

Tactile land navigation for dismounted soldiers

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Abstract

In land navigation by dismounted soldiers, using a visual display obstructs the use of the soldier's eyes and hands for other tasks. This issue can be resolved by presenting navigation information on a tactile waist belt, which proved to be effective in previous studies. This paper presents an experiment focused on navigation, target detection and situational awareness (SA) in a multitask environment. The performance and subjective ratings for a tactile and two visual navigation systems were compared. 24 Soldiers navigated three densely forested routes at night, with live and silhouette targets along the route. The soldiers found the tactile display easy to use and reached high performance levels: more targets were detected and higher navigation speeds were reached on part of the route. The soldiers rated the tactile system high, and especially appreciated its hands-free and eyes-free aspect. However, the soldiers also indicated that the tactile system was less suited to build up global situational awareness, compared to a map display.

Introduction

Navigation by dismounted soldiers has been identified as having a potential for high workload and stress (Mitchell et al., 2004). The level of multitasking during land navigation will vary in accordance to the task demands in a particular mission. Relevant tasks include navigation in terrain that is unfamiliar and often difficult to manoeuvre, maintaining situation awareness, verbal communication, enemy detection and avoiding obstacles. Many of these tasks rely on visual information processing. In addition, navigation devices also usually require visual attention (e.g., compass, Global Positioning System (GPS) device). According to Wickens' Multiple Resource Theory (Wickens, 2002), competition for the same - in this case visual - modality can produce interference, and can ultimately lead to performance degradation. A possible solution to counteract this threat of visual overload is to present information via other sensory channels, for instance through the sense of touch.

The Multiple Resource Theory states that tactile information can be largely processed simultaneously with visual and auditory information. The goal of using the sense of touch is to present more information than a person could have processed using only eyes and ears (present information both tactilely and visually or auditory),

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