**Executive Summary**

These days millions of people around the world suffer from various eye related illness ranging between poor eyesight and complete blindness. Some of the most severe ones originate in the retina.

Today, researchers understand how the retina is built, but not how it works precisely, this fact makes finding cures to these illnesses a difficult task.

The role of the retina is to convert light and color to nerve signals in order to transfer

them to the brain, the retina is also responsible for preliminary processing of the visual input.

Thus, it plays a role in creating the visual perceptionn.

The retina is a layered structure when each layer has a different role and different

functionality, while both are not well-understood to the researchers yet.

There are very few tools which can simulate the functionality of nerve networks, such

as Neuron Simulator which simulates the brain nerves - neurons. This simulator is

cumbersome, obsolete, and overloaded with functionality that retina researchers do not need.

Additionally, there are deep neural network models that can simulate the

functionality of the retina. However, this is done as a black box and does not provide insight or understand of the functionality of the retina.

תמונה שמכילה טקסט

התיאור נוצר באופן אוטומטי

Figure 2 structure of the retina cross-sectioned

This project deals with building upon and upgrading an existing simulator dedicated to the neural structure of the retina, which will be used by researchers as a tool for understanding the retinal cell functions.

Currently, there is no convenient tool to build networks of a few hundred cells to represent the retina, which means that researchers are not able to run simulations in a scale which will allow them to crack the inner workings of the retina.

This project will provide a solution for that need by creating an intuitive and comfortable interface for researchers to run simulations on.

Our simulator is based on the first part of this project, which was done as a final project in software engineering two years ago.

It will allow to receive real values as intake that represents the signal transfer which the retina layers receive, the simulator will allow to change the structure of the cells, the way they work, see the effect on the network, as well as provide a visual representation of the flow in the graph level or a group of graphs.

Our system provides a visualization of a graph/group of graphs/connections between graphs in a 2-D environment that represent parts of the network that is the retina, meaning, the interface that we created represents and creates models of large graph systems of cells with which can observe both on the micro or the macro level.

The system’s goals are:

1.Building a 2-D graph/group of graphs/connection between graphs

2.Graph connections

3.Graph Duplication

4.Loading graphs into external files

5.Graph deletion

6.Visualization of the graph/group of graphs/connections of graphs

7.Simulating the flow of signals through the retinal network