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Dakota C. Evans, Mary Fendley

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Dakota C. Evans, Mary Fendley

Department of Biomedical, Industrial and Human Factors Engineering, Wright State University, 3640 Colonel Glenn Highway, 207 Russ Engineering Center, Dayton OH 45435, USA

evans.199@wright.edu,
mary.fendley@wright.edu

Abstract

Eye behavior metrics, time of run, and subjective survey results were assessed during human-computer interaction with high, low, and intermediate system autonomy levels. The results of this study are provided as a contribution to knowledge on the relationship between cognitive workload physiology and automation. Research suggests that changes in eye behavior metrics are related to changes in cognitive workload. Few studies have investigated the relationship between eye behavior metrics physiology measures and levels of automation. A within-subjects experiment involving 18 participants who played an open-source real-time strategy game was conducted. Three different versions of the game were developed, each with a unique static autonomy level designed from Sheridan and Verplank's 10 levels of autonomy (levels 2, 4, and 9). NASA-TLX subject survey ratings, time to complete run, and visual fixation rate were found to be significantly different among automation levels. These findings suggest that assessing visual physiology may be a promising indicator for evaluating cognitive workload when interacting with static autonomy levels. This efforts takes us one step closer to using visual physiology as a useful method for evaluating operator workload in almost real-time.

Relevance to industry

Potential applications of this research include development of software that integrates adaptive automation to improve human-computer task performance for high cognitive workload tasks (Air Traffic Control, aircraft piloting, process control, information analyst, etc.).

Keywords: human-computer interaction, cognitive workload, automation, physiology, visual physiology

1. Introduction