Performance measurement in driving simulators

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Abstract

This paper is the result of a study aimed at improvement of Performance Measurement and Feedback (PMF) systems in driver-training simulators, and thereby formulation of guidelines for the development of these systems. First the major shortcomings of some existing PMF systems will be reported. These are characterized mainly by a lack of application of knowledge concerning the driving task and the way student drivers learn perceptuomotor skills. More important for the present purposes, however, is the manner in which relevant knowledge may be implemented in a PMF system for a driving simulator. Therefore, five principles that are crucial for a successful development of PMF systems for training simulators will be presented. These principles refer to the validity of the simulator for different subtasks, the relevance of subtasks for the training, the relevance of measured variables for subtasks, the manner of metric construction, and the comprehensibility of scores. In the design of a PMF system these principles should be applied systematically and in a stepwise manner. This was accomplished for two driving simulators of the Dutch Army. The global characteristics of these systems will be briefly presented and discussed.

Introduction

For the training of tracked-vehicle drivers (Leopard 2 and YPR-765) of the Netherlands Royal Army, two full-scale driving simulators were developed. These simulators include, among other things, a computer-generated and collimated image, a six degrees-of-freedom moving-base system and an instruction panel.

In order to enhance the instructor's efficiency, both simulators also are equipped with a so-called 'Performance and Marking' system, developed by the manufacturer. This is a Performance Measurement and Feedback (PMF) system that measures driving performance. Training with such PMF systems may provide two major advantages above usual training on a driving simulator: explicit feedback to the student and more objective performance judgements by the instructors (Korteling, 1990a). Feedback is of primarly relevance for the student, who needs knowledge of results (Adams, 1979, 1987; Schmidt, 1975, 1988), and objectivity is primary relevance for the instructor, who wants to compile an objective appraisal of the strong and weak points of a student's driving behaviour. These advantages are closely related. Objective performance data, for example, enable the instructors to