Using Brain Waves to Remove Drone Racing Accessibility Barriers

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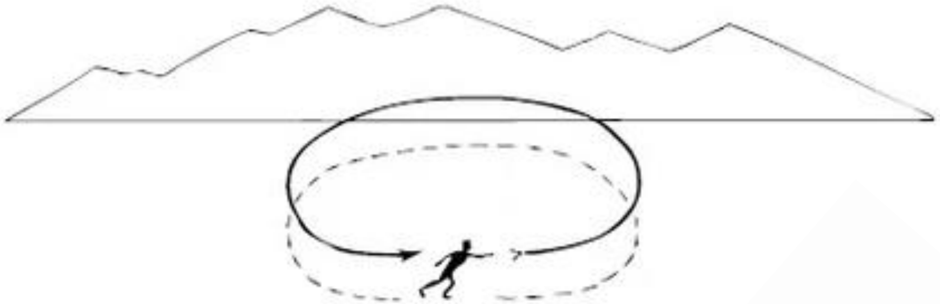
About Me



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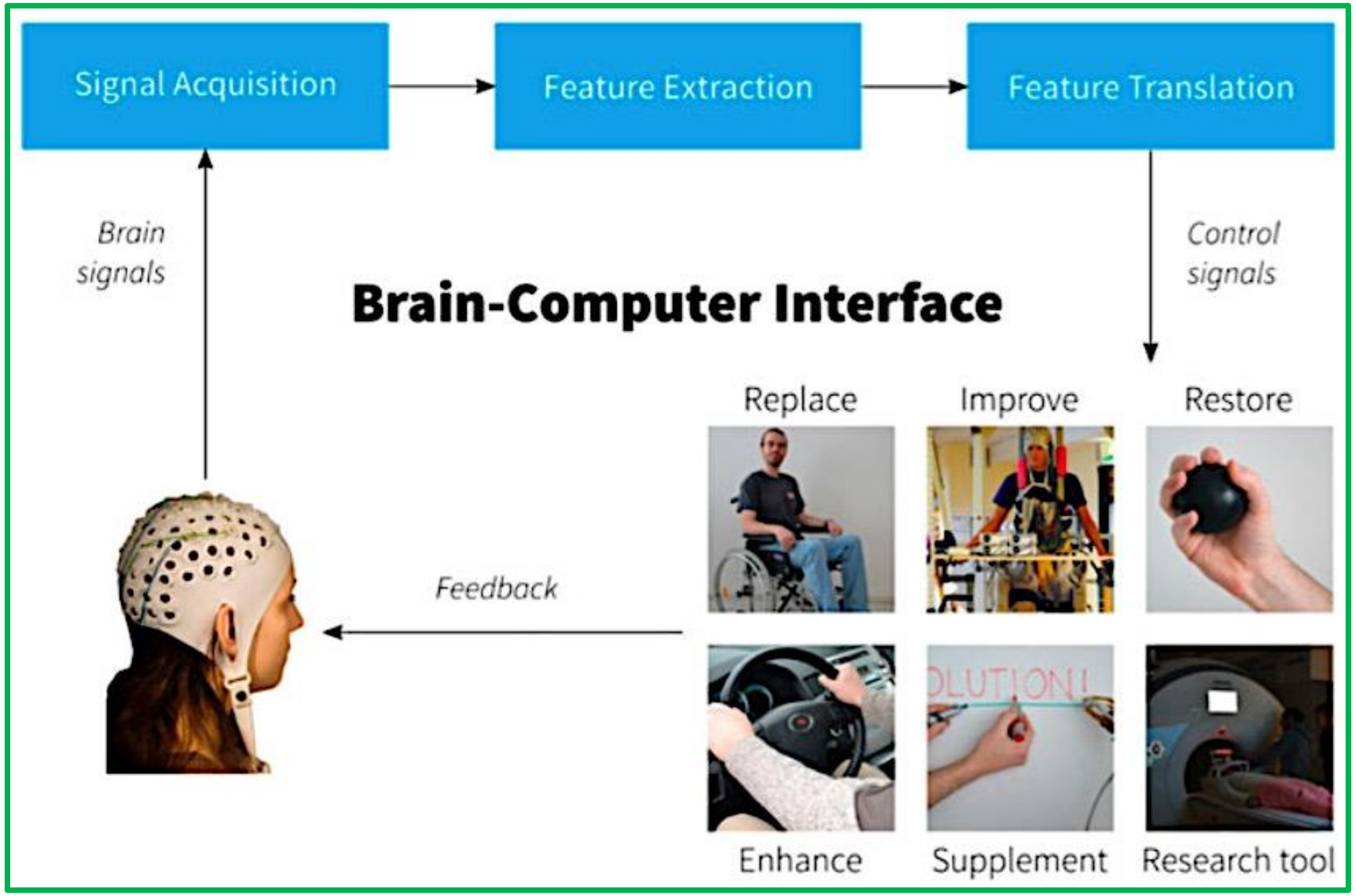
Research Interests

- Unmanned Aerial Systems
- Human-Drone Interaction
- Brain-Computer Interfaces



Brain-Computer Interfaces

Active: the use of a wearable device to enable the brain to control machines

Passive: measure and decode the affective and cognitive states

Brain-Controlled Drones

Brain-Drone Racing

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Brain-Drone Racing

- Control flight using an EEG headset
- What impacts performance?
  - Audio and Visual Distractions
  - Engagement level
  - TDCS

Using Brain Waves to Remove Drone Racing Accessibility Barriers

- Compare first versus third-person view flying.
- Increase performance?
- Bridge the gap between drone racing and brain-drone racing

Objectives

- Compare the performance and user experience between brain-drone racing and FPV brain-drone racing.
- Provide guidelines for brain drone racing and future research
- Introduce undergraduate students to human-drone interaction and brain-computer interface research

Equipment

- Brain-Computer Interface
  - NeuroElectrics Enobio 8 Channel EEG headset
- Drone
  - Tello

Motor Imagery

Spectral bands breakdown

Beta (β) - (13-30 Hz)

- Mental Activity, Alerted

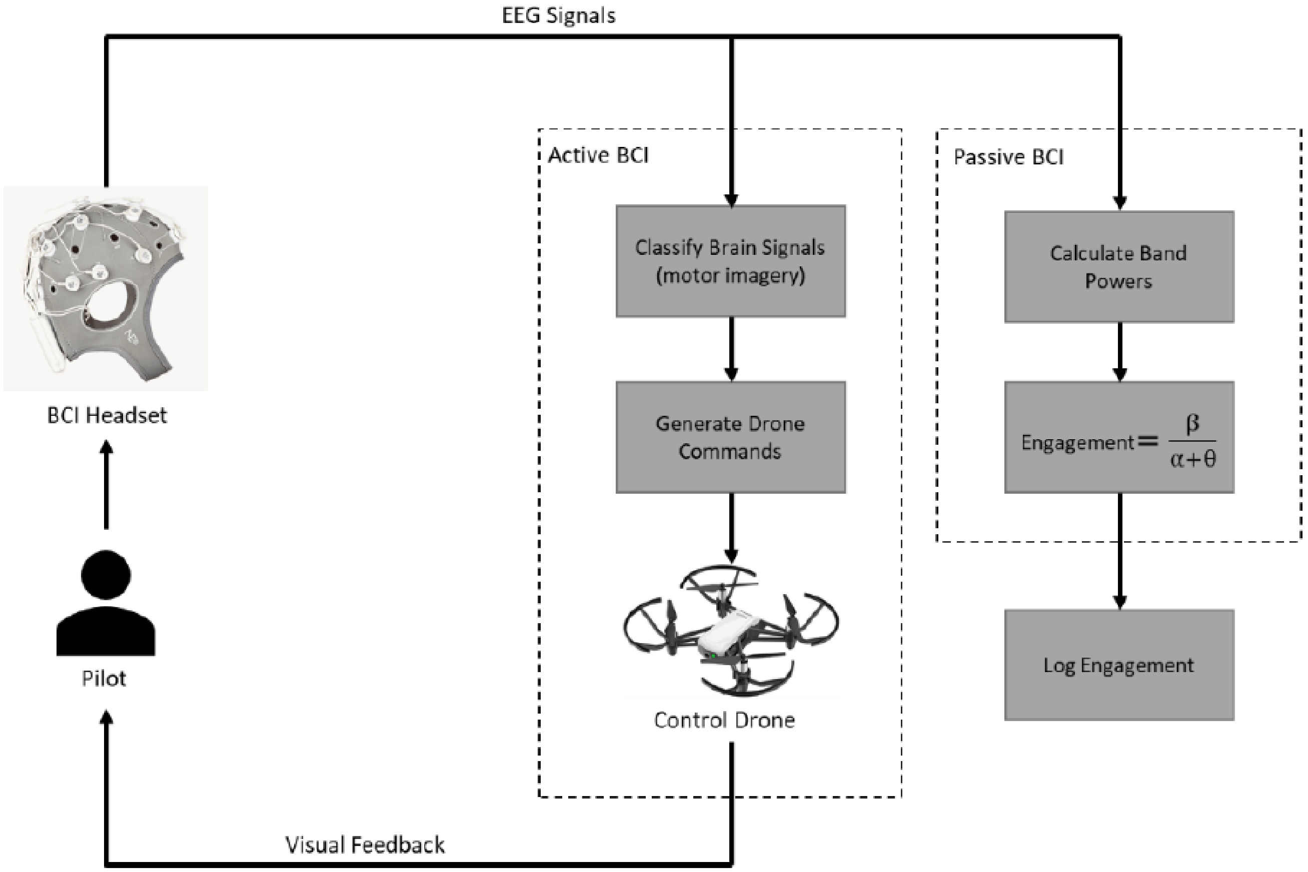
Alpha (α) - (8-13Hz)

- Relaxation

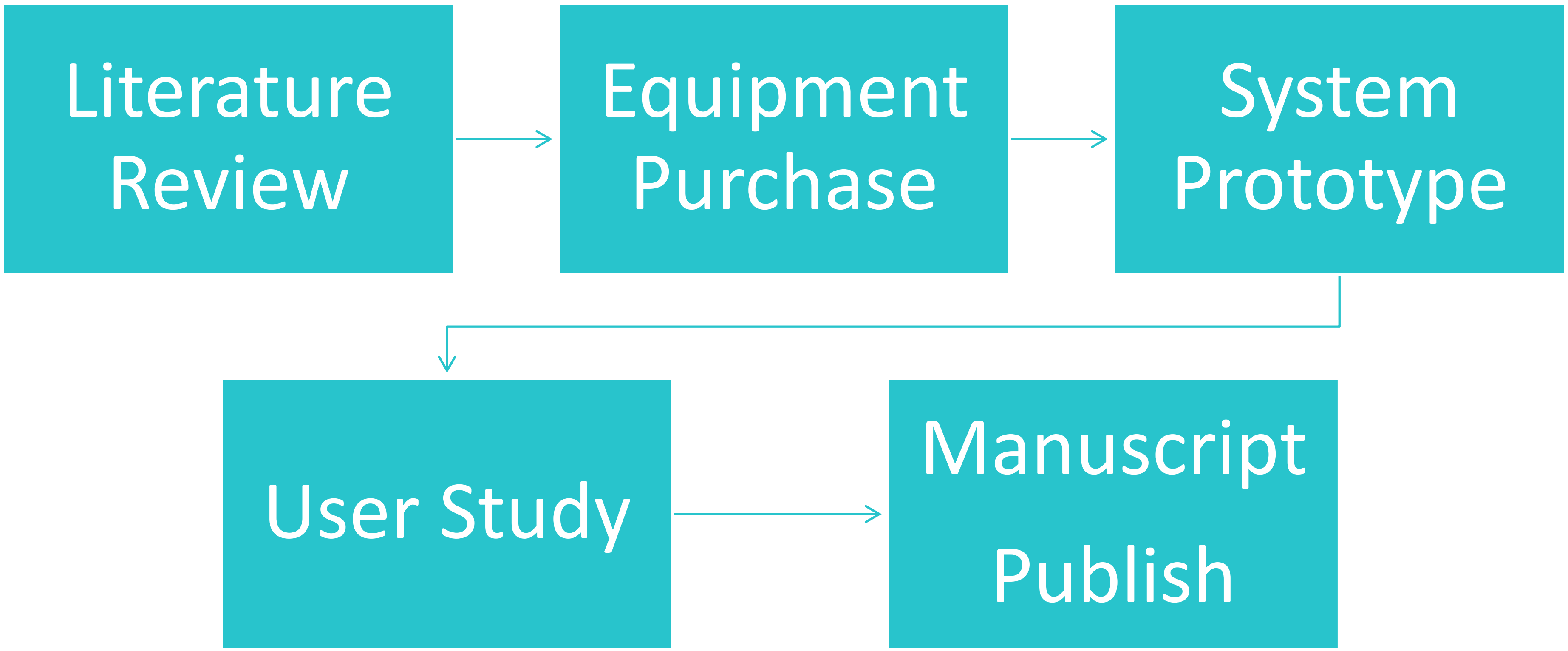
Theta (θ) - (4-8 Hz)

- Drowsiness

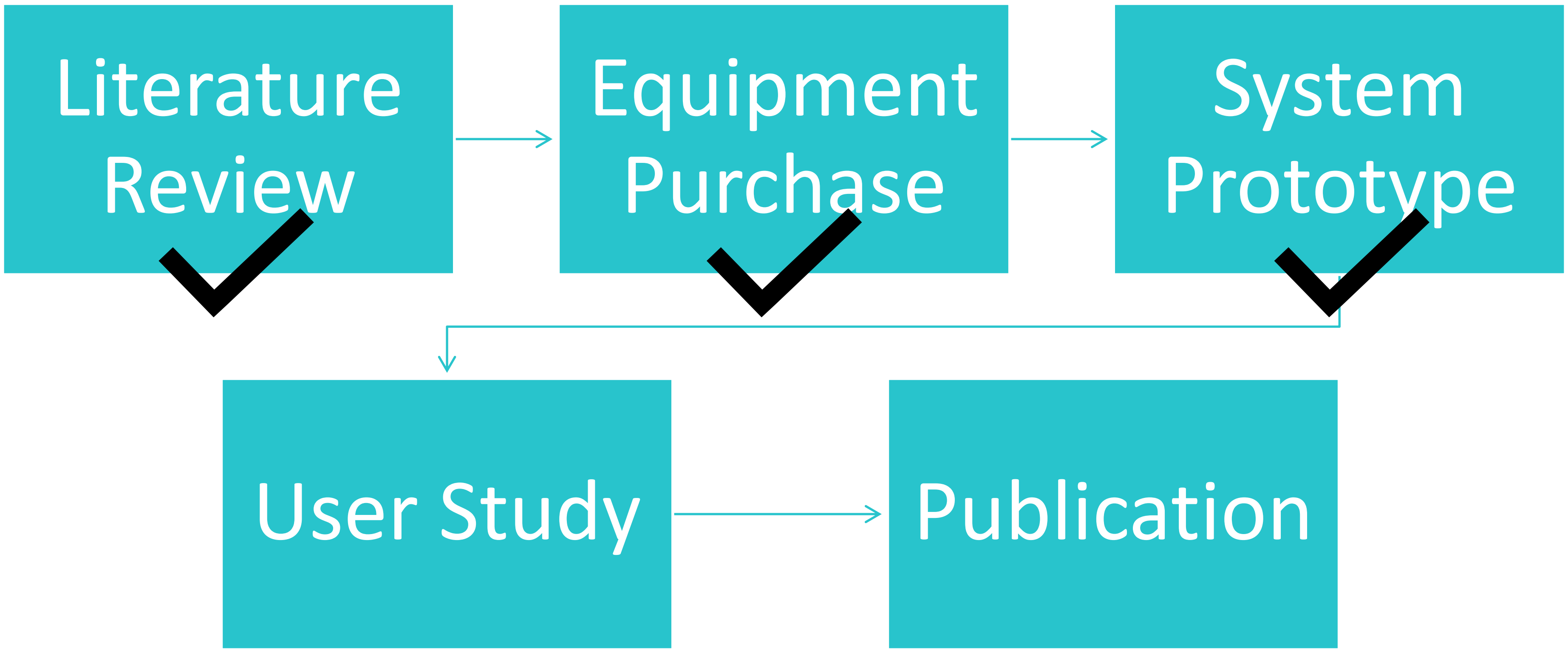
System Architecture



Research Progress



Research Progress



User Study

Within-subject

First-Person View vs. Third-Person View

Within-subject

- Performance (time required to complete a race lap).
- Engagement level, measured using the BCI.
- Pilot's workload, measured through the standard NASA-TLX survey.
- System usability score, measured through the standard SUS survey.

Undergraduate Researchers

Ashley Land

- Brain-controlled drones
- Annual Biomedical Research Conference for Minority Students

Ricardo Zamora

- Motor imagery classification

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Questions?