ANALYSIS ON THE APPLIANCE OF EYE WHEREABOUTS FOR PHYSICALLY DISABLED USING LABVIEW

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Abstract:- Almost all the disabled persons are dissuaded from using personal computers due to their powerlessness to make use of a hand-controlled mouse. In this case, if directional discrimination of a mouse pointer are often achieved, these people would be precocious to require on the functions of a mouse while not using hands.The plan of this proposed work is to introduce the mouse cursor control system using Electrooculogram (EOG) signals. We acquire the physiological signals because of eye movements which will be used as a pointer to indicate the directional discrimination and also the signal is analyzed with LabVIEW information acquisition software

Keywords: Electrooculogram, Human Computer Interaction (HCI), LabVIEW.

I. INTRODUCTION

Many diseases and different injuries can lead to a lower level of patient's mobility. As an example, large brain strokes, dystrophy, multiple sclerosis, and injuries to spinal cord can be a reason for high degradation of person's mobility. Though they are of a different origin, they all can cause almost total immobility of the affected person. This condition incapacitates those persons to be able to use common applications and devices in everyday life within the modern information society.

The issue between human-PC cooperation can be seen as two amazing data processors (human and PC) endeavoring to speak with one another by means of a restricted transmission capacity, exceptionally compelled interface. Recent technology has been stronger in the computer-to-user direction than user-to-computer. Utilizing eye developments as a client to-PC correspondence medium can help review this irregularity. A UI dependent on eye development information sources has the potential for quicker and more easy association than current interfaces, since individuals can move their eyes amazingly quickly and more effortless interaction than current interfaces, because people can move their eyes extremely rapidly and with little mindful effort. Eye tracking is a technology in which a camera or imaging system visually tracks some feature of the eye and a computer then determines where the desired user is looking through the use of cameras [4]. prevailing

methods for eye discovery and following, just as look examination that don't depend on infrared lighting normally rely upon high-goals pictures of eyes, frequently acquired by container/tilt/zoom cameras. These methodologies require high-goals pictures of the eyes for appearance or highlight based strategies that situate, for instance, eye corners, eyelids, or forms of the iris [2]. There are several literature studies of the human-computer interface based on EOG. Mobile robot is operated by the use of horizontal and vertical eye movements and two or three blinking signals. A dynamic threshold algorithm is established because the EOG signals are slightly different for each subject [1]. The issues with existing methods are with the use of a web camera, the price becomes very high and the clarity of the picture, we prerequisite high pixel camera. The image processing techniques are preprocessing, filtering, equalization and edge detection. The pattern of BTE and Region of Interest (ROI) is tracked in face tracking with matching model and histogram. Then the Sum of Squared Differences (SSD) between a frame that has the feature's template and the current frame is calculated. Certain drawbacks in these systems are to be carefully analyzed where the above methods cannot be deployed to people of higher disability because they require fine and accurate control which is most of the time not possible.

Patients littered with paralysis have restricted or no practicality below their neck. they're bolted in their own bodies with virtually no communication with the surface world. In order to impart functionality and/or means of communication to such patients, attempts are being made to optimally utilize all the available resources available with the patient such as eye movement, or even brain activity.

Here, we have obtained the EOG (Electr-Oculography) signals from a subject for different eye movements (up, down, left, right) and then designed a model to identify these distinct movements. After this, these signals were used for control of a computer mouse

Our proposed paper is arranged as follows: Section 2 describes the system concept, Section 3 describe proposed
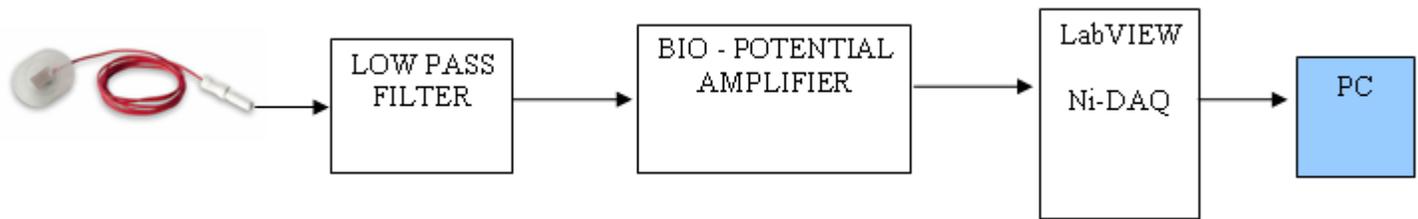
Fig.1 Block diagram for our proposed work

methodology for signal acquisition & then Section 4 later provides the results obtained using our algorithm .Final Section provides conclusion and future work.

II. SYSTEM CONCEPT

Our proposed work is based on a physical link between disabled patients and computer using LabVIEW as a tool to acquire and process the biosignals.

III. METHODOLOGY

The first step of exploit signals starts with positioning of electrodes followed by filtering and amplifying units' severally. Then the signals are processed into the LabVIEW board to the PC as shown in the above block diagram.
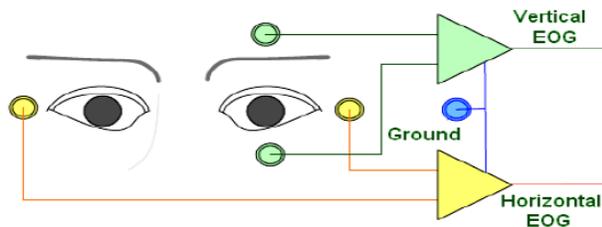
ELECTRODE PLACEMENT

Fig.2 Placement of Electrodes

The placement of electrodes is important for acquiring a good signal form the eyes. The overall placement of the electrodes. For the detection of horizontal discrimination, electrode is placed to the left of the left eye and one to the right of the right eye. It is important to keep the electrodes equidistant from the center of the face for the EOG to be properly centered. In a similar fashion, an electrode is place above the eyebrow and below the eye for both the left and right eyes. These four electrodes are used for vertical detection. Although it is possible to detect vertical motion with just two electrodes, greater sensitivity values

are achieved using four electrodes, thus providing for more accurate detection due to the greater dipole induced. In addition, so as to manage the click of a mouse pointer, 2 electrodes were used, one on all sides of the jaw, as input for the electromyogram. The clenching of the jaw is best detected at the ends of the jaw within the cheek space.

ELECTRODE SELECTION
The eye maintains a voltage of zero.4 ~ 1.0 mV with relevancy membrane (due to the upper rate at the membrane compared to the cornea). This corneoretinal potential is roughly aligned with the optic axis. Hence it rotates with the direction of gaze. It can be measured by surface electrodes placed on the skin around the eyes. Surface electrodes are both noninvasive and inexpensive and will work well for the purposes of EOG recordings. The electrodes were chosen with the concern of protecting the eyes from hazardous elements. Thus, solid gel electrodes were chosen over wet gel electrodes as a precautionary measure to prevent the gel from entering the eyes.
The advantages of Silver/Silver-Chloride electrodes were chosen because the half-cell potential was the closest to zero. Electrodes with the littlest quantity of half-cell potential area unit fascinating as a result of they cause {the least the smallest quantity} amount of offset

LOW PASS FILTER

Noise artifacts are mostly transients caused, for example, by the turning of an electrical switch on/off in the vicinity of the electrodes, contraction [10] of the facial or neck muscles, movement of the cathode because of sweat and eye squinting. Still, the indications produced by eye blinks are, in fact, quite unvarying.

EOG AMPLIFIER CIRCUIT

The EOG and the EMG amplifier have the same basic layout. Both circuits are based on the basic bio-potential amplifier. The bio-potential amplifier has three parts to it, each stage contributing to the overall gain. The first two stages are called the preamplifier and serve as a high input impedance load on the electrodes. This preamplifier must have low noise, and therefore it is pertinent to keep the gain low in the preamplifier stages because any noise that exists may be amplified along with the desired signal. This

premature amplification makes it difficult to distinguish the actual signal and may saturate the signal. In addition, it must be coupled directly to the electrodes to provide optimal low-frequency response as well as to minimize charging effect on coupling capacitors from input bias current.

Even without coupling capacitors it can polarize the electrodes resulting in polarization over potentials that produce a large dc offset voltage at the amplifier's input. Thus, the preamplifier is capacitor coupled to the third stage, which helps prevent dc offset.

Fig.3. EOG Amplifier design circuit.
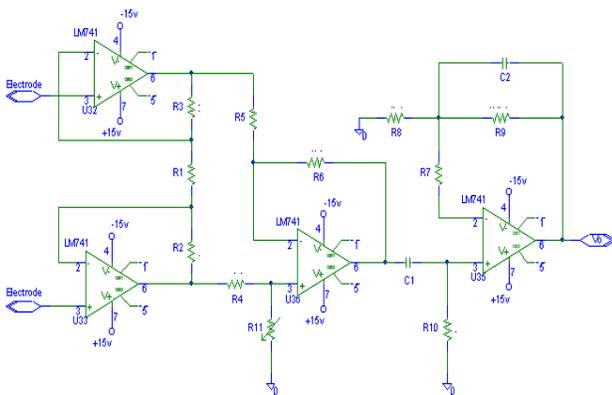
The first half of the preamplifier, stage 1, is directly coupled to the electrodes and has high input impedance since it acts as the load on the electrodes. The gain of this stage is

Stage 1 Gain = (R1+R2+R3)/R   (1)

The last half of the preamplifier, stage 2, is capacitor coupled to the rest of the amplifier stages to eliminate the saturating effects of the dc potential. The gain for this stage is given as shown in equation (2).

Stage 2 Gain =R6/R5   (2)

IV. IMPLEMENTATION

LabVIEW may be a graphical programming atmosphere employed by lots of engineers and scientists to develop refined activity, test, and management systems victimization intuitive graphical icons and wires that check a multidimensional language. The software tool implemented in the design for data acquisition is LabVIEW, selected primarily for its vast graphical capabilities and flexibility in design.

NI-DAQ

The signal was acquired with an AT-MIO-16 NI-DAQ connector; this was the National Instruments data acquisition board. Three channels are used for mouse pointer detection. The first channel was used for horizontal detection, the second channel for vertical detection and the third channel for click detection. The final component of the LabVIEW programming component is the graphical display that provides a simulation for the mouse pointer control. The data from both the Vertical index and the horizontal index are read into individual arrays so that it could be processed and displayed graphically. The inverse horizontal data is taken so that the "pointer" would move in the direction that the user is looking. The vertical data was left alone and stored into an array. LabVIEW then processed these data arrays and a graphical display was generated and the coordinates were plotted on a graphical display.

V. RESULTS & DISCUSSIONS

The graphical portion of the LabVIEW program provided the user with a simulation of controlling the mouse cursor with the eyes. A graphical region was displayed on the computer screen, and a red cursor was used to simulate the mouse cursor. LabVIEW comes with in-built FFTs that build the method of element separation fast. In addition, medical specialty signals, being extraordinarily little in amplitude, area unit susceptible to being flooded by noise. To combat this, it's necessary to run the noninheritable signal through a group of filters. This will be done external to the pc victimisation commonplace hardware filtering devices. LabVIEW offers the choice of Butterworth, Bessel, Chebyshev, and Chebyshev II digital filters. With a few adjustments, these filters can be configured for almost any design that is needed.
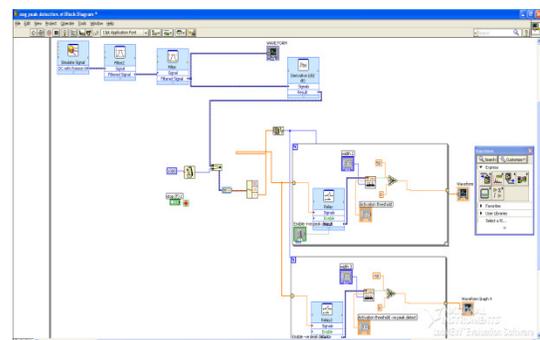
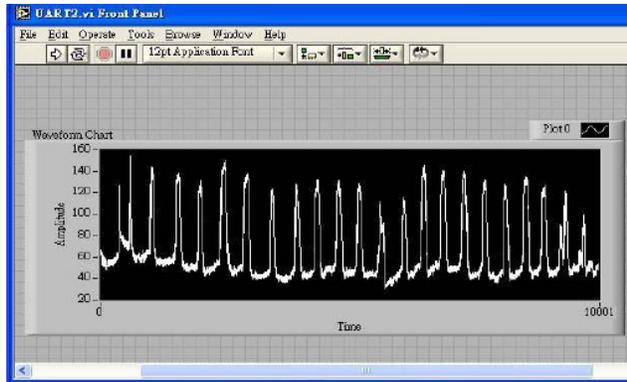

Fig.4. EOG signal processing in LabVIEW
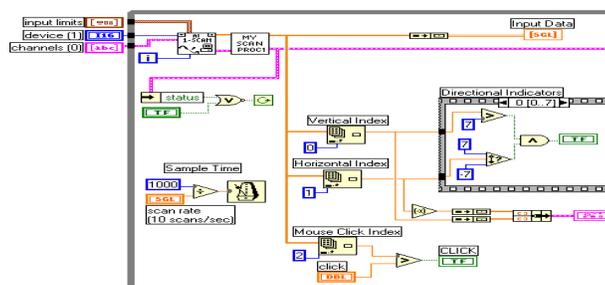
Fig.5. EOG signal generated

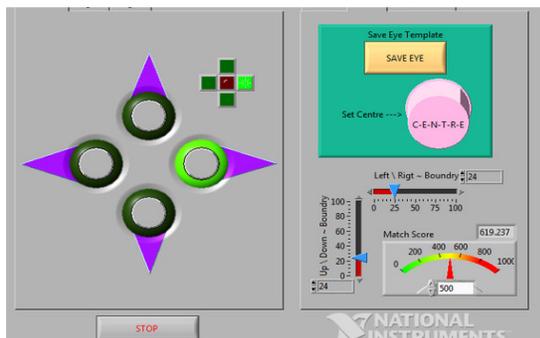**Fig.6. Cursor movements in LabVIEW**

Fig.7 Virtual layout

CONCLUSION

The simulation of a mouse pointer controlled by eye movements has been successfully developed. The two signals effectively navigate the mouse pointer on a computer screen and the electromyogram properly indicates a mouse click. The hardware is interfaced with the LabVIEW data acquisition software using an AT-MIO-16 NI-DAQ connector. The LabVIEW program determines in which direction an individual is looking and whether the user is clicking on the mouse pointer. A future application of the computer mouse controlled by eye system includes mounting non-sticky electrodes on eye glasses. This provides a portable and user-friendly way of attaching electrodes to the face. To get the face mouse to work within a true operating system, software mouse drivers would have to be written so that the computer would understand the control of the mouse. LabVIEW would have to be modified so that the signals could be sent to programs outside of LabVIEW.

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