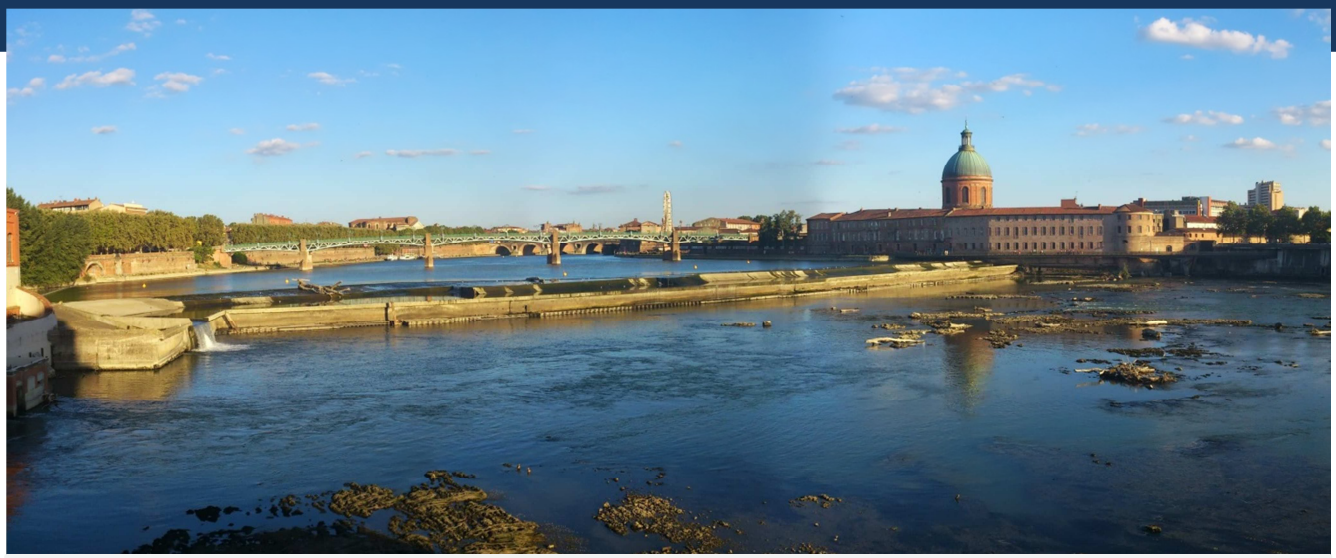

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Realtime Assessment of Team Workload and Collaboration during C2 mission flight

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Content

In the context of human machine teaming for mission effectiveness we report on some preliminary empirical findings, in which we measure and assess mental workload, physical workload, and stress on individual and team levels while fly-ing a mission scenario in a spaceship simulator. The simulator is operated by 4 entities; two human operators (tactical, operational), one AI (engineer) and a commanding officer. We implemented a Command and Control C2 scenario such that the spaceship encounters several mission phases and operations like search and rescue, repair, combat, transport, et cetera. These mission phases vary in complexity and difficulty and differentiate for and between the various operators. Phase duration is approximately five minutes. The total duration to complete the mission is around 45 minutes. The task of the tactical operator is navigating and fighting while the operations operator takes the responsibility of tracking and identifying targets. A simple AI represents the role of the on-board engineer and manages power consumption and damage control. The commanding (human) of-ficer is given a display presenting the observed versus expected human machine states which he can consider for realizing mission efficiency and performance. The data acquisition system is measuring the two operators (tactical and opera-tional) simultaneously (hyperscanning): both wearing an EEG device (Muse), GSR and heartrate device (Shimmer) and we track their mouse input while inter-acting with the simulation. The assessment modules take EEG for classifying mental workload, GSR and heartrate (Shimmer) for capturing the level of stress, and mouse movements elucidating physical workload. What is displayed are the observed versus expected physical and mental workload, stress and collaboration levels within and across the various mission phases for the different operators. The assessment application normalizes the workload and stress measurements based on the operator personal profile for which we used the NASA TLX score-card. Implications for human machine teaming, mutual human-machine under-standing, autonomy trade-off between human and machines, task automation are discussed.

Keywords : Mental workload, Acute stress, Emotion, Fatigue