

The different human factor in automation: the developer behind versus the operator in action

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Abstract

The rapid technological improvements in computer-based control systems make any direct comparison of performance between human operators and machines obsolete. Recent studies of automation do not concentrate on performance oriented comparisons but rather emphasise unwanted side-effects of function allocation, such as loss of competence, deficiencies in situation awareness, complacency, mistrust, etc. We focus on a “forgotten” question of function allocation: How well can future events be prospectively handled by developers compared with the operator’s handling of the same events when they really happen? Developers of automation systems are able to program suitable algorithms for predictable problems. Human operators are needed for unpredictable situations. But analyses of accidents reveal that developers of automation are unable to consider all possible combinations of disturbances, while human operators are unable to act as quickly and accurately as needed. This represents a serious problem. A Socially Augmented Microworld (“SAM”) was developed for the experimental comparison of developers’ anticipation and operators’ actions. We analyse the state-of-the-art concepts of function allocation from the described perspective. Developers and operators have different resources in anticipated vs. real-time process control. These resources are discussed and the methodological approach of “SAM” is explained. First laboratory studies are reviewed.

Introduction: a different perspective on function allocation

Recent technological developments have made one thing clear: as machines get smarter they still cannot consider all factors of human decision making (Norman, 2007). So, despite the exponential improvement of the technological basis for automation, it seems that Price’s promising, more than 20 years old statement has not been culminated in an always reliable automation: “capabilities of machines to perform “intelligent” acts such as automation and decision-support are ever improving.” (Sheridan, 2000, p. 204). Many implicit procedures and explicit principles of function allocation have been discussed: left-over and compensatory strategy had been replaced by a complementary approach (Hollnagel & Bye, 2000). Yet all have one thing in common: the comparison or integration of man and machine, i.e. their capabilities. Our approach could be described as human-centred in

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