Virtual Campus of Nanyang Technological University

Alexei Sourin
Nanyang Technological University, Singapore

NANYANG UNIVERSITY

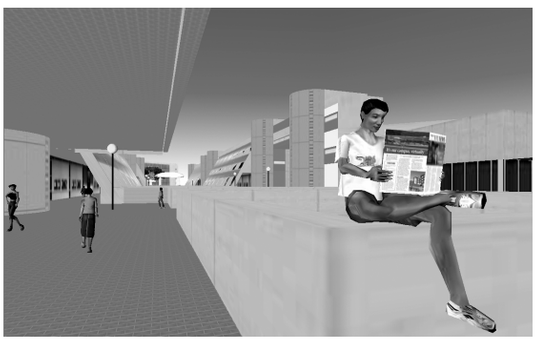
Nanyang in Chinese means "south seas"—a reference to the Southeast Asian region. Back in the 1940s and 1950s, many Chinese from mainland China ventured south to seek their fortunes in new lands. Malaya—now Singapore and Malaysia—was then known as Nanyang to the Chinese. After World War II, a university was founded in Singapore that would provide tertiary, comprehensive education in Chinese. On March 23, 1953, 523 acres of donated land helped expand the new Nanyang University (known as Nan Tah in Chinese). The modern Nanyang Technological University (NTU, www.ntu.edu.sg) originated from Nan Tah. NTU occupies a large, beautiful campus with hilly terrain in Jurong, located in the western part of Singapore. Many of the campus buildings have sophisticated, futuristic architecture, some designed by Kenzo Tange, the famous Japanese architect.

VIRTUAL CAMPUS

The Virtual Campus of NTU is a shared virtual world built with Virtual Reality Modeling Language and *Blaxxun Contact* communication platform (www.blaxxun.com). It is a virtual model of the real campus of Nanyang Technological University. The whole Virtual Campus, including VRML models of the land, buildings, interiors, avatars and texture images, is stored in only about 15 Mb of files and can be accessed from any Internet-connected personal computer (www.ntu.edu.sg/home/assourin/vircampus.html). In this cyberspace, visitors can turn themselves into virtually anything. Some choose to look like fancy-dressed people, some turn themselves into sports cars, and some appear as sparkling clouds or fireballs.

Many visitors to the Virtual Campus are computer graphics students who either play virtual "hide and seek" with their professor or come to study concepts of virtual reality and shape modeling. There are also strangers from around the world meeting together on this hospitable land. Local students easily navigate the familiar 3D environment, go to their favorite places or meet with friends in their hostel rooms. Foreign guests usually just wander around and chat, astonished by the size of what is probably the biggest shared cyberspace of this kind.

Figure 1. A snapshot of the Virtual Campus



Dusks and dawns in this cyberspace follow Singapore time, but the Virtual Campus never sleeps. Many *bots* (robots) populate it. These are avatars of students and professors who walk back and fourth between lecture theatres, libraries and student hostels. There also are birds hovering in the sky and cars riding by the roads (Figure 1).

The bots are programmed to behave realistically for visitors. Some of these activities are stochastic and some follow the real class time tables. The first bot the visitors meet will greet them immediately upon arrival by offering them help on navigating within the virtual environment, as well as by providing consultations on computer graphics. This bot is an avatar of one of the project students who contributed a lot to the Virtual Campus. Its "brain" is developed using *AIML language*, ALICE files (www.alicebot.org) and computer graphics terms from Sourin (2004). There also are a few other agents wandering around. They, too, are "clones" of former project students. In fact, each of the project students has a personal avatar copy in the Virtual Campus.

Virtual Campus is not only for walking through and seeing other avatars or bots. The visitors can talk to them. Blaxxun Contact provides the communication platform. It also allows for text-to-voice synthesis so that visitors can hear your computer-simulated voice as well as voices of other visitors. These chats may involve

all the visitors or can be organized into private chat groups.

Virtual Campus is a place for research on crowd simulation and shared cyberspaces. Its content changes frequently. You can come across an avatar, which is in fact a bot, and it will take time before you understand it. Sometimes it may be a real person disguised as a bot to test human reaction on some avatar activities to be programmed.

CYBERLEARNING ON THE VIRTUAL CAMPUS

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 software (www.blackboard.com) and several other companion software tools. It is extensively used by NTU professors to enhance their lectures and achieve personal mentoring of students. 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 necessary and very important part of each course, with thousands of visits each day. Besides teaching materials such as lecture notes, slides, streaming audio/video presentations and extra materials, it can be used for setting up online quizzes and discussion groups and uploading assignments. However, edveNTUre rather gives a "two-dimensional look" of the teaching process, being based on html Web pages. In contrast and in addition to it, on the Virtual Campus, NTU professors are able to meet with their students in virtual 3D classrooms, "see" and communicate with each other, and so add more immersion and fun to education. Besides that, distant overseas students get a feeling of really being on campus. Many features available in edveNTUre are also available on the Virtual Campus. Thus, some of the virtual lecture theatres and other places are linked to streaming multimedia presentations of current and prerecorded lectures and events.

Of course, Virtual Campus is a learning tool for computer graphics students, illustrating to them theoretical concepts of virtual reality, real-time rendering and shape modeling. It is used during lectures, as well as after classes for consultations. One of the student assignments is to design a "Perfect Student Room" to eventually make it available on the Virtual Campus. So the digital clone of the real campus mixes with the imaginary cyberspace.

COLLABORATIVE SHAPE MODELING HANDS-ON EXPERIENCE

Another cyber-learning activity on the Virtual Campus is the Collaborative Shape Modeling Hands-On Experience. This is a part of the curriculum for the students taking "Computer Graphics and Application." The virtual laboratory where this hands-on shape modeling experience is running can be entered either from the lobby of the School of Computer Engineering of the Virtual Campus or by a direct link (http://blaxxun.sce.ntu.edu.sg/csbin/ community/print.exe).

Before going there, the visitors have to install a small software plug-in. This plug-in is an extension of VRML, which allows for defining geometric shapes with analytical formulas. By "formulas," we understand analytical definitions with *parametric*, *implicit* (Bloomenthal, 1997) and explicit *FRep* (Pasko, 1995) functions. All these formulas are functions of three coordinates, which are either parametric or Cartesian coordinates of 3D shapes. These different representations are usually not used together in computer graphics. When using our plug-in, they can be used concurrently for defining geometry and appearance of shapes. The shape's geometry can be defined by a basic geometric shape and its *geometric texture*, each defined with either parametric, implicit or explicit functions. The appearance of the shape can be defined by either function-defined or fixed colors. Similar to the shape's geometry, parametric, implicit or explicit functions can be used for defining the shape's color on its surface and inside it. This approach helps students to more easily understand the concepts of function-based shape modeling. Also, the synergy of using the three different

Figure 2. Collaborative shape modeling laboratory