**Problem Definition**

**Motivation:** The electroretinogram (ERG) has been used to diagnose a number of eye diseases (Figure 1). Retinal physiology can also reflect systemic disorders such as liver and kidney disease. Currently, there is a need for many new drugs for eye disease to be developed and tested. An ERG provides an optimal research environment because tests can be conducted on an isolated retina (Figure 2), which various solutions to be in contact with the sample. Although systems exist for the measurement of ERGs in animals, it is important to create a computer program that will help integrate components of a given test design and allow researchers to visualize and analyze their data.

**Background:** The ERG measures the electrical responses to light of various cell layers in the retina. Electrodess on the retina, after light stimulation of varying wavelength and intensity, identify a triphasic wave. The a-wave, b-wave, and slow wave create the wave form, representing different layers of the retina. Chemical solutions that block various cell types are flushed over the retina in order to isolate cell layers, making it easier to distinguish problem areas. (Figure 2)

- **A-wave** reflects the physiological health of photoreceptors in the outer retina.
- **B-wave** reflects the health of the outer cell layers of the retina.
- **Slow wave** provides information on the bipolar and ganglion cells.

**Final Design**

In the backend, a sub.vi has been created which stores the data recorded by the electroretinogram into two columns: time and voltage. Additionally each of the user-selected settings for a particular test is stored in the header.

**Design Criteria**

**Problem Statement:**
A computer interface will be designed to integrate aspects of research design with ERG data acquisition and analysis. These aspects include liquid exchange through valve control and incorporation of a logarithmic light wheel along with the need to export data files and graphs to a separate program to store the information in a simple and organized format.

**Abstract**

The electroretinogram (ERG) records voltage responses of the retina in response to light stimuli. This project's goal was to design an interface in LabVIEW that would monitor, control, and record values from the ERG corresponding to liquid delivery, light intensity, flash duration and frequency, and voltage responses. We integrated all of these controls while updating the graphical user interface (GUI) so that it was easy to navigate in a dark room under a red filter. Up to eight different solutions can be delivered, and only one solution is delivered at a time. Light intensity is controlled by setting a number on a filter wheel through the interface. An option to export data to Microsoft Excel is included along with real-time graphs. All relevant functionality present in a previous version of the interface was preserved, and input points were organized into tabs so that real-time graphs could be enlarged and the interface did not look cluttered. The new interface is functional on the client's setup and provides the capabilities to properly record and analyze the ERG.

**Testing**

**Save Feature**
Saving data is an important feature and this component has been tested by sending data (time and value) and verifying that the results open in Excel and are accurate (Figure 6). The headers are located on the top two rows, followed by the data below.

**User Interface**
The new colors were tested behind a red filter to verify a high level of contrast (black for background, white for foreground) while allowing a minimal amount of light through. The testing environment can be seen in Figure 7.

**Future Work**
Software features have been implemented with the knowledge that the hardware is going to be added in the near future. These include a light wheel that controls the intensity of light shining on the retina and a valve delivery system to perfuse solutions over the retina.

**References**


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