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Oculography: A Review

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Abstract: With smarter human computer interfaces being released frequently, a need to more sophisticated HCI unit arises. The popular technology apart from keyboards and mice are touch screens, oculography, brain waves and sign language. This paper showcases different oculographic techniques that exist.

Keywords: Oculography; sensors; blinks

I. INTRODUCTION

Humans are blessed with good motor sensible organs to perform certain actions in our daily life, but still people come across certain disorders due to some disability among which one known disorder is paralysis (speech-impaired).

It is necessary to implement the oculography system which actually means a method of recording eye positions and tracking eye movements. It is broadly classified into two major types namely, electro oculography and video oculography.

Electro oculography is a method which uses sensors which are fixed on either sides of eye measuring the positional difference between them and identify any type of movement in the eye. This technique is well known as invasive oculography.It is found that this method is too uncomfortable for the patients to use. Hence to overcome this issue, video oculography has been proposed, where in camera is used for eye tracking. Since no piercing of electrodes occurs here, this technique can be considered as non-invasive technique.

II. LITERATURE SURVEY

In [1], implementation of electro oculography includes electrodes which are placed in appropriate positions with respect to eye movements.

Electrode here consists of two poles: positive pole concentrated with respect to cornea and negative pole concentrated with respect to retina. There is a 1mV potential difference created between the two poles, also the electric field is generated due to corneoretinial potential in front of the head. This is caused due to the changes in the head orientations with eye ball rotations. Here the electrodes track the eye-movements in two possible directions such as horizontal and vertical positions.

The most advanced technique noticed in [2] is human computer interface for the detection and tracking of eye movements. Human computer interface is interfaced with EOG signals in which the system employs the filtering using the moving average with a five point moving window technique. This process efficiently removes the power line noise. This system requires the user to perform a necessary action of the eye in desired direction and then return again to the center position.

It is also observed that the one more assistive technology named video oculography can be used. In this technology, a single web cam is used to detect for the detection of eye gaze based on extraction of geometrical features.

The main purpose in [3] is to study the effect of movement of eye using electro oculographic technique. In this technique (EOG), electrode measures the electrical signals to generate the corneoretinial standing potential placed between the front and back of the human eye. The circuit developed to collect the eye signal is Arduino Olimexino 328 circuit. It is seen that this circuit is interfaced with the MATLAB software to get the data acquisition. In order to detect the EOG signal, Ag/Agcl electrodes are placed near the face. The polarization of eyeball is measured with respect to skin around the eyes. The magnitude varies with respect to displacement of the eye ball, in which eye ball operates on two positions such as horizontal and vertical. Since two electrodes are used, eye is said to be focused at four positions in which two positions are with respect to one electrode. For detecting the left and right eye movement, the electrodes are attached into the vertical position.

In [4], the algorithm used is image processing to detect the eye tracking. In this project eye pupil is mainly observed. The RANSAC out-layer removal and moving average filter is used to increase the accuracy the pupil. The process is divided into five stages namely, Masking process, Thresholding process, Contour extraction, Ellipse fitting and outlier removal. EOG will record movements of eye even when the user is in sleep, which is not needed. As well as the electrical signal generation by EOG is unstable and sensitive. To overcome this drawback of EOG SSC method is introduced (Seleral Search Coil). SSC is a coil which placed in contact lens. In this method best precision results are obtained physically from the eyes. The use of coils will cause coil slipping, electrical leads breakage and highly irritation. To overcome this VOG is introduced to extract the eye movement from the video.

III. DISADVANTAGES

The Electrodes must not get disturbed during eye blinks. The potential resistance varies from one to another patient. It cause pain and fear in patients.

The problem observed in [2] is filtration of false the detections which causes jerky movements of camera. The image obtained is blur and system design is complex.

In [3], noise affects the EOG Signals. Since eye is concentrated in it position, it causes more stress and strain to the human eye.

The main drawback in [4] is the use of ransal outlier removal using heavy competition.

IV. CONCLUSION

From the above proposed papers it is found that the technology implemented is very inefficient and un-desirable to the users. Hence in order to avoid this we implement a video oculographic system can be proposed whenever tracking eye becomes mandatory.

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