



Chapter 9

Human Learning Models and Data Collection Over the “Long Haul”

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Modeling human learning and performance that also involves data collection requires teamwork, most often inter-disciplinary. When research is of long duration, changes occur in personnel and even in the research areas. When computing is a core component, technology change presents additional issues, in how to best exploit new technology and to preserve already successful work. This chapter offers solutions and suggestions based on our experience and ranging from theory-based to practical approaches.

INTRODUCTION

A programmatic research program spanning several years encounters many challenges, increasing when the research is interdisciplinary and affected by rapid change in information technology (IT).

Our research meets these criteria: in progress for several years; inter-disciplinary faculty and students, in computing sciences and psychology; and extensive and varied computing, in the form of multiple simulation models, animations, and distributed data and information. Simulations model memory strategies used by children with and without mental retardation (Anumolu et al., 1997; Bray, Reilly, Huffman et al., 1998; Bray, Reilly, Fletcher et al., 1998).

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Diversification in our research starts from the machine context, i.e., (networked) workstations and PCs, with different configurations for behavior and computer science participants. Core modeling and general software extends over: PDP and MATLAB neural network packages; MATLAB fuzzy systems package; C, Java, GPSS-H, Prolog for complementary functionality; Tcl/Tk, Proof Animation, and OpenGL for animation; and CGI and Java for networking. Despite this variety, pressures arise for more!

Rapidly changing IT helps and hinders. On the positive side, there are improvements in machines and communications. Unfortunately, the opportunities demand time, and the problem becomes “Can we appropriately exploit them, given the learning curve and the many constraints imposed by maintaining and expanding current applications.”

SOLUTIONS AND SUGGESTIONS

The above discourse deals with problems, mainly, some identifiable in increased opportunity! Our solutions and suggestions fall under these categories, each having IT education implications:

- A theoretical view of the overall modeling project in terms of a model (M) and a modeling framework (MF), with practical realization (case studies);
- Animation, promoting communications and defining requirements for models admitted into the modeling framework;
- Networked solutions, speeding data and simulation results between computing and empirical studies lab settings;
- Attention to modeling tools and their relationships, and their roles in the project, e.g., prototyping, executable specifications, and model abstractions; and
- Educational interventions: course modules, seminar materials, etc.

THEORY SCOPING

We mentioned “multiple” simulation models above. These are deemed necessary for the studied phenomena, i.e., the general knowledge gaps on human information processing. Casually viewed, our effort may appear as a collection of (about six) models. An integrating view “sees” a model (M) and a modeling framework (MF). The model (M) is an almost fixed entity, changes being allowed only to fit data statistically. The modeling framework (MF), while not eschewing statistical fits, is open to (and seeks) alternative modules, limited only by usual scientific criteria, e.g., parsimony, precedence in the literature, etc. M builds on Anumolu et al. (1997) and MF emerges first in Bray et al. (1997) and in more detail in Reilly, Bray et al. (1998). The duo, M and MF, create a modeling “style,” some aspects of which emerge as we proceed.

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