2006-2007 Computing Advisory Committee (CAC) Proposal  
Campus-Wide Initiatives and Innovations for Computer-Based Instructional Support  
Iowa State University

**Laser Scanner Support for Computer Lab Center**

**PRIORITIES**
1. Campus-wide proposals addressing student needs for computing capability.  
2. Other innovative proposals with student involvement.  
3. Upgrading an existing open access facility.

**PROPOSERS**

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REVIEWING UNIT
College of Design

PROJECT OVERVIEW
This is a proposal to incorporate state-of-the-art 3D laser scanners into the collection of input/output services located in the College of Design. These services are not available publicly anywhere else on campus (or in Ames). The equipment will be housed in the college’s new Input Center located in 530 design and the college’s Output Center located in 426 Design. These facilities are open during regular lab hours, 108 hours per week and 24 hours a day during the end of the semester. The facilities are open to all students, faculty and staff in the university. As such, this project is a university-wide initiative in support of computer-based instruction on campus and benefits a broad range of students. College of Design students could use to scan buildings and artwork, engineering students could use it to scan organic products, or digitally inspect materials of parts (part-to-part inspection), i.e., sheet metal inspection among various applications.

Laser scanners would provide students with the ability to digitize hand built organic objects, sculptures, artistic artifacts, or buildings. Students in the design disciplines could further explore design-related issues using the scanned digital model. This technology is widely used in commercial applications and is well-accepted in academia as a training tool. The input and output facilities in the College of Design have various equipment installed allowing students to go from digital to physical. Laser scanners will give students the ability to go from physical to digital and explore more design opportunities. Thus, this proposal intends to train students not only in the use but also in the practical benefits of the new laser scan technology. The various departments in the college are in support of initiatives that enforce the development of the digital curriculum. Other than design studios, courses that relate to the design field and the newly approved Digital Media minor program at the College of Design will benefit from this project.

The total amount of funding sought from the Central Pool is $100,860.00. It will be used to purchase a fixed 3D laser scanner for fixed object scans (see figure 1), and a portable 3D laser scanner (see figure 2) for larger parts where mobility is important and for hard to reach places. The portable scanner will be available for checkout in the College of Design Output Center located in 426 Design.

![Fixed 3D laser scanner.](image1) ![Portable 3D laser scanner.](image2)

Proposal Statement
As the laser scan technology will be an asset to developing curriculum and becomes useful to artists, engineers, textile and clothing designers, anthropology, archaeology, architects and planners alike, this proposed project satisfies the following goals of the University, College and Department:

University’s Goal 1: Enhance learning through exceptional learner-centered teaching, services, and enrichment opportunities [1/2: “Improving student learning through curriculum development and instructional innovation to keep pace with the changing world marketplace.”]

- A broad range of intellectually challenging curricula that prepares graduates for successful and rewarding lives in a rapidly changing world - with emphasis on
developing skills in critical thinking, information management, team-based learning, problem-solving, and skills needed for life-long learning.

- Innovations in effective teaching and learning programs supported by faculty and staff development opportunities; widespread emphasis on student-centered learning environments.
- Ubiquitous use of information technology, and its integration into curricula; internationally prominent programs in information science and technology

**College’s Goal 1: Enhance learning through exceptional learner-centered teaching, services, and enrichment opportunities**

- **Institutional Base + Visual Literacy:** A strengthening of the visual communication component of degree programs, and an enhancement of student’s ability to understand and communicate visual information.
- **Creative Inquiry:** A reinforcement and celebration of the studio method of education as a learner-centered approach to address complex issues; a nationally distinguished instructional program noted for innovation.
- **Integrated Study:** Establish national leadership in scholarship on innovative learning environments and methods.
- **Industrial Design Curriculum Development:** These pieces of equipment will establish a framework of tools around which the College’s future desires to develop an Industrial Design Major can revolve.

**Departmental Goals for Curricular Development in Digital Architecture Education:** “It is expected that the computer-aided design (CAD) education implemented at the Department of Architecture provide students with knowledge and skills to generate creative, cutting-edge CAD products that will allow them access to future positions in the design field.”

- Students must be provided ability to utilize information technology in design practice
- Students must be provided ability to apply necessary CAD skill to meet the emerging challenges occurring in the profession
- Students must be provided ability to prepare for pursuing an advanced graduate degree in design computing.

**Innovative Production and Aesthetic Practices**

This proposal emerges as part of a continuing effort to obtain and maintain a strong affiliation between the methods of design representation being employed in practice and those being employed at our institution. As visual representation and form-making will remain inherent to design education, the methods by which the students perform these tasks will determine their viability as they move into practice. The Laser Cutter, 3D printer and CNC router purchased through CAC funding from the 2003-04 and the 2004-05 academic years, has been a tremendously successful addition to the College and University. Our laser cutter is in use nearly 90% of the time and is often booked for more than a week in an advance. The Dimension BST 3D printer and CNC router have allowed students to make models of forms that otherwise have not been possible.

The ShapeGrabber LM600 System with an SG1002 scan head can scan a volume of approximately 30” X 30” X 45” with an accuracy of 25-175 microns. The package includes a high end HP computer, setup and installation, a training session, one year maintenance fee, and includes Geomagic, the controlling software. Geomagic does data acquisition, image display and file manipulation. This machine, installed in the lab, can be used for reverse engineering human forms or objects for prototyping form analog, clay or other formed objects.

The portable scanner has 330 degrees of pan motion, and the scan head can be oriented at almost any angle. The accuracy is up to 0.125 millimeter and compatible with very wide variety of materials and all colors in all normal lighting conditions. This portable scanner can be used
outdoors to scan buildings, rooms, street level objects, sculptures, artifacts in nature, or historical monuments for documentary purposes, as well as full body scans. Both packages share the same price; use the same type of scan head and software system for data collection. The portable scanner also has a travel case provided.

**General Student Benefit**

The benefits of two laser scanners as requested in the proposal, would extend throughout the entire department's design and digital curriculum (256+/− students or 100% total enrollment) as well as those of our neighboring departments, Art and Design, Interior Design, Landscape Architecture and Community and Regional Planning. In the College, then, there would be a direct benefit to approximately 1800 undergraduate students. As a University cultural-study service, its benefits are campus-wide.

**Availability and Integration with Other Facilities and Labs**

The Input and Output Centers are open during the following hours: M-R 8:00AM – 2:00AM, F 8:00AM – 10:00PM, and Sat 12PM-8PM, Sun 12:00PM – 2:00AM (106 Hours per week and 24 hours during final weeks of the semester). Access to all equipment in these facilities can be made through the campus network.

The current staff of the College of Design will manage and maintain the new machines. The purchase of equipment includes a special training package. The College of Design Information Technology Officer will provide support as required and oversee the arrangement of the facility to maximize efficiency and safety. In its current configuration there is sufficient space for this equipment in the College.

**Computation Advisory Council Proposal Budget**

**Laser Scanner Support for Computer Lab Center**

**Table 1. Full Itemized Budget**

<table>
<thead>
<tr>
<th>Description of item</th>
<th>Number</th>
<th>Unit Cost</th>
<th>Total Cost by Funding Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ShapeGrabber LM600 3D Laser Scanner plus computer, software, training, and one year of maintenance fee.</td>
<td>1</td>
<td>$50,430.00</td>
<td>$50,430.00</td>
</tr>
<tr>
<td>ShapeGrabber PRM 330 Portable 3D laser Scanner plus computer, software, training, and one year of maintenance fee.</td>
<td>1</td>
<td>$50,430.00</td>
<td>$50,430.00</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>$100,860.00</td>
</tr>
</tbody>
</table>

**Table 2. Minimum Feasible Itemized Budget**

<table>
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