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ABSTRACT

Measurement of Arden Ratio for Diagnosing Hereditary Retinal Diseases Using EOG System

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Abstract: The project helps ophthalmologists to provide a correct diagnosis for hereditary retinal diseases that affect the eyes, which are transmitted between generations in a single-family. The project aims to build & implement an EOG system for recording EOG signals in order to diagnose the Best Vitelliform macular dystrophy (BEST Disease). The EOG system contains different stages of processing and conditioning circuits to obtain the required signal. The recorded signal in light and dark adaptation was transmitted to a computer using DAQ, for further processing using specially designed algorithms in LabVIEW software, for both light and dark adaptation, to calculate the average of the value of EOG signal in each minute recording is calculated and then the smoothed light to dark ratio curve is plotted.

Background: “ISCEV Standard for Clinical Electro-oculography (EOG) 2006”. The clinical electrooculogram (EOG) is a test of the function of the outer retina and retinal pigment epithelium (RPE) in which the change in the electrical potential between the cornea and the ocular fundus is recorded during successive periods of dark and light adaptation.

Objectives:

- Design and implementation of EOG system for recording EOG signals.
- Connect the designed system with LabVIEW software for signal processing.

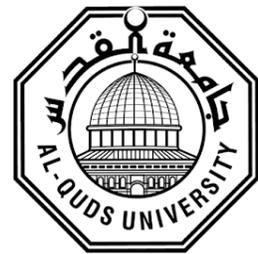
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- Calculate the Arden Ratio by LabVIEW for diagnosing eye diseases.

Methods: several stages of theoretical calculations, electrical design, and software application. Several stages of calculation are done in order to choose the appropriate value electrical components circuit. Then shows the connections between the project components of (electrical circuit, myDAQ, computer, labVIEW). In addition, the electrical design simulated using MULTISIM program. myDAQ hardware acts as the interface between a computer and the design. LabVIEW will be used for signal processing, plot the Light-Dark curve, calculate and display the Arden Ratio and diagnosing retinal disease.

Results: Calculate the average of saccadic eye movement during one minute along 30 minutes, and then plot Arden curve. The Arden ratio is then calculated by dividing the light peak over the dark trough of the smoothed light to dark curve, when the size of the light peak is compared to the dark trough the relative size should be about 2:1 or greater in normal conditions. A light / dark ratio of less than about 1.5 is considered abnormal.

Conclusions:

- The project helps ophthalmologists to provide correct diagnosis for hereditary retinal diseases that affect the eyes, which is important for giving the best treatment for the patient.
- The device also has light weight, so it can be used easily and everywhere.
- This system combined between efficiency and efficiency, since it uses LabVIEW software

Key words: EOG : Electro-oculogram, LabVIEW :Laboratory Virtual Instrumentation Engineering Workbench, RPE: Retinal Pigment Epithelium, DT :Dark Trough, LP: Light Peak