Announcing the Final Examination of Ziqing Xu for the degree of Doctor of Philosophy

Time & Location: April 5, 2019 at 2:00 PM in Engineering II 312L
Title: A STUDY OF NONLINEAR DYNAMICS OF EEG RELATED TO MENTAL WORKLOAD ON A SIMULATED UNMANNED VEHICLE TASK

In the contemporary world, mental workload becomes higher as technology evolves and task demand becomes overwhelmed. The operator of a system are usually required to complete tasks with higher complicity within a shorter period of time. Continuous operation under high level of mental workload can be a major source of risk and human error, thus put the operator in a hazardous working environment. Therefore, it is necessary to monitor and assess mental workload.

In this study, an unmanned vehicle operation with visual detection tasks was investigated by means of nonlinear analysis of EEG time series. Nonlinear analysis is considered more advantageous compared with traditional power spectrum analysis of EEG. Besides, nonlinear analysis is more capable to capture the nature of EEG data and human performance, which is a process that subject to constant changes. By examining the nonlinear dynamics of EEG, it is more likely to obtain the deeper understanding of brain activity.

The objective of this study is to investigate the mental workload under different task levels through the examination of brain activity via nonlinear dynamics of EEG time series in simulated unmanned ground vehicle visual detection tasks.

The experiment was conducted by team lead by Dr. Lauren Reinerman Jones at Institute for Simulation & Training, University of Central Florida. One hundred and fifty subjects participated the experiment to complete four visual detection task scenarios (1) change detection task with steady event rate, (2) threat detection task with steady event rate, (3) Dual task with changing change detection task rate, and (4) Dual task with changing threat detection rate. Their EEG was recorded during performing the tasks at nine EEG channels.

Major: Industrial Engineering

Educational Career:
Bachelor’s of Electrical Engineering, BS, 2006, China Agricultural University
Master’s of Industrial Engineering, MS, 2011, Auburn University

Committee in Charge:
Waldemar Karwowski, Chair, Industrial Engineering and Management Systems
Lauren Reinerman Jones, UCF Institute for Simulation & Training
Peter Hancock, Department of Psychology
Piotr Mikusinski, Department of Mathematics

Approved for distribution by Waldemar Karwowski, Committee Chair, on March 22, 2019.

The public is welcome to attend.