Chapter 37

VIA: Using GOMS to Improve Authorware for a Virtual Internship Environment

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ABSTRACT

This chapter describes the testing of the computer-human interface of Virtual Internship Authorware (VIA), an authoring tool for creating web-based virtual internships. The authors describe several benchmark tasks that would be performed by authors who create lessons on the subject matter of land science. Performance on each task was measured by task completion times and the likelihood of completing the task. Data were collected from ten novices and three experts familiar with the broader learning environment called Intershipinator. Task completion times and the number of steps to complete the tasks were also modeled by GOMS (Goals, Operators, Methods, and Selection), a theoretical model that predicts these measures of user interaction based on a computational psychological model of computer-human interaction. The output from the GOMS simulations of task completion times and number of steps robustly predicted the performance of both novices and experts. Large deviations between model predictions and human performance are expected to guide modifications of the authoring tool.

DOI: 10.4018/978-1-5225-8356-1.ch037

INTRODUCTION

One of the major bottlenecks in developing learning environments is designing authoring tools for subject matter experts to create content and recommended learning strategies (Murray, Blessing, & Ainsworth, 2003; Sottilare, Graesser, Hu, & Brawner, 2015). In an ideal world, the *authorware* would be so easy to use that the learning materials, curriculum, and pedagogical strategies could be created by a wide range of subject matter experts. Moreover, the experts who use the authorware would be able to create lessons even when they have modest expertise in digital literacy, minimal computer programming experience, and no more than intuitive knowledge of the science of learning. They would be able to assemble impressive learning environments that integrate text, diagrams, video, chat facilities, conversational agents, interactive simulations, and other materials that may already exist in different media, modalities, formats, and types of interaction.

Unfortunately, that ideal remains elusive to developers of most advanced learning environments. Instead, subject matter experts typically provide content to computer programmers and pedagogical experts who end up being responsible for transforming the various materials into interactive learning environments. Improvements in authorware may only occur after developing a systematic scientific approach to conducting iterative testing and modification of the content, pedagogical strategies, and human-computer interfaces for the end users.

This chapter describes our approach to improving the human-computer interface of the authorware for a virtual internship project called *Internshipinator* (Shaffer, Ruis, & Graesser, 2015). The authorware is called VIA, which stands for *Virtual Internship Authorware*. We use the term authorware in a general sense here, duly recognizing that a software product from Adobe, called Authorware (http://www.adobe.com/products/authorware/), has existed for decades. VIA is a specific type of authorware that developers of learning environments can use to create virtual internships in a web-based learning environment.

Virtual Internship Authorware (VIA)

In one example, a virtual internship called *Land Science* (Bagley & Shaffer, 2015), students play the role of interns at Regional Design Associates, a fictional urban and regional planning firm. Their problem solving task is to prepare a rezoning plan for the city of Lowell, Massachusetts that addresses the requests of various stakeholder groups (business, environment, industry, or housing). The stakeholders have views on socioeconomic and ecological issues, some of which are incompatible. The students read about the different viewpoints and preferences of stakeholders and eventually prepare individual reports on how to handle competing concerns. While making these decisions, students discuss options with their project teams through online chat. They also use professional tools, such as a geographic information system model of Lowell and a preference survey to model the effects of land-use changes with feedback from mentors. At the end of the internship, students write a proposal in which they present and justify their rezoning plans. During this process, a mentor keeps the small group of three to four students moving forward, but does not encourage any particular solution to the problem solving tasks at hand. The ten-hour simulation environment is divided into fourteen rooms with different goals and objectives, as well as a chat capability associated with each room.

Land Science is clearly a complex internship-based learning environment with many different learning resources, communication media, recommended agenda, and instructions. The author of the environment has to create all of this material for the virtual internship, which is quite a challenge. Authors with high