

A Dynamic Measurement of Operator Performance of Supervisory Tasks

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Abstract

It requires a great deal of continuous attention for operator in supervisory tasks. Either lacking in vigilance or information over/under load may lead to human errors and result in calamitous accidents. Therefore, real time understanding operator's mental state and performance in supervisory tasks is important. In this study, a supervisory task was designed to investigate the relationships among the operator's mental workload (NASA-TLX questionnaire), task performance (hit rate) and seven physiological signals (parasympathetic/sympathetic ratio, heart rate, heart rate variability, diastolic pressure, systolic pressure, eye blink frequency and blink duration). Furthermore, a regression model of the task performance and physiological indices would be constructed to predict the operator's mental workload and performance, and then enhancing the supervising safety. The experimental result indicated that the vigilance work significantly affected the operator's mental workload ($p < 0.05$) and operator's performance ($p < 0.05$). The correlation between subjective mental workload (NASA-TLX questionnaire) and work performance was significant ($r = 0.784$, two tailed $p < 0.01$). The task performance predictive model was also developed with $R^2 > 0.8$. The proposed model is expected to provide operators a reference value of their task performance by giving physiological indices. The proposed model can be applied to many fields such as main control room of nuclear power plant, air transportation control and radar vigilance, etc.
