

# INSTRUCTOR

## **Let the Experts Guide the Use of Simulation Software**

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*Abstract. A new guidance concept is presented, which encourages third parties, like educators, to provide additional, comprehensive information to users of highly complex (e.g. simulation-) software, helping them to flatten the steep learning curve by understanding the impact of decisions made during the input/design process.*

*Keywords. Software; Simulation; Education; Instruction; Guidance.*

### **Introduction**

Effective use of simulation software (e.g. energy simulation tools) requires significant background knowledge for the development of reasonable models and the production of sufficiently accurate results. Most of these simulation tools have a very steep learning curve, which is considered the main barrier that prohibits many professionals and/or students from using them (Donn, 2001; Hien, 2000). The help files and/or manuals usually provided with simulation software do not extend beyond user interface issues.

An experienced user or a professor, however, could provide new users or students with additional knowledge that addresses issues beyond user interface, i.e., modeling, background and theory to specific design parameters or even interpretation of results. Unfortunately such knowledgeable persons are generally not involved in simulation software development and the preparation of the associated help files and reference manuals. Moreover, different types of users need different types of help and reference, i.e., a single manual may not necessarily be best for all users.

Instructor is a software extension to simula-

tion tools that allows non-programmers to prepare instructions and guidelines that can be interactively used during actual use of simulation software. Most important, instructions and guidelines can be prepared on completed versions of the simulation software, without need for access to the source code or recompilation.

One of the main objectives of Instructor is to flatten the steep learning curve of simulation software, which could lead to a broader employment of simulation tools in the daily work of architects. Therefore the aim of the Instructor tool is to build a bridge between software developers and educators, or other knowledgeable persons, that allows for easy preparation and presentation of integrated help screens, guiding users through the use of the simulation software.

### **The Concept**

The Instructor approach allows the software management to be done by programmers, while the knowledge for the use of the simulation software is provided by educators and/or other persons with extensive knowledge on the subject matter of the simulation tool. The Instructor can be easily integrated into software packages by

simply adding a few lines of code and providing libraries to the project before compilation (Reichard, 2003). An educator is then free to choose which information s/he will provide. By using XML and HTML technology, the Instructor offers extensive flexibility in presenting educational topics using multimedia, along with additional links to web-related information available through the Internet. This approach allows different educators (e.g. a group leader at a company or a professor at a university) use their own educational concepts, and, if desired, share and exchange it with other educators. Currently the implementation is restricted to Windows™ applications and C++ as the programming language.

To demonstrate the Instructor concept, Instructor has been implemented into the Building Design Advisor (BDA) software (Papamichael, 1996). This software supports integrated use of multiple simulation tools, in a single application and offers a very large variety of parameters. However, assignment of values to these parameters requires significant knowledge, making the BDA a very appropriate application for the use of Instructor. Instructor information was entered for various input parameters of the BDA software, e.g. for the “New Project” command, which invokes a dialog window, for general Project information, such as building type and location (Figure 1).

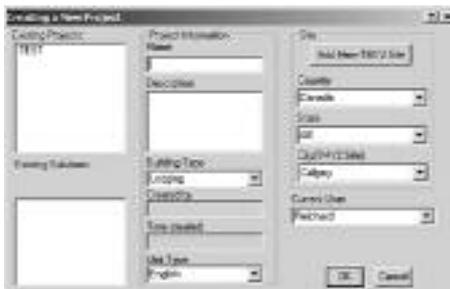


Figure 1. The “New Project” dialog of BDA

## Implementation

The Instructor software consists of three modules. The first module is used by simulation software developers to specify sets of data for instructions. The second module is used by educators, i.e., knowledgeable users (e.g., professors), to specify any type of information they want to guide the end user in properly using the simulation software. The third module is called by the simulation software and is used to interact with the final user, to dynamically create and present the previously defined sets of instructions.

### The Developer module

The Developer module allows developers to define sets of parameters for each Instructor entry point he wants to offer. The parameter sets include information about each parameter, e.g., name, type, default value, etc., which are stored as Developer files (\*.dev) in XML format (www.w3.org/XML: May 2003). Developer files can be modified wither through the Developer module user interface (Figure 2) of by directly editing the Developer file using a text editor.



Figure 2. The Developer module

### The Educator module

The Educator module allows experienced users (e.g. professors) to provide comprehensive information to other users (e.g. students) to help them make better decisions on proper use of the

simulation tool as well as improved building design.

The Educator module has its own user interface (Figure 3), which allows educators to load Developer files, choose specific parameters and define HTML pages that provide the desired instructions and guidance. The intrinsic instructions are saved as HTML files, which are displayed automatically during the execution of the

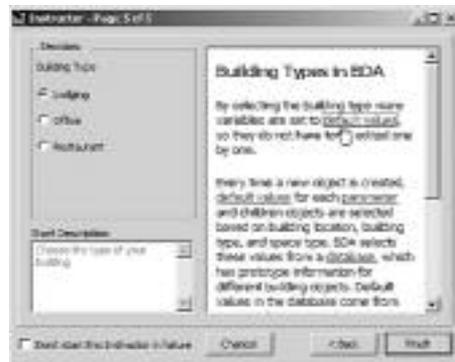
Figure 3. The Educator module



Figure 5. The Instructor called from the BDA simulation software

to step through each parameter, review the available information and make decisions on the values of input variables.

When the BDA software reaches an Instructor entry point, e.g. the “New Project” command, it bypasses its own user interface (Figure 1) and offers control to the Instructor software, which displays the Instructor interface (Figure 4) and



simulation software and allow the Instructor software to take control.

Since the Instructor software uses the OCX control provided by the MS Internet Explorer™, all common HTML techniques can be used for the guidance pages, like animated gif’s, flash animations, etc. as well as “external” links to any URL in the world wide web for further information.

#### The End-user Interface – The Instructor

When the end-user interacts with the simulation software and reaches a point, where an Instructor set can be launched, the software first checks, if there is an appropriate Instructor file available. If a corresponding file is found, Instructor is launched and takes control displaying the Instructor user interface. This interface works like most “wizards,” allowing the end-user

passes control back to the BDA after the user completes the instruction process.

Once all decisions are made, the user can deselect the set for future use, if s/he is already familiar with the content. When the “Finish” button on the final page or the “Cancel” Button on any page is hit, the interface is closed and a decision file is written to the hard disk. The information in this decision file is then retrieved by the calling application using a set of functions to read parameters of XML decision files.

### Conclusion

By using XML and HTML technology, the Instructor tool offers extensive flexibility in presenting educational topics during the use of simulation tools, using multimedia along with addi-

tional links to web-related information available through the Internet. Moreover, Instructor allows the specification of arbitrary information for any set of input parameters without need for recompilation of the simulation software. The value of the information is maximized because the information is provided when most needed, i.e., during the decision-making process of specifying input to simulation tools or selecting output. The Instructor approach allows different educators (e.g. a group leader in a company or a professor in a university) to use their own educational concepts, and, if desired, share and exchange it with other educators.

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