Brain Drone Race:

Drone Racing Through Brain Computer Interface

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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.

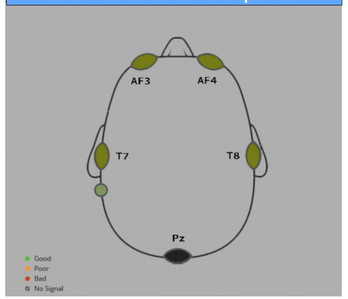
Project Objective

- To make improvements to the previous race, explore other drone options, and document the race organization process to aid with reproducibility.

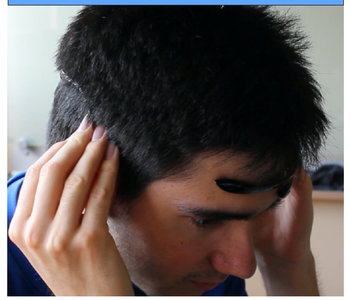
DJI Phantom 3 Drone

Bebop 2 Drone

EEG headset control panel



EEG headset



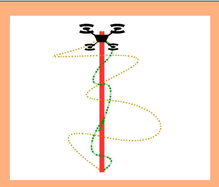
Methodology

1. Reproduce standard flight used for first race.
2. Identify areas of improvement for DJI Drone.
3. Test different parameters and measure relative improvements.
4. Explore other drone options (Bebop 2).

Implementation

- The main race issue was a non-functional line follower algorithm. A bug was identified and corrected, and the effects of the following variables were explored:
  - Hue Saturation Value (HSV): A color model that describes colors in terms of their shade.
  - Maximum correction speed (pThresh): The top speed the drone can attain to correct the deviation from the line.
  - Altitude of the flight.
- The main reproducibility issue was high cost. We pursued an alternative drone option, the Bebop 2.
  - Designed and 3D printed propeller guards to make drones suitable for race environment.

Results



DJI Results

- Improvement in flight stability following the glitch fix.
- Lane alignment improved by 14.5%.
- Amount of realignment errors in 5 runs improved by 50%.

Bebop Results

- Without line follower algorithm little to no lane deviation and 90% lane alignment improvement over DJI.
- Simpler EEG headset integration than with DJI drone.

Conclusion and Future Directions

Conclusion

- Brain Drone Racing is facilitated with use of drones such as the Bebop 2.
- With increased success of line follower program, performance of DJI Drones has improved.

Future Directions

- Brain Drone Race will be held at UF again next Spring.
- Documentation will help make such an event executable for other institutions.

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