004) 'Ubi finger : Gesture Input Device For Mobile, Keio University Faculty of Environmental Information