

Project title: NeuroMaze

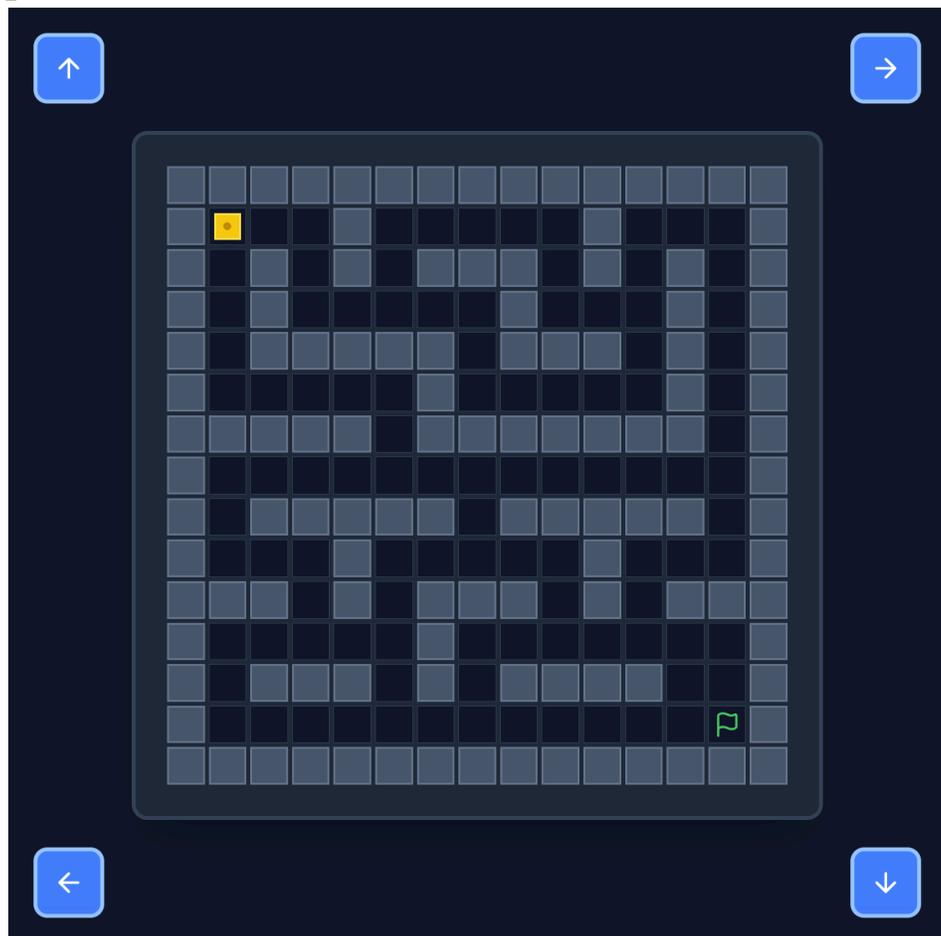
Project concept:

We will be creating a fun, interactive mobile game in which a user attempts to navigate through a maze using solely their brain waves. The mobile game will be controlled by a brain computer interface (BCI) facilitated by the g.tec Unicorn EEG headset, covertly disguised in an inconspicuous baseball cap.

Goal/Purpose:

The user will be able to look at one of four different corners of the screen, each corresponding to different directions that their character can move in. Our BCI will be able to detect which direction the user intends to move in, and their character can progress to the end of the maze. By the end, our user will have been able to navigate through our maze game entirely hands-free!

UI Mockup:



In our app, the background of each of the four arrows will be flashing at four different set frequencies. This allows a machine learning model to observe the presence of different features in our EEG data depending on the arrow the user is looking at. This is a commonly used BCI paradigm called Steady State Visually Evoked Potential (SSVEP).

Technology overview:

To build a cross-platform mobile game, we will use React Native, Flutter, or equivalent cross-platform mobile development framework. We will be using the Steady State Visually Evoked Potential (SSVEP) BCI paradigm to operate the game. We will be using our g.tec Unicorn headset, disguised in a baseball cap, as our source of EEG data. EEG data will be live streamed from the Unicorn headset directly to our mobile device using Lab Streaming Layer (LSL). Every few seconds, the current EEG data will be input into a custom-trained machine learning model, which will accurately deduce which direction the user wants to move in. The character will then move in this direction, and our user can progress through the maze.

Development Plan:

We will first build our mobile game as we have outlined above, however without the machine learning component. We can use this app to create a dataset of EEG data from several different users paired with the direction that a user intends to move in. Using this dataset, we can train an accurate machine learning model, and add this to our application to complete the BCI. After we obtain these results, we can change different parameters of our app to see whether they improve our baseline performance. Parameters like button location and the specific flashing frequencies will be especially crucial to the accuracy of our BCI. Once these parameters are tuned, we can test our app on more users and make sure that the user experience is smooth.

Total Estimated Budget:

The costs of this project will be fairly negligible. We already have multiple Unicorn headsets adapted into baseball caps. Future costs may include app store submission fees, cost of hardware needed for repairs, and potential server costs. The total budget this project would need would be at most \$100.