



TOPIC	CWT and EEG
ORGANIZERS	Student Leadership Council and Faculty of ACIT Institute and TECHLAV Center
AREA	Support Vector Machine Classification and Psychophysiological Evaluation of Mental Workload and Engagement of Intuition- and Analysis-Inducing Tasks
SPEAKER	Joseph K. Nuamah
DATE	Friday 24, 2017
TIME	3-4PM (EST)
VENUE	Fort IRC 410, North Carolina A&T State University, UTSA and SIPI will be joining through video-conferencing
FEES	No Charge

SYNOPSIS

The design and evaluation of user interfaces for human supervisory systems require an understanding of the cognitive characteristics that these interfaces' support and the effect of their design on human operator judgment. The two main cognitive modes are analysis and intuition. The main difference between them is cognitive effort. Whereas the intuitive decision making is triggered effortlessly, analytic decision making is controlled. User interfaces may present information in a format that elicits any of these cognitive modes. Traditionally, behavioral and subjective measures have been used to measure judgment performance of operators who use these interfaces. However, behavioral and subjective measures alone may not produce much information on the cognitive state of the operator. The functional (mental) state of the human operator during task execution can provide very useful information when aiming to evaluate and optimize the design of user interfaces. Mental states that can be measured during task execution include workload, engagement level, and emotion. The obtained information may be used to improve suboptimal user interfaces in human automation interactions, leading to less errors, increase in productivity, and avoidance of operator frustration. Furthermore, in adaptive automation the level of automation may change during system operations. Physiological measures recorded during task performance can be combined by a classifier to determine the functional state of the operator. Data that represent the cognitive states of interest from each operator separately or data obtained from a group of similar operators are used to train the classifier. Afterwards, the trained classifier is continuously fed with physiological data during performance of a task. The classifier uses these data to estimate the operator's functional state. Classification results may be used to modify the operator's task via adaptive aiding with the goal of enhancing overall performance.

In my talk, I present how I employed the continuous wavelet transform (CWT) to electroencephalograph (EEG) in order to evaluate mental workload and engagement. I used two EEG indices, Task Load Index (TLI) and Task Engagement Index (TEI), to respectively explore task engagement and cognitive load imposed on participants performing intuition-inducing and analysis-inducing tasks. I employed objective measures (reaction time and percent correct), and a subjective measure (NASA-TLX) to validate the objective EEG measures (TLI and TEI).

ABOUT THE SPEAKER



Joseph K. Nuamah is a Human Factors PhD candidate at Industrial and Systems Engineering Department of the North Carolina A & T State University. His research interests are: Neuroergonomics, Cognitive Engineering, Brain Computer Interface, Human Computer Interaction, Machine Learning and Trust in Automation. Joseph is a Project Management Professional (PMP). He holds an MSc in Communications and Media Engineering and BSc in Electrical and Electronics Engineering.