

Human control of dynamic slow responding systems – Effects of action regulation

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Abstract

This paper presents preliminary data from a currently ongoing micro-world study where the operator faces a complex and dynamic slow-responding task. In the study, operator actions have been regulated in terms of how often it is possible to take action, corresponding more or less well to the temporal development of various processes in the micro-world simulation.

Time and Control

Although time is one of the most important parts of our everyday context, and thus an essential component of control and human factors, little research has been done about time and control (with a few exceptions, see Decortis & Cacciabue, 1988; DeKeyser, 1995; DeKeyser, d'Ydewalle & Vandierendonck, 1998, Hollnagel, 2002). To clarify, some basic concepts about properties of time must be introduced. The meaning of properties of time, like fast, slow, overlapping, etc are a result of relations between the controller and the target system. A simple example is “fast” and “slow”. If a person is trying to catch balls thrown at him/her, it is necessary to be able to catch the first ball before the second ball has to be caught. If the balls are thrown at a higher pace than the controller can catch, they are thrown too fast and the controller is too slow.

Problem

It is a known fact that human operators have difficulties controlling systems that respond slowly or provide delayed feedback (Crossman & Cooke, 1974; Brehmer & Allard, 1991; Dörner & Schaub, 1994; Langley, Paich & Serman, 1998) both in everyday situations and complex control tasks in working life. A simple example from everyday life is cooking. Sometimes when we put something on the stove, we overcook it or burn it. Normally this is not because we are not aware of the fact that we should monitor the progress of the cooking, we simply are unable to keep the fact that we should monitor in our working memory. From an operator perspective, the problem is that time between action and response is so long that the operator either forgets that he/she has done something, and therefore gets surprised when the