Retinotectal Projection Simulation: Requirements Document

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1 Functional Requirements

/FR-10/ Simulation Configuration Parameters
 Users can customize the following options specific to the nature of the simulation:

1. Number of Steps

2. Size of each Step

3. Number of Growth Cones

4. Size of Growth Cones

5. Sigma Value for Gaussian Distribution

6. Adaptation Enabling

7. Adaptation History Length

8. Probabilities of Steps taken in X and Y directions individually

/FR-20/ Substrate Configuration Parameters
 Users can customize the following options specific to the Substrate:

1. Dimensions of the Substrate

2. Type of Substrate

3. All necessary variables to customize settings for different types of substrate, i.e., wedge or stripe dimensions

/FR-21/ Advanced Substrate Configuration Parameters
 Users can customize the substrate using the GUI by adjusting each cell.

/FR-22/ Substrate Types

Users can choose from following Substrate Types:

1. Continuous Gradient

2. Wedges

3. Stripe Assay

4. Gap Assay

/FR-30/ Visualization Configuration Parameters

Users can customize the following options specific to the visualization of results and substrates:

1. Growth Cone Trajectory

/FR-40/ Simulation

The program conducts simulations of the Retinotectal Projection based on user-defined configurations.

/FR-50/ Graphical User Interface

The program offers a graphical interface for user interaction.

/FR-51/ Estimated Time

During the simulation, the program provides an estimated time remaining indicator.

/FR-40/ Results Display

The program visualizes Results and Substrate in different ways, including

1. Ligand and Receptor Values of the Substrate Separately

2. Combined Receptor and Ligand Values of the Substrate

3. Tectum End-Points of Growth Cones

4. Projection Mapping on a two-dimensional plane, with axes representing the initial and final growth cone positions.

/FR-41/ Evaluation of Results

The program calculates linear regression on projection mapping and presents its graphical representation, including correlation, intercept, and slope values.

/FR-42/ Result Saving (optional)

Users have the option to save simulation results.

2 Non-Functional Requirements

/NR-10/ Scalability

The program should be designed to accommodate larger quantities of growth cones, steps, and field sizes.

/NR-20/ Performance

Considering NR-10, the program should optimize simulation time to efficiently handle larger inputs.

/NR-30/ Usability

The program should be intuitively usable by anyone and easily extendable by bioscientists.

3 Constraints

/CN-10/ Development Platform

The development platform is limited to MatLab or Python.

/CN-20/ Mathematical Model

All calculations in the simulation will adhere to predetermined mathematical models of this Paper.