Human-Computer Interface with Eye Movement

S.Wilson Prakash, S.Sri Hari, R.M.Santhiya Sree, P.G. Divya

Abstract: This paper focuses on using IR handset to operate the PC's mouse pointer, which distinguishes the client's eyeball creation for Human Machine Interface. Having the ability to perform left, right, up, down and double taps based on different eye squints with significantly high precision, it uses a viable example classification calculation. In view of the actual usage of Eye Contact, the sensor projections are usually used to gage self-look headings in low- minus- calculations. The proposed architecture is a promising human-PC interface for flexible eye following applications due to its lightweight construction and strong precision.

Keywords: "Human-System interaction, Eyemovement detection, Microchip PICkit2, Eye following".

I. INTRODUCTION

Evolution of computer has been in a rapid growth in recent decades. And also the way to communication with these systems has also been in a great advancement. These development has helped many to achieve great things which humans dreamt of. Beginning from human-PC interaction, systems for persons with and without incapacity to address behavioral, psychological, and ophthalmological problems in humans and functional implementations, for example, interfaces for wearable PCs, has been a crucial advancement because of its potential in a range of applications. Eye tracking plays a major role in improving the usability of the system. In literature, it has been proposed that an array of eye-following structures are described based on their physical configuration or operating style. In terms of physical configuration, they are built into head-mounted structures or remote frames. Specific instructions may be attributable to being wearable or non-wearable, and to being based on infrarot or presentation. When considering a long established way(Classic way) of human system interaction, the user wastes time in some physical movement which is considerably reduced while using eye tracking method. The user also feel a natural way of interaction with the system.

This system is designed not only for the disabled persons to use systems but it is also designed to improve the performance and efficiency of any normal user.

Eye Contact is one of the light-reflective eyes following systems that is implemented by positioning IR LEDs and IR sensors across a frame of eyeglasses. In this program it consists of five important segments [1]IR Transceiver, which transmits IR vitality and looks for mirrored IR vitality to detect any impediments in front of the sensor screen. [2]PIC Microcontroller, The PIC16FXX structure evolved further and produced highlights when compared with its previous structure. [3] RS-232 represents Recommend Standard number 232 and C is the most recent update of the standard. In this proposed system a software application is used to track the eye movement in a very low cost. This system removes all the complicated equipment and introduces light weighted components which reduces the overall cost and increases overall comfort in usage..

II. RELATED WORKS

The related work that is based on the issue indented by this project is presented in this segment. Arslan Qamar Malik, and JehanzebAhmad[1], "Retina Based Mouse Control(RBMC)". World Academy of Science, Engineering and Technology, August 2007.This Work involves a system where EOG is used to detect the eye movement. In this technique a pair of electrodes are placed around your eyes and then the movement is identified. The drawback of the system is that the user sometimes feels some discomfort when electrodes are places around their eyes.We overcome this issue by placing all the gadgets on the frame of the glass. So that the user does not feel any discomfort.

In paper [2], [3], It specifies that the eye movement is identified using placing electrodes about 01.cm above and 0.2 cm below the eyelids. This results in some disturbances and the user cannot use this for longtime as the electrodes placed above and below their eyelids uses some chemical glues to stick these electrodes towards the skin. The user also experiences some delay as the data from the electrodes has to be processed before sending it to appropriate system or software, where later these processed data is used for cursor pointing. This is the downtime of this proposed work.

In paper [5], [6], [7],It proposes that the eye movement is predicted using electro-encephalogram , where multiple small metal disks are attached towards your scalp. Using this system for longtime results in headache and lot of wires are connected to those small metal disks which makes it more complex in setting up the infrastructure before use. Prior knowledge of the setup is needed and this system cant be used for aged people as it does not suits them. The input for this system is provide in serial format which increases dependency.

Retrieval Number: G5726059720/2020©BEIESP
DOI: 10.35940/ijitee.G5726.059720
Journal Website: www.ijitee.org

920

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

III. PROPOSED SYSTEM

The eye movement will be detected by the pic16F877A microcontroller's array of IR sensors that have been mounted in the glass frame with Anti-reflective coating and UV-blocking Treatedglasses so the user doesn't feel any discomfort while using computer. The goggles used will absorb light reflectance from human eye hence eye movement is detected. These outputs from the IR sensors will be decoded and supplied as the data to the microcontroller. Then the data will be processed in the microcontroller and then passed on to the RS-232, which is a dual transmitter and receiver telecommunication integrated circuit with the ability to convert the signal to TTL. The received output is provided to the PS/2 mouse which is directly connected to the host computer by the microcontroller. As a consequence, the show will have a corresponding operation. When human eye is moved and focused on a particular part of the screen due to the light reflectance the average spot focused on the screen can be found and the mouse pointer can be moved appropriately. The average blinking speed of any human being will range from 300 to 400 millisecond. So when every Human eye is kept closed for 1 second the system considers it as an right mouse click and for every two consecutive blinks the system considers it as an double click. Blinking regularly has so many good effects on the human eye. It cleans our eye and even helps to achieve a clear vision.
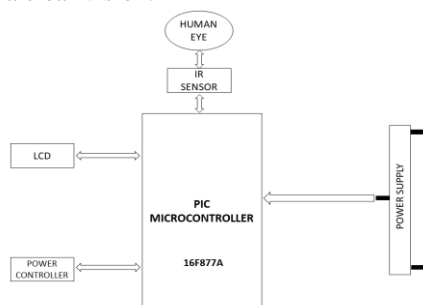

Fig 1 Configuration Using PIC Microcontroller

A. Eye Touch Goggles

Fig 2 Eye Touch Googles

Eye Touch goggles are an eyeglass frame without lenses. The Eye Touch goggles have been designed to absorb light reflectance effectively from various parts of the human eye. In our previous experimental phases, two infrared light-sensitive goggle prototypes have been produced. To monitor the iris movements, the goggles are fitted with 12 infrared LEDs that illuminate both eyes and minimize the potential of ambient light to degrade device efficiency, and with 12 infrared-sensitive phototransistors generating voltage values concerning the amount of light received in the infrared spectrum, six LEDs and sensors are included in both the left and right frame parts. Consider that the number of sensors (phototransistors) is a parameter of the design. There is an important relationship between the number of sensors and the precision of the device, as will be seen in Sec. VI. Also, the sensors are surrounded by opaque cylindrical plastic covers which ultimately cause the sensors to depict light reflection from different portions of the eye. As regards the number of LEDs, it can vary from the number of sensors. Since the main aim of providing LEDs on the goggles is to illuminate the vicinity of the eye homogeneously at a suitable degree of light, some of these are positioned to avoid the variances of illumination. In Appendix A, we describe useful information about the eye safety issues of infrared light emitted by goggles. Light-to-voltage optical sensors are the IR sensitive sensors used on goggle. With a sharp peak at 940 nm, these sensors respond to the light in a wavelength range of 800–1100 nm. Because the IR LEDs used to emit light at thewavelengthof around 940 nm, the pairs fit well.

B. Zigbee

Fig 3 Zigbee

ZigBee Module is a basic organizing minimum effort, low power, remote job. The simplicity makes the invention usually to be sent in remote control and observation applications, the usage of low force makes for longer life with smaller batteries, and the structure of the research gives high unwavering efficiency and wider range. Temco has built up a remote information communication module implanted receiving apparatus that supports regular ZigBee remote innovation. This module is compatible with the remote information communication module used by Industry Standard. This module can achieve straightforward transmission of information between various gadgets, and can frame an organization of MESH. This gadget has the attributes of limited volume, utilization of ultra-low force and minimal effort. It can very well be either as a free transmission of information or built easily into an assortment of things to create a short-range remote transmission of information arrangement. This gadget arrangement has the attributes of sparing electrical power, reliability, minimal effort, enormous limit and stability, and it can be used widely in various programmed control fields. The objective application spaces are focused on industry, home computerization, telemetry and remote control, vehicle robotization, horticulture mechanization, clinical consideration, etc, for example,

lighting control mechanization, remote information procurement and observing sensor, oil field, electric force, mining and coordinations the board and so forth.

C. Ir Transceiver- Ir Sensor (Ir Emitter And Ir Receiver)
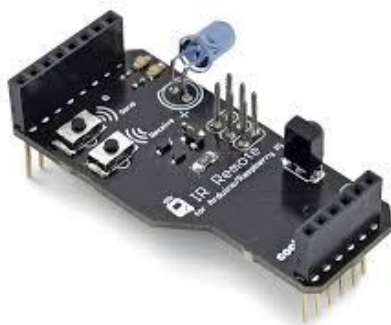

Fig 4 IR Transceiver

The basic IR sensor theory is based on both an IR emitter and an IR receiver. Once power is supplied to it, the IR emitter can emit continuous infrared. On the other hand, the IR receiver will be attached, and a voltage divider will perform the job. IR receiver can be pictured as a transistor with its current base determined by the strength of the received IR light. The lower IR light intensity induces greater resistance between transistor collector-emitter terminals, which restricts the current from collector to emitter. The resistance change would further change the voltage at the voltage divider output. In other words, the higher the strength of the IR light reaching the IR receiver, the lower the IR receiver resistance and thus the voltage divider output voltage would decrease. The IR emitter and IR receiver will normally be placed side by side, projecting to a reflective surface.

The further gap between the emitter and the receiver reduces the amount of infrared light that reaches the receiver if the gap between the sensor and the reflective surface is set. Because the voltage output from the voltage divider differs with the strength of IR light and microcontroller is noted in this project, a comparator (LM324) is used to demonstrate the changes.

D. Pic 16f877a Microcontroller:

Fig 5 PIC 16F877A Microcontroller

The PIC microcontroller PIC16f877a is one of the industry's most popular microcontrollers. This controller is very easy to use, this controller is even simpler to encode or program. One of the key benefits is that as it uses FLASH memory technology, it can be write-erase as many times as possible. It has a total of 40 pins, and input and output are 33 pins. In digital electronic circuits, PIC16F877A also has many applications.

E. Lcd Interfacing

Fig 6 LCD Interface

The LCD (Liquid Crystal Display) screen is an electronic display element. A 16x2 is a widely used LCD. Such modules are selected over 7 segments and other LEDs in multi-section. Each character in this LCD is represented in a matrix of 5x7 pixels. This LCD has two different registers, named Command and Data. The command register stores instructions provided to the LCD for the order.PIC microcontroller PIC16f877a is one of the industry's most popular microcontrollers. This controller is very easy to use, this controller is even simpler to encode or program. One of the key benefits is that as it uses FLASH memory technology, it can be write-erase as many times as possible. It has a total of 40 pins, and input and output are 33 pins. PIC16F877A is used in many pic microcontroller ventures. In digital electronic circuits, PIC16F877A also has many applications.
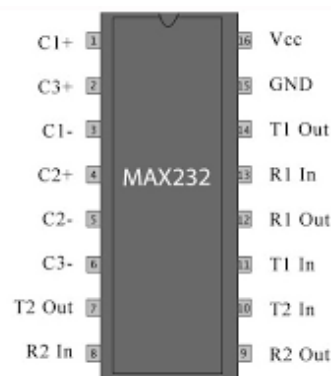
F. Max-232

Fig 7 MAX - 232

In the telecommunications industry, RS-232, Suggested Standard 232is a standard introduced in 1960 for serial data communication. The basic RS-232 had been commonly used in serial computer ports. TIA-232-F Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Using Serial Binary Data Interchange, introduced in 1997, is the latest version of the standard. Once a popular personal computer feature used to link modems, data storage, printers, mice, continuous power supplies, and other peripheral devices was an RS-232 serial port.RS-232 has lower transmission speed, short maximum cable length, wide voltage shift, large standard connectors, no multipoint capacity and minimal multidrop capacity as compared to later interfaces such as RS-422, RS-485, and Ethernet. USB has replaced RS-232 from most of its peripheral control functions on modern personal computers.
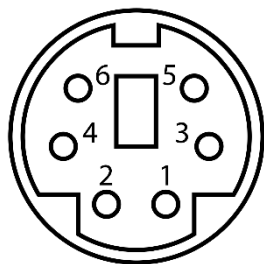
G. Ps/2 Mouse

Fig 8 PS/2 Mouse

Any regular PS/2 mouse system sends their movement and button information to the host as a packet of three bytes. Information on movement of the mouse is sent as a relative change of position, and is a signed binary number complement of nine bit two. A regular PS/2 mouse also has a left, middle, and right-hand button. Initially, after the host has decided if the mouse is a normal PS/2 mouse or an improved PS/2 mouse, the host interacts with the mouse to set it.

IV. SOFTWARE MODULE

We use the following applications in this section of the Program:

- Development device : PC with windows
- Target Device   : PIC16F877A
- IDE   : MPLAB
- C Variant   : Embedded C
- Compiler   : Microchip

  PICkit 2

- PC Application   :DotNet using

  MS Visual Studio

H. Mp Lab

MPLAB IDE is a software system used to build Microchip microcontroller applications and digital signal controllers. This development tool is called an Integrated Development Environment, or IDE, because it offers a single integrated "environment" for embedded microcontrollers to create code. This chapter describes the evolution of an embedded device and discusses briefly how MPLAB X IDE from Microchip is used in the process. MPLAB Microchip compilers include fully integrated, optimized code for PIC MCUs and dsPIC DSCs, along with micro Engineering Labs, CCS and SDCC compilers; They are invoked for instant testing and debugging by the MPLAB X IDE project manager to compile code which is immediately loaded into the target debugger.

I. Microchip Pickit2

PICkit is a family of programmers made by Microchip Technology for the PIC microcontrollers. They are used for programming and debugging microcontrollers, and for the EEPROM software. Some models may feature serial communication (UART) and logic analyser tool. IDE is a software system used to build Microchip microcontroller applications and digital signal controllers. This development tool is called an Integrated Development Environment, or IDE,

because it offers a single integrated "environment" for embedded microcontrollers to create code. This chapter describes the evolution of an embedded device and discusses briefly how MPLAB X IDE from Microchip is used in the process. MPLAB Microchip compilers include fully integrated, optimized code for PIC MCUs and dsPIC DSCs, along with micro Engineering Labs, CCS and SDCC compilers; They are invoked for instant testing and debugging by the MPLAB X IDE project manager to compile code which is immediately loaded into the target debugger.

J. .Net Ms Visual Studio

.NET System (pronounced dot net) is a Microsoft-developed software system that runs primarily on Windows. Interoperability of languages is achieved using a wide range of software library called as Framework Class Library. The programs written for. NET System run in a software environment (as opposed to a hardware environment) called Common Language Runtime (CLR), a virtual application machine that provides protection, memory management and exceptional handling services. (Computer code written using. NET Framework is known as 'controlled code') FCL and CLR together form the. NET Framework. User interface, data access, accessibility to the database, cryptography, creation of web applications, computational algorithms, and network communications is achievable through FCL. Software is developed by programmers combining their source code with .NET Framework and other libraries. Most new applications developed for the Windows platform are designed to use the system. Microsoft is now increasingly developing an interactive production platform for Visual Studio. NET applications.

V. RESULT

This results in reduction of human effort and increases the human - system interaction in an more fun way. For working professionals it can even reduce their stress and thus improves efficiency. Even sometimes hand movements becomes impossible for some people so this system can help them achieve their task without any problem and often blinking also relaxes the human eye and helps to achieve focus. This system also helps user in saving their time in moving the mouse. This proposed system can be beneficial also for physically challenged people who find using mouse a disadvantage. The selection of particular Application or part of the screen is tested and the result was obtained as expected.
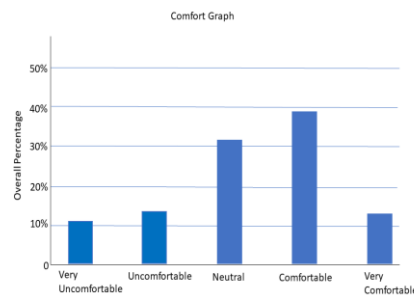
K. Comfort Graph:

Fig 9 Comfort Graph

Retrieval Number: G5726059720/2020©BEIESP
DOI: 10.35940/ijitee.G5726.059720
Journal Website: www.ijitee.org

923

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

While using other methods discomfort is more. This graph is made with the feedback obtained from various people while using this system. So this graph shows that eye tracking system gives more comfort than any other system which is previously used.
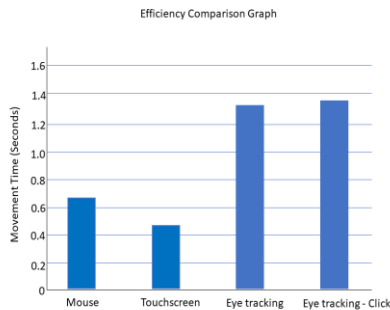
L. Comparison Graph:

Fig 10 Comparison Graph

This graph make comparisons by visually displaying data. This talks about the efficiency and how much time it takes to respond while using different systems . This graph justifies that while using eye tracking system we get more efficiency and lot of time is saved

VI.   FUTURE ENCHANCEMENT

Future incorporation of the Eye Contact into a wearable device that has an HMD is expected rather than using the method with a desktop computer. Eye Touch can also be a solution for innovative and effective user interfaces for different applications, such as vehicle and handicapped wheelchair control. Eye Tracking Device User Interface primarily involves creating an eye tracking system using IR sensors. It also combines complex and accurate machine tuning. This app can be used in many video games and virtual reality systems. Eye blinking is an important safety mechanism that protects the eye from the harmful exposure to atmosphere. And it's useful eye twitch detector. Also for the diagnosis of exhaustion the eye twitch is known to be an effective measure for multiple and specific human activity activities.

VII.   CONCLUSION

The In this paper, we proposed and implemented the Eye Contact framework for gaze estimation and blink motion detection for click behavior, which is based on compact and low cost components in a wearable shape. The absence of traditional video camera and the related high computational costs can be seen as an benefit of the proposed system. In addition, this paper provided insight and possible results for the detection of gaze direction and eye winks from a novel infrared method. The experimental findings showed that in some situations where hand operation can be difficult, Eye Touch represents a promising alternative user interface. In conclusion, Eye Contact is being suggested to become an effective solution for mobile systems among a few approaches to eye tracking. A dedicated software has been developed for the proposed hardware in this particular work, and tested by several subjects. The proposed device is argued to be conveniently mounted on an eye-glass frame. Consequently, it was concluded that the concept of using an IR sensor for eye

position sensing is a successful attempt to accurately detect the direction of the eye gaze. The proposed system not only helps the disabled to use the system but also improves the performance of any normal user.

REFERENCES

1. Arslan Qamar Malik, and Jehanzeb Ahmad, "Retina Based Mouse Control (RBMC)". World Academy of Science, Engineering and Technology, August 2007
2. Rafael Barea, Luciano Boquete, Manuel Mazo, Member, IEEE, and Elena López, "System for Assisted Mobility Using Eye Movements Based on Electrooculography", IEEE Transactions on Neural Systems and Rehabilitation Engineering, Vol.10, No.4, December 2002,
3. Ali Bulent, Usakli and Serkan Gurkan, "Design of a Novel Efficient Human-Computer Interface: An Electro-oculogram Based Virtual Keyboard", IEEE Transactions on Instrumentation and Measurement, Vol.59, No.8, August 2010.
4. Ali Bulent, Usakli and Serkan Gurkan, "Design of a Novel Efficient Human-Computer Interface: An Electro-oculogram Based Virtual Keyboard", IEEE Transactions on Instrumentation and Measurement, Vol.59, No.8, August 2010.
5. Shubhodeep Roy Choudhury, S.Venkataramanan, Harshal B. Nemade, J.S. Sahambi"Design and Development of a Novel EOG Biopotential Amplifier"IJEM,Vol.7,No.1.2005
6. P. He1 .G. Wilson,C. Russell " Removal of ocular artifacts from electro-encephalogram by adaptive filtering", Med. Biol. Eng. Comput., 2004, 42, 407–412
7. Yathunanthan, S. Chandrasena, L.U.R. Umakanthan, A. Vasuki, and V. Munasinghe, S.R. "Controlling a Wheelchair by Use of EOG Signal". Information and Automation for Sustainability, 2008.ICIAFS 2008. 4th International Conference on. 2008 .
8. Xiaoxiang Zheng Xin Li Jun Liu Weidong Chen and YaoyaoHao "A Portable Wireless eye movement controlled human computer interface for the disabled," in Proc.ICME Int. Conf. Complex Biomedical Eng., Tempe,AZ,,USA,Apr. 2009,pp.1-5.

AUTHORS PROFILE

Mr. S. Wilson Prakash born on 14th May 1991 at Srivilliputhur, Virudhunagar district, completed his schooling in 2008. He completed B.E in Computer Science and Engineering in 2012 from Ranganathan Engineering College (affiliated to Anna University, Chennai), Coimbatore and M.Tech in Network Engineering in 2015 from Kalasalingam Academy of Research and Education, Krishnankoil and He is currently working as an Assistant Professor in Department of Information Technology at Sri Shakthi Institute of Engineering and Technology, Coimbatore. His research interests lie in networking, particularly in software-defined networking and network security.

Mr. S. Wilson Prakash is currently specializing in Software Defined Networking with a focus on Traffic Engineering.

Sri Hari S Student, Department of Information Technology, Sri Shakthi Institute of Engineering and Technology, Coimbatore, India.

Santhiya Sree R.M Student, Department of Information Technology, Sri Shakthi Institute of Engineering and Technology, Coimbatore, India.

Divya P.G Student, Department of Information Technology, Sri Shakthi Institute of Engineering and Technology, Coimbatore, India

Retrieval Number: G5726059720/2020©BEIESP
DOI: 10.35940/ijitee.G5726.059720
Journal Website: www.ijitee.org

924

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication