augmented reality
[erweiterte realität]

Bauhaus-Universität
Weimar

Projectors for Graphics

-Course-

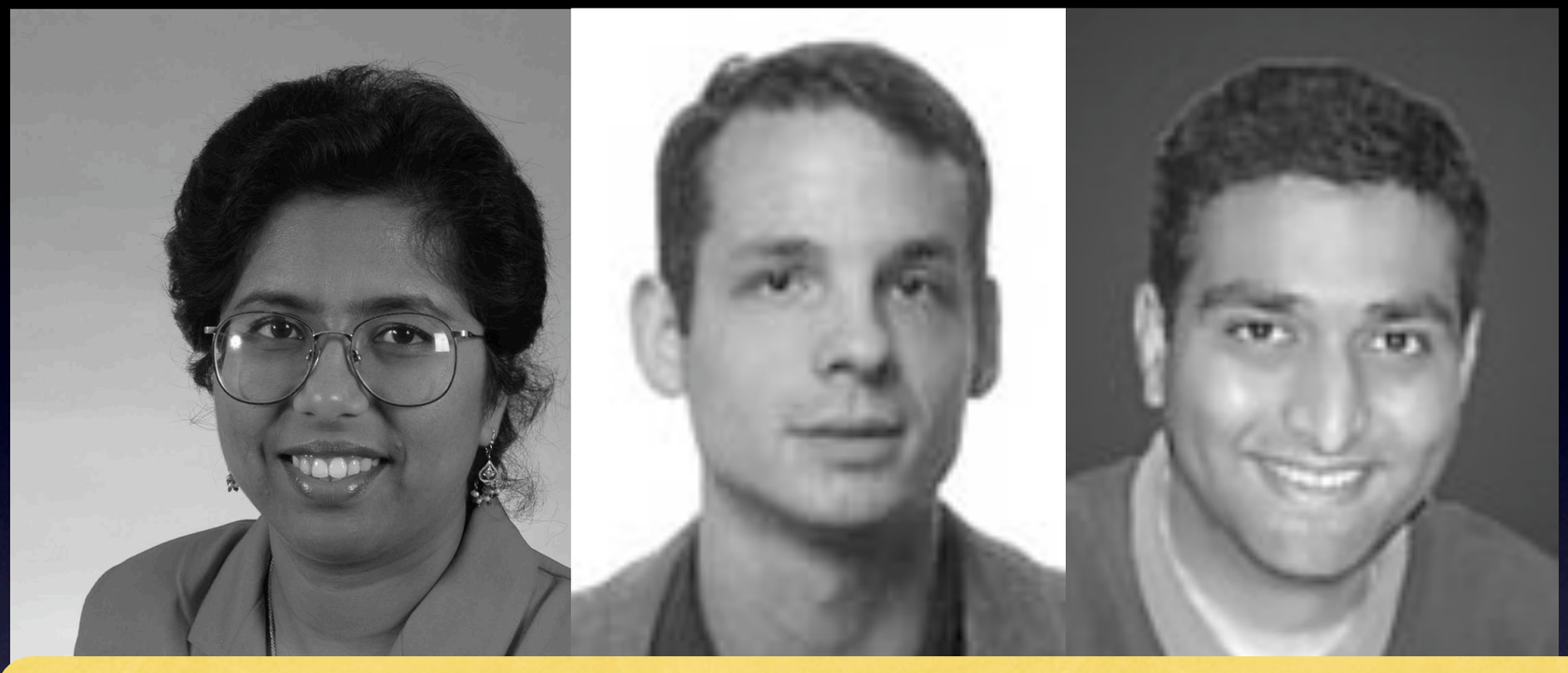
Speakers

Aditi Majumder is an assistant professor at the Department of Computer Science in **University of California, Irvine**. She received her BE in Computer Science and Engineering from Jadavpur University, Calcutta, India in 1996 and PhD from Department of Computer Science, University of North Carolina at Chapel Hill in 2003. Her research is in the general area of computer graphics, vision and visualization. Her primary research contribution has been on using computer vision methodologies for easy and automatic assembly of commodity projector(s) and camera(s) to build large tiled multi-projector displays, exploiting human perception limitations for making them perceptually and functionally seamless. and devising human computer interaction modalities for such displays. She is the author of the recent book "Practical Multi-Projector Display Design" released by A.K.Peters in 2007.

Speakers

Oliver Bimber is an Associate Professor for Augmented Reality at the **Bauhaus University Weimar**, Germany. He received a Ph.D. (2002) in Engineering at the Darmstadt University of Technology, Germany and a Habilitation degree (2007) in Computer Science (Informatik) at the Munich University of Technology. He is co-author of the book "Spatial Augmented Reality" and serves on the editorial board of the IEEE Computer magazine (graphics and multimedia editor). Bimber taught courses on Spatial Augmented Reality and projector-based display techniques at Eurographics 2003 and Eurographics 2004, ICAT 2005, ETD 2006, as well as at Siggraph 2005, Siggraph 2006 and Siggraph 2007. His research interests include real-time rendering, computer vision and human visual perception in the context of next-generation display technologies.

Speakers



Ramesh Raskar is Associate Professor at **Media Lab MIT**. He was previously a Senior Research Scientist at MERL. His research interests include projector-based graphics, projective geometry and non-photorealistic rendering. During his doctoral research at U. of North Carolina at Chapel Hill, he developed a framework for projector based 3D graphics, which can simplify the constraints on conventional immersive displays, and enable new projector-assisted applications. He has published several articles on immersive projector-based displays, spatially augmented reality and has introduced Shader Lamps, a new approach for projector-based augmentation. His technical papers have appeared in SIGGRAPH, EuroGraphics, IEEE VR, IEEE Visualization, CVPR and many other graphics and vision conferences. He was a course organizer and speaker for Siggraph 2002-2007. He is a member of the ACM and IEEE.

Speakers

Hendrik P. A. Lensch is the head of an independent research group "General Appearance Acquisition and Computational Photography" at the **MPI Informatik in Saarbrucken**, Germany. The group is part of the Max Planck Center for Visual Computing and Communication. He received his diploma in computers science from the University of Erlangen in 1999, and after joining the computer graphics group at MPI he received his PhD from Saarland University in 2003. Dr. Lensch spent two years (2004-2006) as a visiting assistant pro essor at Stanford University, USA. His research interests include 3D appearance acquisition, image-based rendering and computational photography. For his work on reflectance measurement he received the Eurographics Young Researcher Award 2005. He was awarded an Emmy Noether Fellowship by the German Research Foundation in 2007. He has given several lectures and tutorials at various conferences including SIGGRAPH courses on realistic materials in 2002 and 2005.

Outline

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Large Format Displays

Visually Augmenting the Real World with Projectors

Mobile Projectors and Optical Com-munication

Compu-tational Illumination for 3D Scene Modeling

Large Format Displays

From CAVEs to large visualization centers, single and multi-projector displays are becoming easier to use due to novel camera-based maintenance systems.

- Overview and New opportunities
- Planar, cylindrical, spherical and non-planar displays
- Geometric and color calibration
- Rendering strategies
- Distributed self-calibrating displays

Visually Augmenting the Real World with Projectors

Augmenting real world surfaces with projected images can be challenging. This module describes the fundamental concepts.

- Human vision adapted techniques
- Global illumination compensation (scattering, inter-reflections, caustics)
- Defocus compensation (with multiple and single projectors)
- Imperceptible coded projection
- Superresolution and high-dynamic range projection
- Applications (theatres, museums, historic sites, advertisement, games, television studios, movie sets, on-site visualization, etc.)

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Mobile Projectors and Optical Communication

Pocket projectors allow novel human-computer interaction opportunities. Spatio-temporal modulation of light creates high speed optical communication which can be used in many tracking applications.

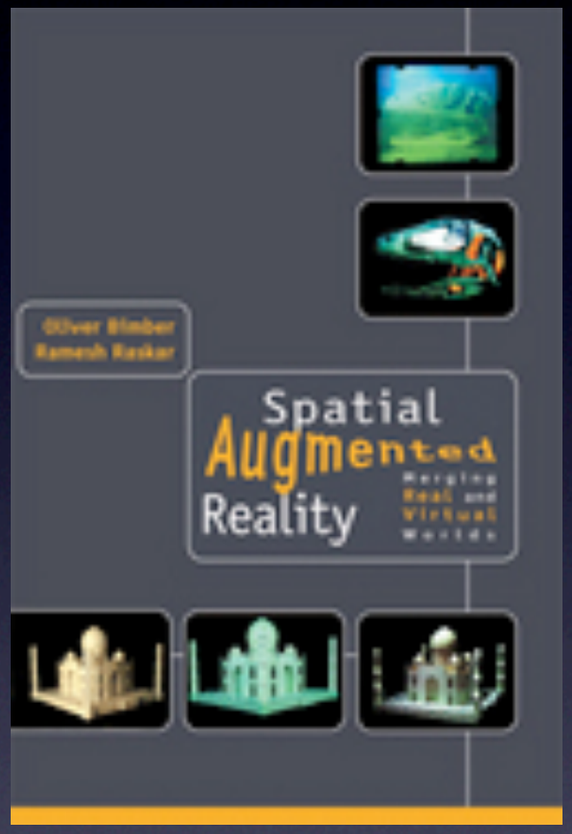
- Portable projectors, technology and issues
  - Single-handed interaction, Image stabilization and resizing
  - iLamps: Geometrically aware pocket projectors
- Optical and Radio Frequency Tags
  - RFID for Augmented Reality: Location sensing RFID and automatic authoring
  - Optical communication for space labeling in robotics, games
  - Imperceptible projection for high speed motion capture visualization, etc.

Computational Illumination for 3D Scene Modeling

The appearance of real world objects can be represented via a high-dimensional reflectance fields. Projectors are highly suitable for computational illumination to model such objects for rendering and computer vision applications.

- Scene appearance as higher dimensional reflectance fields
- Pattern projection for 3D geometry acquisition
- Measuring appearance parameters
- Capturing (and removing) global versus local illumination effects

Reading Material



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Outline

Large Format Displays