Eye scan patterns in a simulated ambulance dispatcher's task

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Abstract

A simulated ambulance dispatch task was used to study the effects of mental workload on eye scan patterns. Participants received an extensive training to be able to perform well on every part of the ambulance dispatch task. During the experiment participants had to complete a scenario that consisted of six 15-minute periods; periods with low mental demand were followed by high workload demand periods and vice versa. Eye movements were recorded to compute fixation times, dwell times and entropy (a measure for randomness in eye scan patterns). These measures were calculated in five areas of interest. Results show that task performance was faster during high workload periods, while dwell times were shorter in these periods compared to lower workload periods. Entropy showed a more complex pattern of results. For time segments in which participants were involved in ambulance planning for ordered patient transport (A3 rides) entropy was lower in high workload periods, indicating a more systematic pattern of activities. However, for time segments in which the main task was selection of ambulances for emergency rides entropy was higher in high workload periods. It was concluded that participants use different task strategies in periods of high mental workload. Furthermore, it proved to be possible to detect these strategy changes by means of scan pattern analysis.

Introduction

Quality of task performance in complex dynamic tasks is strongly dependent on the workload level of the work to be done. Therefore, it can be very useful to provide the operator with adequate support or even to apply a form of adaptive automation (AA). Essential in such an approach is to find the right moment in time to offer support. If the help is offered in a time period in which the operator still has the feeling of full control over the situation the support is considered as superfluous and unnecessary. If the help is given too late the operator could have lost control, eventually even leading to erroneous task performance. The current state of the operator is of great relevance in this approach, while physiological state indicators, task performance indices and subjective feelings of the operator should be considered to be part of a state estimation method to be used in such an approach.

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