



## Human Performance Modeling Technical Group

The Human Performance Modeling Technical Group focuses on the development and application of predictive, reliable, and executable quantitative models of human performance. It considers the human, engaged in some goal-directed behavior, in the context of a specific task environment.

### CLINICAL FOCUS

Medical systems are increasingly dependent Models of interest to the TG encompass the scope of systems of interest to the Human Factors and Ergonomics Society. Hence, we would equally promote models of physical activity, isolated aspects of human performance, models of integrated perceptual, cognitive, and motor systems, and integrative ergonomic modeling. The TG will promote and disseminate (a) the basic science foundation of such models, (b) engineering research needed to apply human performance models to human factors applications, (c) new formalisms for human performance modeling, and (d) techniques for evaluating the predictive success of such models.

We see the TG as a forum for testing modeling approaches that are emerging from the basic research community against the hard realities of human factors problems. Contrariwise, we see the identification of challenges faced by the human factors community in human performance modeling as providing significant feedback to more basic researchers on the problems to be overcome and the opportunities for improvement to the research base.

### THE GROWTH OF HUMAN PERFORMANCE MODELING

The new TG is an outgrowth of the renewal of interest in the human factors community towards the development of engineering style approaches appropriate for problems in human factors. This movement has been centered on quantitative models.

In many engineering domains (including many human factors areas), the space of design possibilities is too large to allow empirical assessment of it all. Some winnowing of the space is accomplished through guidelines and intuition, but . . . in many engineering areas, design guidance and evaluation rely on quantitative modeling, and modeling practices have become codified enough that software tools to support such modeling are widely available (Byrne & Gray, 2003).

Newell and Card (1985) warned the human factors community that the way to deal with scientists, engineers, and designers was not through the use of platitudes or by advocating the empirical testing of an infinite number of design alternatives but, rather, through the use of predictive and reliable quantitative techniques. We expect that the HPM-TG will be a way to bring modern efforts in quantitative techniques home to HFES.

### WHAT IS NOT ENCOMPASSED BY HUMAN PERFORMANCE MODELING?

Some social scientists use the term model to refer to verbal-analytical models. Sometimes block diagrams that describe the flow of information, material, or action are considered models, as are

physical reconstructions of reality. We specifically exclude these uses of the term model from what we intend this TG to be about. The TG will promote models based on abstractions that involve explicit mathematical or computer-based formalisms and that have an executable or computable representation.

Models that are useful in human factors work capture some aspect of human behavior in a task-related setting. That is why we refer to them as human performance models. The psychological literature is full of examples of theories and models of highly compartmentalized but computable representations of memory behavior, learning behavior, perception, and movement. However, only some of these have the potential to be useful as we strive for larger, more integrative representations of human task behavior.

Computational models of mental workload, human response to stress, and cultural variants on behavior are clearly relevant and useful.

#### **WHAT IS INCLUDED**

Although wishing to differentiate ourselves from existing HFES technical groups, we wish our charter for human performance modeling to be interpreted broadly. This charter explicitly includes the following: First are physical models included in software such as the Jack, Safework, and HUMOSIM programs. Such digital human models and virtual dynamic manikins that represent the anthropometry, movement capabilities, and sometimes strength of people are clearly relevant. Second, the roots of human performance modeling are in Control Theory (Pew & Baron, 1983) and this approach remains a strong and vibrant part of human performance modeling (e.g., see Jagacinski & Flach, 2003). We expand on this to include new formalisms emerging from disciplines such as machine reasoning and operations research as they are used to define the optimal performance that may be achieved, regardless of human limits, in a given task environment. Third are models based on cognitive architectures. Through cognitive architectures, theories of the control of cognition and theories of functions such as memory, attention, perception, and action are embedded in software. Models written using this software are executable computer programs. They are the main source of models that truly integrate perception, cognition, and action in a task context. Finally, we also include part-task models (such as models that predict excessive physical stress) that have the potential to integrate with integrative ergonomics models.

In summary, this TG will encompass all quantitative executable representations of human performance that are potentially useful in human factors research or application. For more information on the HPM TG visit <http://www.sys.virginia.edu/hfes/hpm/>

#### **BENEFITS OF MEMBERSHIP**

HPMTG performs a variety of functions and services including sponsoring technical paper sessions, special symposia, and poster sessions on topics in human performance modeling at the HFES Annual Meeting. Members also receive the HPM Newsletter and have access to the HPM Web site and Internet List Server that provides important news, descriptions of current research, discussions of current issues, and announcements of interest.

It is not necessary to be an HFES member to join HPMTG. Additional information or membership in HPMTG can be found in the HFES Web site <http://hfes.org> or through the HPMTG Web site <http://www.cogsci.rpi.edu/cogworks/hpm-tg/>