NASA SBIR/STTR Technologies

A1.05 - Cognitive Modeling for Closed-loop Task Mitigation

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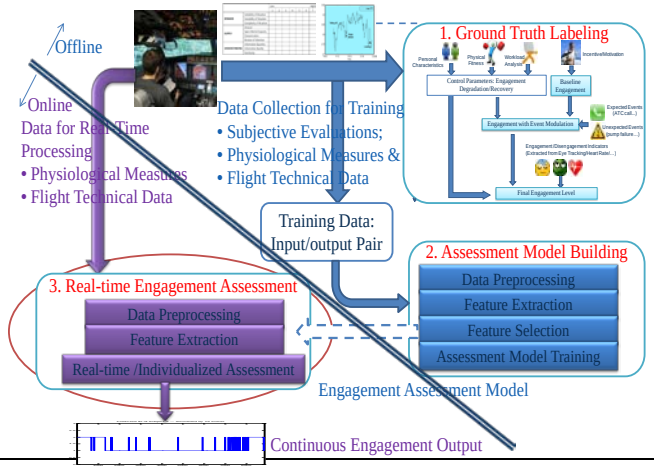
Identification and Significance of Innovation

Human operators play an important role in aviation and other safety critical missions. However, human errors are becoming one of the key leading causes of mission failure. As reported by Boeing in 2004, accidents due to flight crew actions are identified as the top primary cause in both large and small aircraft. Two types of hazardous states of awareness are more likely to lead to human errors: a stress state due to high workload for a prolonged period of time or a complacent/bored state in extremely low workload situations. In existing aviation systems, the functional state of the operator is not monitored and remediation is not implemented. Proper assessment of Operator Functional State (OFS) and appropriate intervention offers potential to improve mission effectiveness and aviation safety.

Expected TRL Range at the end of Contract (1-9): 5



Technical Objectives and Work Plan

Objectives: The main objective is to develop and implement a closed-loop Adaptive Task Management System (ATMS) for both over-load and under-load conditions based on the Operator Functional State (OFS) assessment in real-time.

Work Plan

Task 1: Refine Phase II requirements
Task 2: Enhance individualized OFS assessment model
Task 3: Perform OFS reference analysis
Task 4: Design/perform experiments for OFS assessment
Task 5: Analyze EEG/Non-EEG sensing modalities for OFS assessment
Task 6: Develop the software and perform software testing
Task 7: Performance evaluation using benchmark datasets
Task 8: Integrate the cognitive model with CATS
Task 9: Develop Relationships with Industrial Partners to Commercialize the Technology

NASA and Non-NASA Applications

The adaptive task management system provides sensitive and robust monitoring of human operator functional status in-situ and allows human and automated agents to adapt appropriately in NASA's aviation safety mission and in manned space flight and exploration missions.

The closed-loop task adaptive management system can also be applied to other operational environments such as military and civilian aviation, military UAV mission controllers, general transportation operators (particularly long haul trucking),and other supervisory control environments.

Firm Contacts

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NON-PROPRIETARY DATA