An Authorware Prototype for Interactive e-Learning & Visualization

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Abstract

Many would argue that visualization skills represent the most indispensable tool set that landscape architects can employ throughout their careers. This session demonstrates how Macromedia Authorware (with other important software) can be used to create an interactive e-Learning application that features a multimedia visualization experience. This digital prototype attempts to bridge the gap between common landforms & site structures and a designer’s ability to understand/visualize them in two & three dimensions. Furthermore, it strives to improve designers’ abilities to clearly and easily express their ideas to instructors, peers, clients, or themselves.

Introduction

Many would argue that visualization skills represent the most indispensable tool set that a landscape architect can employ throughout project design, documentation, and implementation. Before putting pencil to paper or hand to mouse, one must first develop a mental image of her/his ideas. As they strive to work smarter with emerging and rapidly advancing computer technologies, landscape architecture students must enhance and expand their abilities to visualize landforms. This presentation offers a look at phase two in an ongoing effort to maximize the potential of Macromedia Authorware for creating a multimedia e-learning application that teaches landscape architecture students a unique vocabulary of landforms and site structures in two and three dimensions. Following a quick review of phase one features (shared at the 2003 THE Forum) is an illustrative tour of the latest advancements (more imagery and interactivity for comprehensive and hands-on explorations) to this application, including a look at its graphic content, benefits, limitations, and generally how and why it was developed.

Software, Content, Creation, and Testing

Macromedia Authorware is a leading visual rich-media (digital interactive media that exhibits dynamic motion) authoring tool for creating e-learning applications. Its user-friendly visual flow-line interface requires little to no programming experience. Packaged Authorware applications are deliverable via the Web, a local area network, or a CD-ROM. These delivery options easily facilitate on-site or distance learning initiatives, offering users opportunities to explore landform visualization in traditional classrooms/laboratories or in the comfort of preferred surroundings. Furthermore, Authorware tracks user performance, providing clear paths to data analysis for research and learning outcomes.

A powerful supporting cast of software joined Authorware to create an engaging and effective final product. Autodesk AutoCAD was used to establish the framework for the two- and three-dimensional landforms and structures. Eagle Point LANDCADD and Autodesk Land Desktop were used to generate 3-D models of all forms. Rendering, lighting, interactive QuickTime VR movies, and plan & model images (e.g., JPEG, GIF) were created using auto•des•sys form•Z. Adobe Photoshop was used to edit (e.g., brightness, contrast, size) various images as needed. Authorware is where dozens of different landforms & site structures were organized in a user-friendly interface. The interface resembles a non-linear Web environment, where buttons, text narrative, and graphics on one screen are linked to similar content on others, allowing users to navigate freely.
within an interactive e-learning environment equipped with motion, pull-down menus, and button, hot spot, text entry, hot object, and target area interactions. General content is revealed in the form of two-dimensional contour plans, three-dimensional terrain models, interactive digital movies, photographs, descriptive narrative, and quiz questions. Specific landforms and site structures highlighted throughout include summits, depressions, ridges, valleys, concave & convex slopes, uniform slopes, terraced slopes, gentle slopes, ditches, swales, culverts, road crowns & curbs, retaining walls, steps, ramps, and foundations.

In order to establish value and justify further development, before-and-after testing was performed on a very early edition to determine immediately whether such an application might help, hinder, or have no effect on students’ abilities to understand the given vocabulary of landforms. Between paper-and-pencil pre- and post-tests, students were asked to explore completely the visualization application. According to t-Test (matched pairs, two-tailed, n=31) results, there was extremely strong evidence (0.00008, 0.00018, and 0.000003 at α=0.01) of improvement on multiple-choice questions and landform sketching exercises from pre-test to post-test. This was clear evidence that the application appeared effective at increasing students’ abilities to understand landforms.

**Layout and Navigation**

As with other software applications, a simple double-click on its desktop icon will begin the application. The window size (resolution) is 800x600; the small size helps ensure that the application is visible to more users (e.g., people who still use 15” monitors). The application begins with several informative introductory screens. First is an ID screen where a user is asked to enter the last four digits of her/his Social Security number for identification and data output file purposes; a .TXT file of that name is generated upon exit from the application, simplifying the retrieval of user performance data for analysis purposes. Clicking the Right Arrow button moves the user on to the next screen (or Left Arrow to go back). Second through sixth screens include the welcome, title & author information, brief introduction and purpose statements, directions on how to use the application, and definitions of terms important to a user’s understanding of the material presented.

The hub of all activity is the seventh screen – the Table of Contents. This screen contains numerous named buttons that lead to specific landforms and site structures, a button leading back to the introductory screens, and a button leading to a quiz. Upon clicking a specific landform button, the user moves to that landform’s Home screen. Each Home screen contains the name of the landform, a short description of it, and a 2-D contour plan adjacent to its corresponding 3-D model. At the lower left are four buttons that lead to further exploration of the landform (e.g., interactive QuickTime VR movies, photographs of real landforms, and pertinent notes & comparisons). A Table of Contents button is located on each Home screen and exploration screen to allow the user to move on to another landform at any time. An empty box next to each landform button is marked with an X after its four exploration screens have been visited once. Only after each landform has been explored completely is the user given access to the Quiz button; this ensures that the user has at least visited each landform once before testing her/his knowledge.

The quiz begins with a simple matching exercise where the users must click-and-drag a landform name and drop it on the appropriate definition. A 20-question multiple-choice quiz follows. Questions were designed using Bloom’s Taxonomy to vary the level of difficulty. After the quiz, the user is given feedback for her/his performance (e.g., 18-20 = excellent, 15-17 = average, and below 15 = poor). One last click (on the Next button) exits the user from the application. A data file (.TXT format) is then automatically generated (based on a calculation created during development) by Authorware and saved in a specific folder on the C:\ drive of the computer being used. The file contains information such as time spent in the application, time spent exploring each landform, number of matching questions correct on first try, and number of multiple-choice questions correct on first try.
Benefits and Limitations

This prototype application represents a potentially significant advancement in landscape architecture education and research, and it could revolutionize the way many traditional courses are taught. Besides providing a means to supplement traditional classroom instruction in design and site engineering courses, it promotes accessible educational opportunities (distance learning). It aids students in recognizing and understanding relationships between landforms and other built elements in two and three dimensions. It allows users to easily move between multiple landforms with a simple mouse click. It tracks user performance and yields a resulting data file. Finally, using this application might just make learning more effective, engaging, and interactive than the traditional presentations in a book or through drawings on the chalkboard. If this tool can pique their interests, students may retain more of what they learn.

There were only a few limitations realized during development. First, Authorware has a relatively steep learning curve. Among other things, it requires the use of various scripting, calculations, functions, and variables. All of these can be overwhelming without some expert assistance, prior experience, or a model from which to work. Priced above $3000.00, Authorware’s cost can be prohibitive unless one is committed to it. Finally, Authorware development and landform design & modeling require a significant time investment for design/ideation as well as production/development (a likely factor of Authorware’s steep learning curve). However, the benefits far outweigh the limitations.

Future Development

The opportunities for further advancement of this application seem endless and exciting! Some features that will be part of future editions include electronic evaluation/testing (e.g., digital pre- and post-tests for uniformity & reliability and immediate data collection/feedback), new interactivity (e.g., drag-and-drop, sound effects, voice narration, animations, navigable & modifiable landforms), improved assessment (e.g., interactive questions – sketching, labeling, moving; large pool of randomly appearing questions, performance feedback identifying specific deficiencies), additional landform examples (e.g., plans, models, photos; fully developed residential and commercial sites for diversity and comprehensiveness), cultural and historical perspectives (to add meaning and value), and increased application window size (e.g., 1024x768 for better clarity/legibility).

Summary

The ultimate outcome of this research/creative endeavor focuses on teaching students essential landform visualization knowledge and skills that will be utilized in their landscape architecture coursework and into their professional careers. This digital prototype attempts to bridge the gap between common landforms & site structures and a student’s/designer’s ability to understand and visualize them. It represents one example of the digital explorations happening across the profession that strives to improve designers’ abilities to more clearly express their ideas for instructors, peers, clients, or themselves.

Software Web Links

Adobe Photoshop: http://www.adobe.com
Autodesk AutoCAD, Land Desktop: http://www.autodesk.com
auto•des•sys form•Z: http://www.autodessys.com
Eagle Point LANDCADD: http://www.eaglepoint.com
Macromedia Authorware: http://www.macromedia.com