Cyber-Learning in Cyberworlds

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EXECUTIVE SUMMARY

This article discusses the problems of teaching computer graphics and shape modeling in large and distributed classes using visual cyberworlds—shared information worlds on the Web. Cyberworlds allow for providing personal mentoring to the students with different cultural and educational backgrounds. The Virtual Campus of Nanyang Technological University is such a cyberworld, which is being used for teaching computer graphics and shape modeling. A part of this cyberworld is the Virtual Shape Modeling Laboratory. It is used by the computer graphics students for designing geometric shapes defined with analytical formulas. Augmenting the existing ways of electronic education with cyberworlds appears to be useful which was proved by the final exam results and overall attitude of the students.

Keywords: collaborative learning; computer-based training; computer science education; course Web site; distance education; distance learning; Internet-based instruction; online classroom; virtual campus; virtual communities; Web-based courses; Web-based learning; Web-based teaching; Web-delivered education

ORGANIZATIONAL BACKGROUND

“Nanyang” in Chinese means “south seas”—a reference to the Southeast Asian region. Back in the 1940s and 1950s, many Chinese from mainland China ventured south to seek their fortunes in new lands. Malaya—now Singapore and Malaysia—was then known as “Nanyang” to the Chinese. After World War II, it was decided to start a university in Singapore that would provide tertiary education in Chinese in the region. On March 23, 1953, 523 acres of land was donated to the new Nanyang University, which was known as “Nan Tah” in Chinese. The modern Nanyang Technological University (NTU) (http://www.ntu.edu.sg) originated from Nan Tah. It is a comprehensive university designed to meet the needs of Singapore and the region. The university offers undergraduate and graduate courses in different areas of accountancy and business; art, design and media; bioengineering; biological sciences; chemical and biomedical engineering; chemical and biomolecular engineering; civil and environmental engineering; communication and information; computer engineering and computer science; electrical and electronic engineering;
humanities and social sciences; materials science and engineering; mechanical and aerospace engineering; physical and mathematical sciences; and secondary school education.

NTU occupies a large beautiful Jurong Campus with very hilly terrain, located in the western part of Singapore. The campus has many buildings with quite sophisticated futuristic architecture, some of them designed by the famous Japanese architect, Kenzo Tange.

All the university’s facilities and resources are freely available over the Internet and can be accessed by everyone on the campus network (fixed line and wireless) and from outside the campus through the Internet. By using the university’s mobile service one can connect to the selected e-services from virtually anywhere with mobile phones and PDAs. This existing high-tech infrastructure and the university’s commitment to its permanent improvement, as well as a very great number of local and international students (near 17,000 undergraduate and 7,500 graduate students), there is motivation for rapid development of electronic education at NTU to augment and enrich the traditional ways of teaching in the classrooms.

Computer graphics is one of the flagship areas of research of the School of Computer Engineering (SCE) at NTU (http://www.ntu.edu.sg/sce). SCE has three research centers oriented to and around solving problems of computer graphics. These are Center for Graphics and Imaging Technologies (CGIT), Center for Advanced Media Technologies (CAMTech), and GameLab. CGIT (http://www.cgit.ntu.edu.sg) serves as the focal point for graphics and imaging related research and development activities among the university, industry, and business. Projects which CGIT runs are computer and animation, geometric modeling, scientific and medical visualization, multimedia and training system, computer vision and imaging processing, and intelligent agents for visual computing. CAMTech (http://www.camtech.ntu.edu.sg) is a joint research and development center between the Fraunhofer Institute for Computer Graphics (IGD) of Darmstadt, Germany (http://www.igd.fhg.de) and NTU. Projects which CAMTech runs include but are not limited to multimedia in education and commerce, geographical information systems, scientific and medical visualization, virtual engineering, virtual and augmented environments for medical applications, new media for cultural heritage, mixed reality for engineering, next generation learning, and environments for life sciences. Finally, the GameLab’s (http://www.gamelab.ntu.edu.sg) mission is to continually explore and extend frontiers of game technology to create highly immersive and experiential games for the widest range of applications. The university’s strength in the area of computer graphics has been reinforced by the series of international conferences on cyberworlds organized by SCE in Singapore and in other countries. The topic of cyberworlds and their application to education is discussed in this article.

**SETTING THE STAGE**

Electronic education is one of the priority directions at NTU. The university’s e-learning platform, edveNTUre (http://edventure.ntu.edu.sg), is based on the BlackBoard Academic Suite software (http://www.blackboard.com), and several other companion software tools, such as AcuLearn video streaming software tools (http://www.aculearn.com). It is extensively used by the NTU professors to enhance their lectures, tutorials, and labs. Since its introduction in 2001, edveNTUre has developed from a rather exotic way of publishing lecture materials and occasional visits by the students to the present time, when it has become a mandatory and important part of each course with thousands of visits each day. Besides providing teaching materials such as lecture notes, slides, streaming audio/video presentations, and extra materials, it can be used for setting up online quizzes, discussion groups, and uploading assignments. This is done in line with the present common electronic education technology which assumes putting on the Web course materials that can be further fortified with elements of interaction such as discussion groups and quizzes. However, it was noticed that this approach, which was quite successful and inspiring
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