

# Graphics Lab

The ICT Graphics Lab develops new techniques for creating and displaying photorealistic computer graphics of people, objects and environments. We specialize in developing image-based methods for acquiring shape, reflectance and motion from digital photography and video. The results are computer-generated virtual models which look and behave as realistically as possible, viewable from any viewpoint and in any illumination condition.

## Selected Research Projects:

### Light Stages

Light Stages are a series of lighting devices that record how faces, objects and bodies appear under computer-controlled illumination conditions. The Light Stage devices at ICT capture digital datasets of how real people and objects look under different lighting conditions and viewing directions, allowing photorealistic digital versions of them to be used in visual effects, interactive entertainment and digital archives.

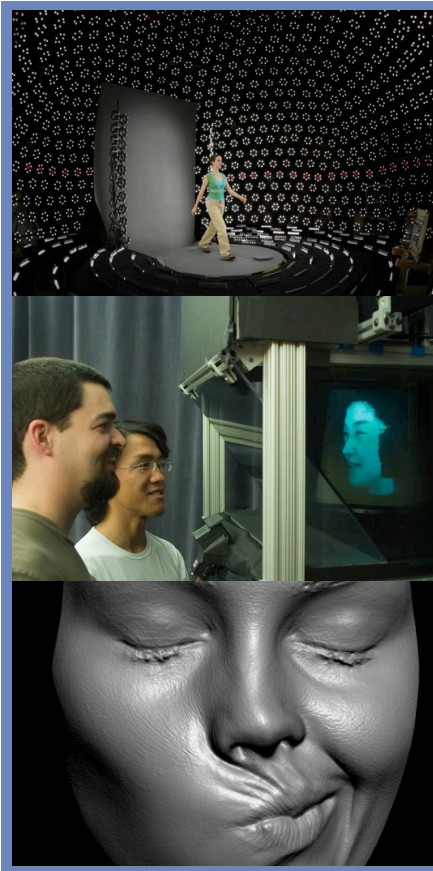
To date, the Light Stages have been used to capture photoreal reflectance data of actors for feature films that include *Avatar*, *The Curious Case of Benjamin Button*, *Spider-Man 2*, *King Kong*, and *Superman Returns*. They have been described in over 20 academic publications. ICT's Paul Debevec and other developers of the technology were honored with a 2010 Scientific and Engineering Academy Award®. The award recognizes over ten years of research, development and application of technologies designed to help achieve the goal of photoreal digital actors.

### 3D Teleconferencing

Live 3D teleconferencing creates a three-dimensional animated image of a person floating in space by projecting high-speed video of different views of the face onto a spinning mirror. As the mirror spins, the different views are reflected to all different viewpoints around the display. This system allows a remote speaker to look at any of the people he or she is speaking to, and also allows all participants see a natural view of the speaker. These effects are not reproduced in conventional 2D videoconferences: if the speaker looks at the camera, they appear to be looking at everyone; if they look away, they are looking at no one. Seventy-two views of the face rendered by a PC with a modern graphics card are projected across 180 degrees field of view. By the time the mirror rotates to reflect images from one eye position to another, a different view of the scene is projected, so the result appears to be three-dimensional. This project aims to better recreate the natural, rich communication that people experience in person-to-person conversations, especially the effects of gaze, attention, and eye contact.

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## GOALS

- Develop a library of realistic VR objects that can be used in any virtual scene.
- Continue work on applying real-world lighting to VR objects, including research on color rendition issues.
- Give VR developers more choices in lighting of objects in a scenario, from scientifically realistic to artistically interpretive, as required.
- Enhance the learning experience of trainees by giving them a more visually stimulating (and believable) training scenario.