NeuroDrive: Brain-Controlled Assistive System

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Date: June 01, 2025

Executive Summary

NeuroDrive is an assistive technology project aimed at empowering individuals with quadriplegia through brain-signal driven control systems. Using an EEG-based brain-computer interface (BCI), NeuroDrive detects intentional brain activity patterns and translates them into control signals. These signals can then be used to control mobility devices such as electric wheelchairs, smart home systems, or custom assistive machinery.

Problem Statement

People with quadriplegia suffer from loss of voluntary motor control, making basic mobility and interaction with their environment extremely difficult. Traditional control methods are not accessible for them. NeuroDrive proposes a solution that utilizes brainwave signals as a non-invasive, intuitive control method for assistive devices.

Project Objectives

- Develop a wearable EEG-based sensor system to read brainwave patterns
- Translate neural signals into actionable commands
- Integrate wireless communication to control external devices (e.g., wheelchair)

NeuroDrive - Project Proposal

- Create a customizable control interface adaptable to user intent

Methodology

The project uses a non-invasive EEG device (such as the Neurosky MindWave or OpenBCI) to record brain activity. Signals are processed using an Arduino or Raspberry Pi for noise filtering and pattern recognition. When a specific neural signature is detected, a control signal is sent wirelessly to an assistive device. The system will be trained to recognize thought patterns related to intent, such as moving forward, stopping, or turning.

Components and Resources

- EEG Sensor: Neurosky MindWave or OpenBCI
- Microcontroller: Arduino Nano / Raspberry Pi
- Wireless Module: HC-05 Bluetooth or Wi-Fi module
- Motor Controller (for test vehicle or wheelchair)
- Power Supply: Portable battery pack
- Software: Python/Arduino IDE for signal processing and control

Timeline

Week 1-2: EEG data collection and signal calibration

Week 3: Signal processing algorithm implementation

Week 4: Communication with assistive device prototype

Week 5: System integration and user testing

NeuroDrive - Project Proposal

Estimated Budget

- EEG Headset: $100 - $300
- Microcontroller (Raspberry Pi): $40
- Bluetooth/Wi-Fi Module: $10
- Battery Pack: $20
- Misc Hardware (motors, cables): $30

Total: ~$200 - $400 depending on EEG device

Conclusion

NeuroDrive aims to bring life-changing independence to individuals with severe motor disabilities. By using the power of brainwave technology and accessible hardware, the project enables intuitive, hands-free control over mobility and smart devices. It promotes inclusion, accessibility, and autonomy.