**Performance Analysis of Brain Control Interface in Drone Applications**

The main objective of this study is to find efficient methods to utilize brain control interface in conjunction with aerial drones. The study investigates how effective the EPOC+ is by challenging users of diverse genders and ages to complete tasks using mental commands or facial expressions to control a Parrot AR-Drone 2.0. After a mental and facial commands calibration phase, the designed experiments were conducted using randomly selected participants (n=20). Preliminary analysis of the collected data indicated that there was no significant difference between the rating of difficulty before and after, between the mental and facial commands. Furthermore, this study showed that from group of participants more individuals had greater difficulty controlling the mental and facial commands than they originally expected. Brain or mind controlled technology offers a new and dynamic type of human and computer interaction. This technology can make the user feel more immersed than other technology can such as a keyboard, mouse, controller, or any other device. During the past decade, drone usage has grown significantly in the military and other federal agencies; this growth has also extended to some local law-enforcement agencies. Growth in drone usage is not limited to government agencies; it can also be seen in the commercial, private, and recreational sectors. Consequently, the Federal Aviation Administration (FAA) and many state governments taken steps to increase safety where drones are concerned. The purpose of this study was to investigate the innovative usages for a brain-controlled drone and how effective these drones might operate. This study also tested the bounds of human connectivity with a mind-controlled drone

**Emotive EPOC+ (Highlight Specifications):**  14 channels: AF3, F7, F3, FC5, T7, P7, O1, O2, P8, T8, FC6, F4, F8, AF4  Sequential sampling. Single ADC  Resolution: 14 bits 1 LSB = 0.51μV 16 bits  Bandwidth: 0.2 – 43Hz, digital notch filters at 50Hz and 60Hz  Filtering: Built in digital 5th order Sinc filter  Dynamic range (input referred): 8400μV(pp)

**Parrot AR-Drone 2.0 (Highlight Specifications**):  4 “inrunner” type brush-free motors, 14.5 watts and 28,500 rev/min  Nyatron Gears  Bronze self-lubricating ball bearings  ARM Cortex A8 1 GHz 32-bit processor with DSP video 800 MHz TMS320DMC64x  Linux 2.6.32 Operating System  DDR2 1 GB at 200 MHz  Gyroscope: 3 axles, accuracy of 2,000°/second

**Question**: Is there a significant difference in difficulty between mental command and facial expression utilizing brain control interface in conjunction with aerial drones?

Allowing for some trouble with the hardware, the toughest part of running the experiment was providing consistent connection between the computer and the drone. Despite some connectivity issues, a good number of participants managed to fly the drone using the facial commands while a slightly smaller number of subjects could manipulate the drone with mental commands once it was in the air. Females tended to have better control over both the virtual cube experiment in the MindDrone App and controlling the drone using the EPOC+ headset. The male subjects consistently succeeded in passing the ‘virtual cube experiment’ but could not translate the thought control into manipulating the drone.