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Recognizing Mouse events through Head/Hand movement

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***Abstract*—** Humans communicate with one another not solely through their vocal talents however additionally through the gestures that they create. A gesture will go an excellent approach in golf shot through our purpose and creating the opposite person perceive U.S. and computers are not any totally different during this and may be controlled and created to retort handy and head gestures employing a gesture recognition system. during this project a gesture recognition models is meant that acknowledge hand or head gestures that's down ,up, left, right and cross, supported the signal from three-axis measuring device. Mouse management supported Gesture entomb action takes advantage of continuity and dynamics of the user's movement of the hand to regulate the mouse movement. Once there's any movement of the body there's generation of signal however common supply is face or hand. This project presents the maneuver of mouse pointer and performs numerous operations like left click, right click, double click and gap and shutting a folder by blinking your eyes. Recognizing gestures may be advanced task that involves several aspects like motion modelling, motion analysis and pattern recognition. Therefore for recognizing the gestures numerous mouse events are performed.

***Keywords*—** Gesture Recognition System (GRS), Three-axis accelerometer, Head Gesture.

I. INTRODUCTION

Over the past decade, computer technology has grown tremendously and has become a necessary part of daily living. These days, the importance of computers has greatly increased. It can be used for many purposes in general or in places of work. Human Computer Interaction (HCI)'s primary computer accessory is mouse. The computer mouse has a lot of research on alternative methods. The computer mouse for HCI has a lot of research on alternative methods. The most natural and intuitive technique for HCI is to use hand gestures to replace the computer mouse. Hand gestures are spontaneous and powerful communication temper for HCI. Several input devices are available for interaction with computer system such as joystick, keyboard, and mouse and touch screen. Here mouse acts as a mainstream device in our project. To recognize manual gestures appropriate devices should be intact to the hardware in order to make the device more functional and capable. Efficient hand tracking is the key to success in any gesture recognition due to vision - based method challenges such as varying lighting conditions, complex background and skin colour detection; human skin colour variation requires a robust frame to interface these components into meaningful plot.

The logic behind the development of a system of gesture recognition is to create a system that can identify specific human gestures and use them in correspondence with a certain gesture to perform certain actions. And to do that, we'll build a GRS to use human gestures to control a mouse. But first of all, we should have to understand what gesture is exactly to understand this technology.

Gestures: Gesture is defined as an expressive, meaningful movement of the body expressing an idea, opinion, and emotion, etc. Human interaction with the computer where the computer recognizes human gestures, usually hand motions. In our society, people with physical disabilities and mentally challenged are an important part. In their inclusion in our Society, they have not yet received the same importance as others. Therefore, to achieve their inclusion in the new advanced technologies, it is necessary to develop easily accessible devices. This paper presents a project whose main goal is to bring all people with disabilities closer to new informative technologies. The system will therefore use an accelerometer in this work and will detect the users ' head or hand tilt to direct mouse movement on the monitor. The keyboard function is implemented such that it allows the user to scroll through letters with head tilt and with eye blink sensor as the selection mechanism**.**

II. RELATED WORK

Gesture recognition has become awfully influencing term. There are several gesture recognition techniques that are developed for recognizing numerous hand gestures. One in all them was wire technology within which the user have to be compelled to hold up themselves with the assistance of wire so as to attach or interface with the pc system. This technology had its own execs and cons. presently some

advanced techniques are introduced like image-based techniques that need process of image options like texture etc. however the matter with this method was that the result varied consistent with totally different skin tones and textures from one person to a different.

The unremarkably used strategies of capturing input from the user that has been discovered square measure knowledge gloves, hand belts and cameras. The approach of gesture recognition [1] and [2] uses input extraction through knowledge gloves. A hand belt with gyro, measuring instrument and a Bluetooth was deployed to scan hand movements square measure used [3] [4]. The authors [5] used a clever Senz3D Camera to capture each color and depth info and [6] used a Bumblebee2 stereo camera. A monocular camera was employed by [7]. Value economical models like [8], have enforced their systems mistreatment easy internet cameras. The strategies build use of a Kinect depth RGB camera that was accustomed capture color stream. As depth cameras give extra depth info for every element (depth pictures) at frame rate at the side of the standard images .Most technologies enable a hand region to be extracted robustly by utilizing the color area. These don't absolutely solve the background drawback. This background drawback was resolved by employing a black and white pattern of increased reality markers (monochrome glove). Where-as constitutional webcams don't provide depth info, they need less computing prices. Hence in our model, we tend to use a digital camera out there within the portable computer while not the employment of any extra cameras or hand markers like gloves. an outsized variety of strategies are used for pre-processing the image which incorporates algorithms and techniques for noise removal, edge detection, smoothening followed by totally different segmentation techniques for boundary extraction i.e. separating the foreground from the background.

Next is that the strong hand detection it's the foremost tough downside in building a hand gesture-based interaction system. There are many clues that may be used: look, shape, colour, depth, and also the context. Then comes noise removal, therefore to get an ideal recognition it's necessary to get rid of these unwanted noise. To induce a higher estimate of the hand, we want to delete the noisy pixels from the image. To use hand gesture, extraction of the hand region data from image frame is that the initiative. There are several strategies to extract hand region victimisation vision based mostly technique like victimisation depth camera during which object nearer to camera are often extracted that's hand region are often extracted. coloring detection technique is an added technique used for recognition of hand gesture. Whereas victimisation this system, removing face region and alternative background object having coloring is difficult task.

Hence in this project we have constructed an interface system that would allow a similarly paralyzed user to interact with a computer with almost full functional capability. In this project we will be using accelerometer to control the movement of head or hand through which the user move his mouse, and also we use an IR sensor that will allow the user to open the folder through his eye blink.

III. METHODOLOGY

The system operates as a mouse initially, but the user has the ability to type using an onscreen virtual keyboard allowing the entry of text. To determine head motion, we built an accelerometer - based tilt detector so it could be used by a quadriplegic individual.

Working Concept:

- In order to direct mouse movement on the monitor, the system uses 3-axis accelerometer to detect the user's head tilt in X - Y axis.
- By blinking the user's eye through an eye blink sensor, the mouse click is activated.
- Using onscreen virtual keyboard with head tilt, the keyboard function is implemented allowing the user to select letters.

Block Diagram

Two things are done by the transmitter part. To get the input from the accelerometer and the object sensor, it runs analog to the digital converter and then transmits the data to the receiver.

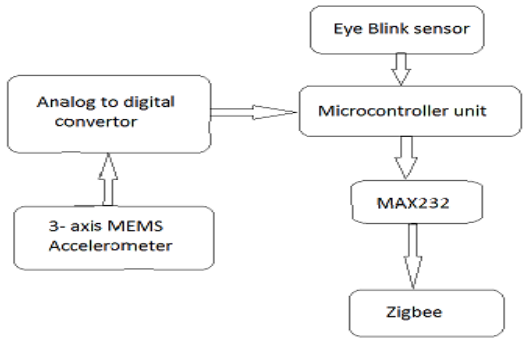


Fig. 1: System Architecture

Accelerometer:

The output voltage for the accelerometer ranges from 0V to 3V, which after analog to digital conversion maps to 0 to 153. When the MCU starts, it takes from the accelerometers 100 readings first and takes the sample data average. These averages are used as the initial head position reference point. If the user's head is tilted up / down or left / right, the accelerometer reading is subtracted from the reference point value. The differences determined the head tilt level. To

eliminate the effect of noise and provide several states, we decided to have three discrete detection levels of head movement.
Move Mouse= -uX*((uX*uX)/3000), -uY*((uY*uY)/1000)

Eye Blink Sensor:
This sensor for the Eye Blink is based on capacitance. The Printed Circuit Board soldered an infrared LED & phototransistor. The infrared reflected back to the phototransistor when the eye closes for a blink. When the eye opens, the eye absorbs the infrared light. The energy is still absorbed by the eye, even though infrared is invisible to the eye. This Eye Blink sensor is capacitance based.

The IR transmitter is used to transmit our eye's infrared rays. It uses the IR receiver to receive the eye's reflected infrared rays. Whenever the signal is high, the transmitter transmits the transmitted signal to the IR transmitter. Connects the IR receiver to the comparator. The comparator is constructed with the LM 358 operational amplifier and its output is converted into digital and is given to the 89c51 micro controller.

Receiver side:
The receiver code does three things ; it receives the data through wired from the P89V51RD2FN microcontroller, then converts the data through serial communication software to meaningful control logic and sends the control signal to the computer using RS-232 Serial port.

ADC Operation:
By successive approximation, the ADC converts an analog input voltage into a 10-bit digital value. The minimum value is GND and the maximum value representing the voltage is 0 - 1023, i.e. 5V.ADC digital values, where 0 is 0v and 1023 is 5V.

By writing a logical one to the ADC start conversion bit, as ADC Read), (a single conversion is started. This bit remains high as long as the conversion is ongoing and when the conversion is complete, the hardware will clear it. If different data channels are selected while the conversion is still in progress, then the ADC will finish the current conversion by commanding as Usart Write) (before changing the channel and sending it through an EUSART pin.

Mouse Logic:
When it is switched on, the X and Y moments they are directly mapped to the moment of mouse. The more your head tilts, the faster the mouse moves and then by blinking the eye the clicking is activated.

Serial Data Parameters and Packet Format
Data packet is three computer memory unit packet. It's send to the pc each time once mouse state changes (mouse moves or keys are pressed/released). The bit marked with X is zero if the mouse received with seven knowledge bits and a couple of stops bits format. It's doable to use the eight knowledge bits and one stop bit format by receiving. During this case X gets worth one. The safest factor to urge everything operating is to use seven knowledge bits and one stop bit whereas receiving mouse data. The computer memory unit marked with one is for causation 1st, then the others. The bit D6 within the 1st computer memory unit it's used for coordinating the computer code to mouse packets if it goes out of sync.
LB it's the state of the left button (1 means that ironed down).
RB it's the state of the proper button (1 means that ironed down).
X7-X0moments in X direction since last packet (signed byte).
Y7-Y0 moments in Y direction since last packet (signed byte).

IV. RESULTS AND DISCUSSION

The results obtained for different mouse events such as cursor movement, left - click, right - click, and double - click experiments help the user control the mouse. Our final design head unit is tapped to a cap. All the functionalities are performed and demonstrated by the entire design. For people with disabilities, the controlled mouse and keyboard project meets a comprehensive, user-friendly, practical input interface. Generally speaking, the device makes it easy to browse websites, listen to music, watch videos, and perform other common computer operations.

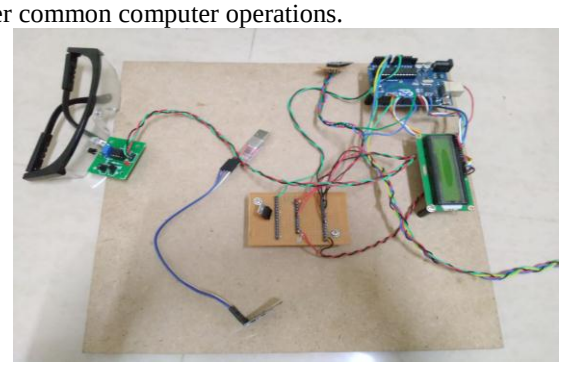


Fig. 2: Device used for mouse events

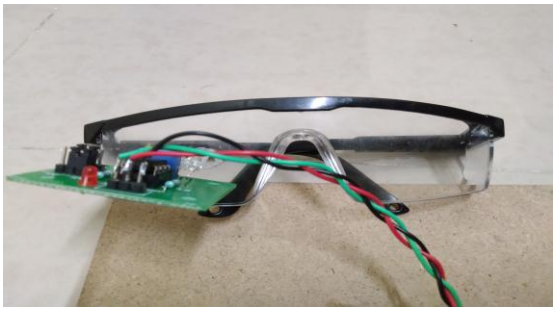
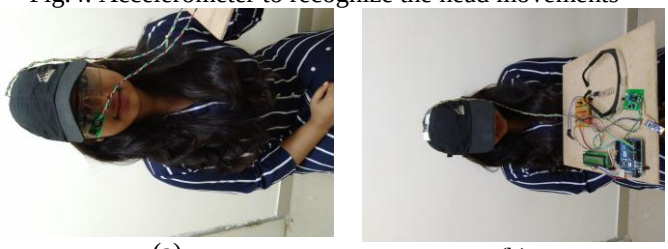


Fig. 3: Eye blink sensor

Fig.4: Accelerometer to recognize the head movements



(a) (b)

Fig. 5: a) Gesture recognition using eye blink sensor b) Gesture recognition using accelerometer

V. CONCLUSION AND FUTURE SCOPE

By careful selection, we ensured safety in light emission on the photodiode when creating head-controlled mouse & keyboard. The user fatigue was the secondary safety hazard we considered. When switched on, the computer control system recognizes the original position as the reference origin, so the mouse stops when the user returns the head position to the reference origin. Thus it provides the user with a resting position when watching films or reading articles online. The sensitivity of the devices is calibrated when tilting the head to ease the pressure on the neck. Our system has a high degree of usability. The compact and comprehensive design allows the public to use it. The functionality of the mouse is quite intuitive, and with a few instructions and practice it can adapt the keyboard functionality.

FUTURE SCOPE

There are some of the other advancements or up gradation can be done to our project for better performance. Some of them are listed below.

1. The head tilt sensing can be made more sensitive compared to current sensitivity which is 800mV/g. This can be upgraded to very high head tilt sensitivity by using a 1200mV/g accelerometer sensor.
1) A complete computer system can be fixed to a wheelchair with our hardware device, so that disabled persons can control the computer without any problems.
2) The serial communication driver can be hard coded by developing a plug –n-play driver in windows or on to microcontroller, so that there will be no need of activation/enabling it.
3) The circuit board can be still made compact by using advanced PCB tools so that it will be comfortable for the users.
4) Used as a joystick for gaming applications.

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