

Red Light Green Light

BCI P300 EEG Survival Game

SURGE BrainHacks Fall 2025

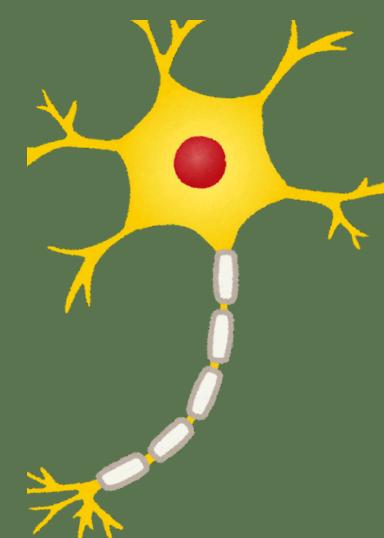
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Planning

- Traditional games rely on hands, controllers, or keyboards ... Can we play just with our brains?
- Brain-Computer Interfaces (BCIs) = direct connection between brain signals and digital interaction
- Use OpenBCI's Cyton Board with 8 electrodes for EEG signals
- Goal: create a fun and unique, survival-style game powered by EEG signals
- Game will be built with Python (NumPy, PyGame, BrainFlow and more)



EEG & Alpha Waves



EEG measures electrical activity from the scalp

- Alpha waves (8-12 Hz): relaxation, focus
- Beta waves (12.5 - 30Hz): Excitement, Focus

Used the ratio of Alpha to Beta waves as the speed value for the game.

We used the Welch transformation to create the alpha and beta bands.

Concept & Rules



Inspired by Red Light, Green Light

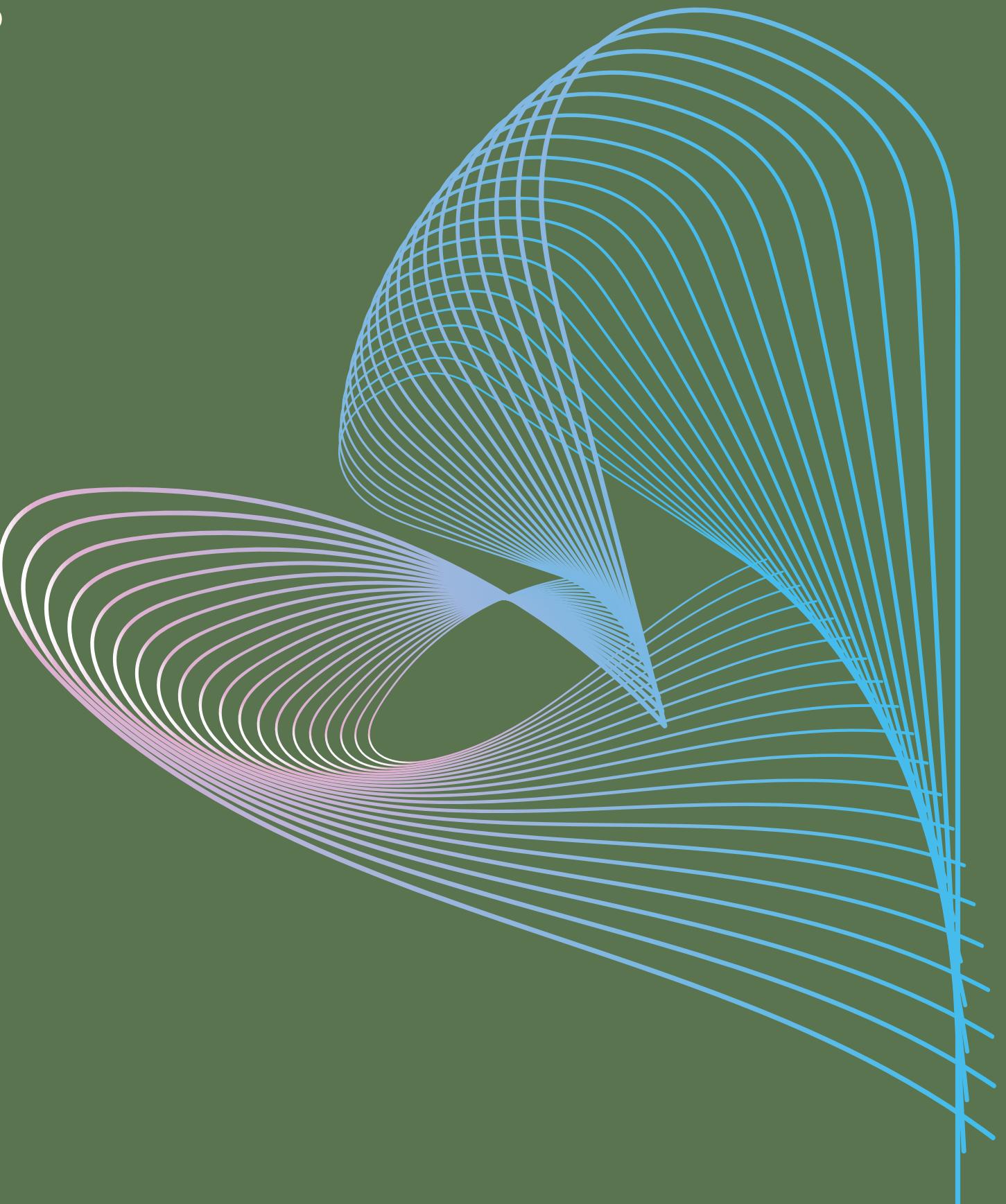
Adapted into Versus Survival mode:

- No finish line – just stay alive by not going off screen.
- Cars also pass randomly as hazards – avoid them to survive.
- Focus to go faster and relax to go slower
- Use keyboard controls for lateral movement

Last player standing = winner

Challenges

- Weak, noisy signals. Difficult to control character.
- Real-time response was difficult to synchronize (delayed responses)
- The OpenBCI board stopped working and we couldn't identify a reason
- Limited build time forced us to use simple mechanics



Reflections

- We should have spent more time planning on the first day before jumping into development.
- The multiple iterations of the game changed from just a simple race with no cars, to a race with red light green light, to a versus survival game with cars as obstacles.
- The game worked as intended, but was largely unrefined due to the time spent debugging the hardware.
- We should have tried alternative BCI tools or pivoted when we recognised the unreliability of the cyton boards.

What we did well

- We added unique spins on our game (e.g., a versus game, cars as additional hazards).
- We stayed resilient despite the many setbacks (e.g., boards not working, computers not working).
- We delegated roles between team members well.



Thank you

