

Reaction to Foshay and Preese Reaction

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Foshay & Preese (F&P) and Scandura (S) define knowledge representation differently. F&P use the generic term “automation”, whereas S argues that representing knowledge as ASTs represents a qualitative rather than incremental advance. Actual savings in development costs may vary from F&P’s 45-50% to S’s 55-60%. Pedagogical options can be set in seconds without “tweaking” and incomplete analyses may automatically be compensated by authors setting more stringent requirements for mastery.

Keywords: Authoring system, computer based instruction, adaptive tutoring, configurable tutoring, structural learning theory, abstract syntax trees, AuthorIT, AutoBuilder, TutorIT.

While very positive, one senses residual skepticism in Foshay and Preese (F&P) reaction.

The most fundamental issue pertains to the way knowledge is represented in AuthorIT. F&P use the generic term “automation”. Knowledge representation (KR) is more than just that. It is widely recognized that KR has been THE major bottleneck in developing advanced (aka intelligent, adaptive) instruction (e.g., Shute et al, 1999).

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AuthorIT's use of Abstract Syntax Trees (ASTs) with semantic attributes represents a qualitative rather than incremental advance in KR. Although hierarchies are hardly new, they have heretofore either been loosely defined or required the introduction of non-hierarchical relationships – neither of which provide an explicit basis for automation. ASTs as detailed in Scandura (2003, 2005) show how any idea or process can be refined into arbitrarily small executable processes.

This advance has fundamental implications – some summarized in my highlights paper (THIS ISSUE). As detailed in Scandura (2005) the structure of AST-based rules is unique in providing a sufficient basis for instructional decision-making. Accordingly, F&P overlook perhaps the most significant advantage of AuthorIT development: Authors can define any number of completely different delivery modes at no additional cost by simply setting options in the Options Tool. Developing once to get multiple products has benefits ranging from running heretofore impractical experiments to potential commercial opportunities.

Two specific points:

1. I fully agree with F&P that it is hard to assign precise percentages to AuthorIT savings. Given eventual maturity, they should reach somewhere between F&P's estimate of 45-50% (10% + 10-15% +25%) and my 55-60% (plus to-be-determined savings in media development because transitioning is automatic). To encourage further analyses, AuthorIT is now available for research purposes.
2. As for F&P's two qualifiers:
 - a. Setting options in AuthorIT's Options Tool can be done in seconds. Unlike expert system development, "tweaking" is not an issue once one learns how to use the tool.
 - b. While AutoBuilder (in AuthorIT) makes it possible to represent knowledge with arbitrary degrees of precision, authors can compromise as desired. It is easy to start an analysis no matter how complicated the problem domain. Analysis only needs to go as far as the author wants. Given incomplete analysis, TutorIT's decision making becomes less precise (typical in contemporary CBI). AuthorIT compensates by allowing the author to set more stringent requirements for mastery (e..g., five items correct on a given kind of problem rather than just one — as experiments show to be sufficient when refinement reaches atomicity).

Overall, F&P (2005) provide a valuable benchmark against which to evaluate authoring systems. It is a benchmark that calls for further more definitive research.

ADDITIONAL REFERENCE

Shute, V. J.; Torreano, L. A. & Willis, R. E. Exploratory Test of an Automated Knowledge Elicitation and Organization Tool. *International Journal of Artificial Intelligence in Education*, 1999, 10, 365-384.