

## **FRESHMAN ENGINEERING COURSE MODULE UTILIZING A 3 D MODELING TOOL**

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### **ABSTRACT**

Instructors of freshman level Introduction to Engineering and Design courses are faced with numerous objectives, some of which are conflicting:

1. interesting projects - from both the professor and student viewpoint
2. projects with elements of design
3. project with the latest technology
4. retention related issues

The engineer has always been in forefront of visualization tools, since 'a picture is worth a thousand words'. Two-dimensional drawing and simulation packages are quite well established and useful. Three dimensional modeling tools take the engineer to the next level, and are far more descriptive. This paper describes a module utilized in a freshman level design course based around a 3 dimensional modeling tool. Additionally, the module is easily available on the web or on CD ROM for immediate utilization by instructors. However, other modules using other tools could be developed. We utilize a product that has an interesting demonstration program, which looks remarkably like a video game. The freshmen utilize existing skills, synthesize new problem solving mechanisms, and quickly adapt to the three-dimensional drawing capabilities - in addition to accomplishing an enjoyable new task.

### **Introduction to 3D design**

Modeling object in 3D offers a great advantage over 2D drawing. Once the geometry of an object is expressed, it can be used to render images from any angle or distance, the object can be dimensioned, rotated, moved around and textured in an infinite number of ways. However, describing the geometry of an object in 3 dimension can be done in very different way, using various tools. The think3 tool was initially selected for the following reasons, although a number of other 3D tools exist that would also be very well suited for this module:

1. low cost

2. Autocad compatible
3. interesting demonstration CD
4. thorough 3D modeling technology

The module has proven very interesting for the 18-20 year old freshmen, and requires the student to become familiar with 3D modeling in a short time frame. We utilize the 'Monkey Wrench Conspiracy' from think3.com, although other programs are available. Students pick up a basic working knowledge of 3D design skills quickly. The module combines gaming strategy with 3-D design instruction to make learning 3D interesting.

Think3's website [1] has a set of services, all very accessible: instructors and students can find solutions to technical problems by using the online technical support and accessing the open-to-the-public knowledge base and view items such as bug reports, workarounds, "how-to" technical articles, all in various multimedia formats (AVI, graphics, etc), utilize discussion boards which also provide a source for some answers, post questions, suggest new features or discuss the latest design project. Students have a very positive interface with the website and the support functions.

Additionally, freshmen engineering students are exposed to the interesting and inviting world of advanced 3-D functionality with useful features such as global shape modeling, smart objects & curve, surface, and solid associativity. The game allows the student the freedom to draw upon the tools at any point in the design process — from initial drafting and conceptual design to wireframe, solid modeling, and even advanced, free-form surfacing.

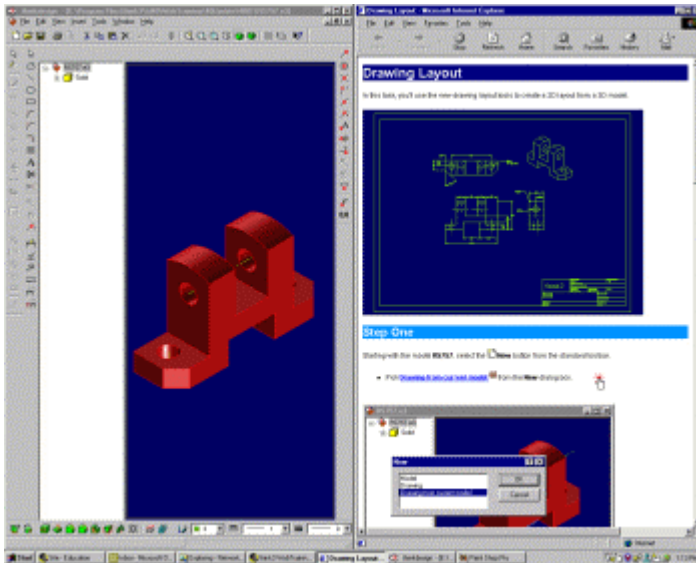
### Implementation of Module

Two different implementations of this project have been tried and evaluated:

1. Completing the demonstration 'game', which involves twenty-one different problem solving steps and diagrams. When students complete the game, they either print out the last congratulation page or demonstrate it to professor. A nice feature of the game is the collaborative facet - students are encouraged to collaborate, just like they do with other computer role playing games.
2. Completing five of the component 3D diagrams required by the game. When students complete this exercise, they save the component diagrams and email to the professor.

Students completing the game neglect the important part of computer aided design: one has to eventually show the results in the form of drawings. However, the students completing the game get more exposure to drawing in the 3D environment as well as additional problem solving experience.

Results look impressive from two viewpoints: combining elements of design and freshman:



## REFERENCES

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2. [www.cadence.com](http://www.cadence.com)
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4. [http://cma.zdnet.com/taxis/cma/cma/+1o9e1D9xxzmwwwxqFqo\\_\\_6sW6XWmzmwwwwnzmwwwwpFqrp1xmwbNLFqnhw5B/display.html](http://cma.zdnet.com/taxis/cma/cma/+1o9e1D9xxzmwwwxqFqo__6sW6XWmzmwwwwnzmwwwwpFqrp1xmwbNLFqnhw5B/display.html)
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## Biographical statements

### LISA ANNEBERG

Dr. Anneberg has been an associate professor in electrical and computer engineering at Lawrence Technological University, in Southfield, MI since 1991. Her research interests include computer networks, error correction and detection, and freshman engineering design. She received the B.S. in industrial and operations engineering from University of Michigan in 1979, and the M.S. and Ph.D. in computer engineering from Wayne State University in 1983 and 1991, respectively.

### ROGER FERGUSON

Dr. Ferguson is an assistant professor of computer systems and information technology at Grand Valley State University in Allendale, MI. He is involved in several ongoing research projects: Personal Software Process, a part of CEI, software testing research, and software development. He received the B.S. in electrical engineering from the Michigan Technological University in 1981 and the M.S. and Ph.D. in computer science from Wayne State University in 1988 and 1992 respectively.