Diagnosing the Puzzle of Autism: A Wearable Micro-Movement Sensing Cap for Early Pediatric Screening

Ferguson, Samuel

Autism spectrum disorder (ASD) is the name for a group of developmental disorders. ASD includes a range of symptoms, skills, and levels of disability. According to the Centers for Disease Control and Prevention (CDC) 1 in 45 children has been identified with ASD. Optimal outcomes for children are dependent on early identification and therapeutic intervention. Diagnosis of ASD is reliant on trained physicians who administer autism-specific behavioral evaluations. MRI's have uncovered patterns of involuntary head micro-movements in children affected by ASD, demonstrating two and a half more movements than unaffected subjects. There is no minimally invasive methodology available to assess the frequency of involuntary micro-movements of the head. The goal of this project is to create and test a simple and economical device to quantifiably measure head micro-movements to serve as an early screening tool for ASD. The project consists of a constructed test bed that will be programmed with an Arduino Uno processor to synthesize human head movements, a wearable cap and accelerometer, a human head analog and remote monitoring. Thirty test samples of Normal and ASD movement programs, were evaluated against Acceptance Criteria with a goal of 95% Confidence and 90% Reliability using the Bayes Success Run Theorum. The testing revealed that the accelerometer in combination with a wearable cap – reliably measured simulated involuntary head micro-movements in 29 of 30 test runs thus satisfying the Acceptance Criteria. The results show that an affordable micro-movement sensing cap for early screening in the pediatric population for Autism Spectrum Disorder, is a feasible, economical and minimally invasive alternative or supplement to existing observational modalities.

Awards Won:

Third Award of $1,000