Design and User Evaluation of an Interface Prototype that Adapts to the Operator's Cognitive Task Load

M. Grootjen [a, b]
Marc@Grootjen.nl

M.A. Neerincx [b, c]
Mark.Neerincx@tno.nl

K.D. Stolk [a]

J.C.M. van Weert [c]
Jochum@gmail.com

E.P.B. Bierman [c]
Bert.Bierman@tno.nl

[a] Defense Materiel Organization, Directorate Materiel Royal Netherlands Navy, Dep. of Naval Architecture and Marine Engineering, P.O. Box 20702, 2500 ES The Hague, The Netherlands
[b] Technical University of Delft, P.O. Box 5031, 2628 CD Delft, the Netherlands
[c] TNO Human Factors, Kampweg 5, P.O. Box 23, 3769 ZG Soesterberg, the Netherlands

Abstract

Earlier research showed the importance and usefulness of the Cognitive Task Load (CTL) model and method in the design and evaluation of new systems in process control. The CTL model describes task load using three variables: time occupied, task set switching and level of information processing. After validation of the model, an interface was developed that supports specifically on those three load factors. To enhance operator support, current research shows the design and evaluation of different levels of automation for this interface. User evaluation shows very positive results on the support system in general and findings are in line with earlier research. However, results show no effects between levels of automation on performance and mental effort. Possible explanations can be found in the experimental and interface design. Modifications to the interface, to achieve higher situational awareness, trust and better results on performance and effort, are discussed. This paper concludes with a short overview how critical areas of effort, performance and CTL can be determined. Together with real time CTL information these areas can be used to adapt support for optimal human machine operation by switching between levels of automation.