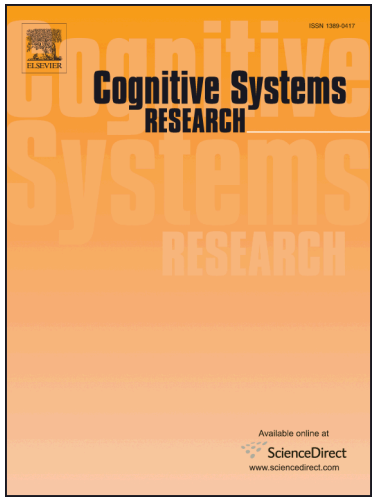

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Using Agent Transparency to Support Situation Awareness of the Autonomous Squad Member

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Agent transparency has been proposed as a solution to the problem of facilitating operators' situation awareness in human-robot teams. Sixty participants performed a dual monitoring task, monitoring both an intelligent, autonomous robot teammate and performing threat detection in a virtual environment. The robot displayed four different interfaces, corresponding to information from the Situation awareness-based Agent Transparency (SAT) model. Participants' situation awareness of the robot, confidence in their situation awareness, trust in the robot, workload, cognitive processing, and perceived usability of the robot displays were assessed. Results indicate that participants using interfaces corresponding to higher SAT level had greater situation awareness, cognitive processing, and trust in the robot than when they viewed lower level SAT interfaces. No differences in workload or perceived usability of the display were detected. Based on these findings, we observed that transparency has a significant effect on situation awareness, trust, and cognitive processing..

1 Introduction

Autonomous robots are being used more often in the military (Defense Science Board, 2016). In addition, they are being developed with increased autonomy and the ability to make decisions, regarding their goals, without the guidance of their human teammate (Klenk, Molineux, & Aha, 2013). The ASM is a novel human-robot interaction paradigm because the ASM is reactive to its human teammate's actions and does not take orders from them. This addresses the issues with current human robot interaction by allowing the human teammate to allow the robot to operate independently and only maintain awareness when the human teammate chooses to. Most human robot teammate systems require the human teammate to give orders to the robot and observe the outcomes of these orders (Miller, 2014). With the advancement in autonomous robots, establishing trust between robots and the teammate becomes increasingly important. One way to build trust between autonomous robots and its human teammate is to support the teammate's situation awareness (SA; Endsley, 1995) regarding the robot's current state/understanding of the world, reasoning behind its actions, and projected outcomes (Chen et al. 2014; Chen et al., in press). Providing this information to the teammate is known as supporting Agent Transparency and it is the foundation of the Situation awareness-based Agent Transparency (SAT) model (Figure 2) (Chen et al., 2014; Chen et al., in press).

(ASM, Autonomous Squad Member) (SAT, Situation awareness-based Agent Transparency)