Using BCI Devices to Harness the Power of Controlling Drones with your Brain

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Background

- Spring 2016, world's first Brain Drone Race held at the University of Florida.
- Takeoff and forward commands were transmitted from the brain by utilizing an electroencephalogram (EEG) headset.

Project Objective

- To find a working method to decipher between different brain signals and map those signals to different drone commands.

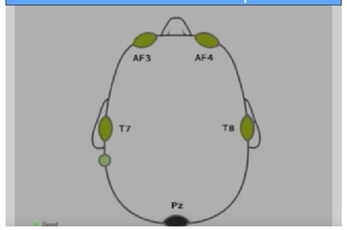
Strategy

1. Get Bebop drone to move forward
2. Add in more commands for Bebop drone
3. Test different commands and map them to brain signals

DJI Phantom 3 Drone

Bebop 2 Drone

EEG headset control panel



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EEG headset

Implementation

- In order to use the Bebop 2 drone the commands needed to be run on a computer. Using an API found on Github, which is an open source website full of code, and Javascript programming language the drone commands were easily accessible.
- Using the Emotiv Insight and two emotiv software packages, Emotiv Control Panel and XavierEmoKey, the commands were mapped to keys on the keyboard using XavierEmoKey. Using Emotiv Contorl Panel the brain signals were captured and saved into profiles which were then mapped to the same keyboard keys

Findings

Brain Signals

- When the EEG signals are read noise is also captured, this noise is generated by other unrelated activities
- BCIs need better signal-acquisition hardware to remove this noise and to allow for the EEG signals read faster
- These signals need to be translated in real time into drone commands for the BCI to effectively communicate with the drone.
- In order for multiple commands to be mapped to the drone from the BCI device EEG signal processing is needed

Future Directions

- Finding out if there are adequate noise removal systems that work in real-world applications
- Finding out if there are other methods to tell the different signals apart

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