Success Story

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—Dr. Christina Bloebaum, Executive Director, NYSCEDII

NYSCEDII and SGI: Promoting the Use of Advanced Visualization in Science and Industry

The New York State Center for Engineering Design and Industrial Innovation (NYSCEDII) was established in 2000 to encourage the use of advanced visualization, simulation, and virtual reality.

NYSCEDII (pronounced like "nicety") has a threefold mission. Housed at the University at Buffalo (UB), NYSCEDII's state-of-the-art facilities support the basic research of scientists and engineers from the UB campus and beyond. Partnerships with local industries promote economic development regionally and statewide. Through advanced coursework, certificate programs, and workshops, NYSCEDII provides students with the advanced skills to use visualization technologies to enhance engineering and basic research.

At the heart of NYSCEDII's operations—interfacing with various input and output devices and handling most of the computer- and graphics-intensive work—are SGI® systems.

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Collaborations to Strengthen Local Industry

In pursuit of its mission, NYSCEDII has formed significant partnerships with local industries. Headquartered in East Aurora, New York, Moog is a leading supplier of precision motion control systems and components. Among their many products are motion simulators used in advanced aircraft simulation, amusement park rides, and other applications. NYSCEDII is collaborating with Moog to develop fully immersive virtual reality simulations to demonstrate the capabilities of the motion base to Moog customers. NYSCEDII has already developed simulations for driving, flight, and bumper cars, and research is continuing to obtain the utmost realism. The motion base is controlled by either NYSCEDII's Silicon Graphics® Onyx2® or SGI® Onyx® 3400 visualization systems, with all motions tightly coupled to the visual environment.

In addition to helping Moog win new customers, this work could result in new types of simulations that are highly scalable and can be tailored to the desires of the user. These simulations could be the basis of amusement park rides that are continuously upgradable through the addition of new software and compute capability to ensure a long life.

Praxair, another important collaborator, designs commercial air-separation plants that provide the pure gases needed for various industrial processes. Praxair is making dramatic improvements in its conceptual design process. The traditional process required time-consuming mock-ups of designs, limiting the number of options that could be considered.

NYSCEDII helped Praxair develop a Web-based interface to do analysis, optimization, and visualization of conceptual product design. Using these tools Praxair can consider literally hundreds of design options and adapt rapidly to changes in customer requirements. Praxair can then use NYSCEDII facilities as needed to show customers particular designs in a full-3D, immersive environment.

Cutting-Edge Research

The visualization and virtual reality facilities at NYSCEDII are also being used in cutting-edge research. In one collaboration a clinical psychologist is working with NYSCEDII to develop simulations that will help patients traumatized by motor vehicle accidents to overcome their fear of riding in and driving cars. After a

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serious accident some patients become so fearful that they can no longer work or engage in other everyday activities. When the development work is completed, virtual reality will be used to slowly reintroduce patients to a realistic driving environment. They will begin by operating a driving simulator in a simple, cartoonlike setting. As their comfort level grows, the realism of the driving environment will be increased, facilitating the transition back to real driving.

In another important collaboration NYSCEDII is involved in a project funded by the National Science Foundation to develop an early-warning system for volcanic eruptions. An advanced simulation models the terrain down to 1 m resolution. The simulation predicts where lava and ash are likely to flow, so that areas requiring evacuation can be identified. Scientists in multiple locations can view and discuss the latest data in real time whenever seismic activity indicates that an eruption may be imminent.

Training the Next Generation of Scientists and Engineers

In the summer of 2001 NYSCEDII offered a two-week intensive workshop on scientific visualization and virtual reality for high school students. Twelve students spent two weeks at NYSCEDII learning the fundamentals of virtual reality programming with the latest technology. The program was sponsored in part by Praxair to encourage students to develop important skills for the future.

Sixteen-year-old David Grabau had this to say about the workshop: "I've done very, very basic computer programming before, but this brought it to a whole new level, and just being given the opportunity to work on millions of dollars of high-end equipment—you never get this opportunity."

The program was a resounding success and generated such a huge response from the community that, in addition to the two-week program, NYSCEDII will offer several mini virtual reality seminars for high school students in the summer of 2002. Also planned is a one-week seminar in which students will study and work with the early-warning system for volcanic eruptions, as an introduction to the scientific applications of visualization.

Powered by SGI

NYSCEDII uses a variety of SGI hardware and software to enable such capabilities as:

- Rapid virtual prototyping
- CAD graphics and 3D modeling
- Real-time interactions with design and analysis
- Visual interaction with high-performance computing applications
- Sensory and haptic (touch and feel) interactions with virtual simulations

Advanced graphics and computing capabilities are provided by a Silicon Graphics Onyx2 workstation and an eight-processor SGI Onyx 3400 system with InfiniteReality3™ graphics. The patented NUMAflex™ architecture of the SGI® Onyx® 3000 series allows users to tailor a system to the specific needs of the application and to scale in place in order to accommodate growth and changing requirements.

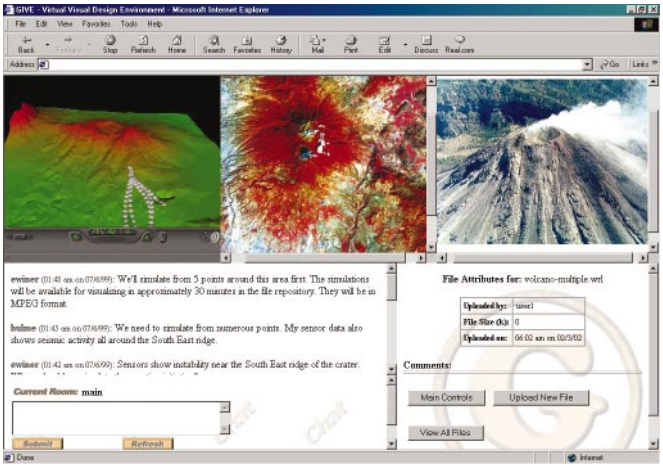
SGI software is used extensively for development work at NYSCEDII. OpenGL Performer™, OpenGL Volumizer™, and OpenGL Optimizer™ provide the advanced APIs necessary to facilitate various aspects of visual programming.

SGI's personnel have been as big an asset to NYSCEDII as SGI hardware and software. "SGI people are simply experts. They have really shown us how to get the most from our hardware and software. SGI has provided advice on shaping the center and provided significant discounts and contributions," said Dr. Eliot Winer, deputy director of NYSCEDII. "It has just been great at every phase."

A Bright Future

NYSCEDII is already ranked among the top 20 academic facilities for visualization. This is due in part to the commitment to technology at UB. UB was ranked as the 10th most wired university in the U.S. by *Yahoo! Internet Life* in 2001, and NYSCEDII earned a special citation in that ranking for its "commitment to emerging technologies."

NYSCEDII is poised to become one of the leading facilities for virtual reality, with many exciting projects in the works, and SGI is continuing to work closely with NYSCEDII to help ensure continued success.



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