

Designing Real-Time 3D Graphics for Entertainment

SIGGRAPH '96 Course #33

Organizer:

James Helman

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Lecturers:

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Eric Johnston

LucasArts

Scott Watson

Walt Disney Imagineering

Steve Rotenberg

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Abstract

This course covers the issues of creating real-time 3D games on platforms ranging from home game consoles up to high-performance image generators used in theme parks. Topics include the hardware architectures of various game platforms, visual simulation tricks, 3D modeling, real-time character animation, game prototyping and programming. The authors draw examples from the development of actual games, tools and game development environments.

The course has two components. The first part covers the graphics and programming techniques available to make the best use of graphics technology for high-quality, real-time renderings. The topics include hardware and software architectures, graphics optimization, database tuning and other tricks of the trade. The visual simulation roots of many of these hardware and software techniques is also covered.

In the second part, developers discuss the use of those techniques as one component in creating interactive 3D experiences, whether for home game consoles or for location-based entertainment or theme park installations. The topics covered include tools and methods for content generation, software frameworks, and animation systems.

Speakers

Speakers

James Helman
Silicon Graphics

Jim Helman works in Silicon Graphics' Advanced Graphics Division as a member of the engineering team for IRIS Performer, SGI's real-time graphics toolkit. Before coming to SGI, he was a student in the Applied Physics department at Stanford University where he worked on his PhD in data visualization. His interests include virtual environments, game design, and keeping large green cars running.

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Andy Bigos
3Dlabs

Andy has been on the engineering staff at 3Dlabs (formally DuPont Pixel) for 5 years. As part of the GLINT & PERMEDIA core architecture teams he helped bring workstation class 3D graphics to the PC platform. As well as working on core architectures he's being closely involved with porting and optimizing OpenGL and Direct3D for 3Dlabs hardware. Andy is currently working with game developers to enable console class games on PC. He holds a Masters degree in Computer Graphics and a Bachelors degree in Engineering, his interests include real-time physically based modelling as well as play testing the latest and greatest games.

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Philippe Tarbouriech
Electronic Arts

Philippe Tarbouriech works in Electronic Arts as a member of the Advanced Technology Group. He manages the conversion of ShockWave to Playstation and PC while working on other projects. He was the software designer, aerial photographer and one of the game designers of the original ShockWave on 3DO. Prior to joining Electronic Arts, he worked in diverse unfit startup companies. His interests include evolution. He holds a M.S. in electrical engineering and computer science from ENSEA (France).

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Eric Johnston
LucasArts

Eric Johnston is currently the technical lead for LucasArts Entertainment's 3D console development group. Previously at Spectrum HoloByte, as head of their VR group, he developed Onyx-based games for location-based entertainment applications. As a Macintosh games programmer, his credits include the Mac versions of Rebel Assault, Indiana Jones and the Fate of Atlantis, Monkey Island 1 and 2, Loom, Pipe Dream, and Putt-Putt Joins the Parade. Eric graduated from U.C. Berkeley, with a B.S. in EE and CS. A former windsurfing instructor, he currently spends too much of his spare time on the flying trapeze.

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Scott Watson
Walt Disney

Scott Watson is Walt Disney Imagineering's VR Studio Technology Director. Scott started programming at 9 years of age. In 5th grade, IBM loaned him their first portable (75lbs) computer, the 5100 in exchange for writing games and demos to show it off. In his college days, when 8-bit machines were all the rage, Scott wrote multi-tasking OSes, device drivers, cross compilers and RF communications stacks as a day job. His free time was dedicated to his band "The Loved Ones" and Fanzine, "The Pig Paper."

Upon joining Disney's R&D department, his first assignment was to write the control software for the "Indiana Jones Ride Vehicle." An eclectic spectrum of projects has followed. Examples range from creating audio and image processing technology for theme-park films to helping design a computer keyboard for dolphins. For several years "Disney.com" was the machine on his desk. Since the beginning of Disney's exploration of Virtual Reality, Scott has been at the heart of the technology and is the principal designer of the "Disney*Vision Player." Disney*Vision is an interactive VR story development system that supports real-time Disney quality character animation and the SAL scripting language. Scott holds several patents and is an avid fan of The Monkees.

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Steve Rotenberg joined Angel Studios in the fall of 1992 to redesign and expand Angel Studios' proprietary 3D animation software and is now Angel Studios' Director of Software Development. Having embarked on his programming career at the age of six, Steve has amassed extensive experience designing software for a variety of platforms. During the past two years, Steve's natural interest in problem solving and his object-oriented approach to software design has proven integral to Angel Studios' development of ANGEL ARTS(tm), advanced real-time software for both the location-based and home entertainment markets. Using his invaluable experience in such software development, Steve has lead teams in developing VR experiences such as Dr. Megow's Mad Cap Ornithon and F-1 Net Race and, more recently, Buggie Boogie for Nintendo's next generation home game platform, the Ultra 64.

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Sharon (Fischler) Clay is a member of the IRIS Performer engineering team in the Advanced Graphics Division at Silicon Graphics where she specializes in performance issues for system implementation and real-time graphics applications. She was a member of the original design team, and before that, was a member of the Graphics Software group where she worked on the development team for the VGX graphics platform. Her interests, besides a real need for speed, include user interfaces, plants and fish (simulated and real). She studied using natural language in graphical user interfaces at the University of California at Santa Cruz where she received her Masters degree in Computer Science. Her Bachelors degree is in Mathematics and Linguistics from the University of California at Berkeley.

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Wes Hoffman
Paradigm Simulation

Wes Hoffman is the founder of Paradigm Simulation Inc. Paradigm Simulation was started five years ago and has positioned itself as a leader in the real-time 3D market. The database and programs he has worked on are well known by those in the industry, such as the Performer town database and the Magic Edge location based entertainment experience. Mr. Hoffman is currently leading the database development effort for Paradigm's Nintendo Ultra 64 game. Before working at Paradigm he worked at Merit Technology building a real-time simulation toolkit. Mr. Hoffman graduated from Syracuse University with a Bachelor of Fine Art and a major in computer graphics. His other interests include making crop-circles.

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Michael Jones works in Silicon Graphics' Advanced Graphics Division where he manages the IRIS Performer engineering team. He has worked with high-performance visual simulation systems for the last 5 years. Prior to joining Silicon Graphics, he worked in diverse areas, including high-performance visual simulation, color conversion of monochrome films and serials, optimization of cellular telephone antenna placement, and the nationwide routing of delivery trucks. He has been a professional computer programmer since the seventh grade. His personal interests include work and sleep.

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Michael Limber
Angel Studios

Michael Limber is COO at Angel Studios and serves as its Production Director. He has a degree in Architecture from U.C. Berkeley and a Masters in Industrial Design from Pratt Institute. His professional computer graphics career began in 1985 after getting a job at Digital Productions in Los Angeles. Beginning as a modeler and progressing to the position of Technical Director, Michael spent two intense years at the trailblazing computer graphics company, using a Cray XMP and state-of-the-art proprietary software to create commercials, film effects, visualizations, and music videos. After serving as Head Animator at the fully digital Post Perfect, in 1989, he moved to San Diego to work as Director of Computer Animation at Angel Studios with another Digital Productions veteran and colleague, Brad Hunt.

Michael worked as Animator and Technical Director on "The Lawnmower Man" and Peter Gabriel's MindBlender, among a multitude of other unique projects. Since that time, Angel Studios has become a significant developer of real-time interactive entertainment for companies like Sega, Hasbro, and most recently Nintendo.

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Agenda

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- 8:30 **Introduction**
Architecture and Performance of Entertainment Systems
 Jim Helman - *Silicon Graphics*
- 10:00 **Break**
- 10:15 **Exploiting Consumer Class 3D Hardware**
Acceleration for Real-Time Entertainment
 Andy Bigos - *3Dlabs*
- 11:00 **Tuning to the Metal**
 Philippe Tarbouriech - *Electronic Arts*
- 12:00 **Lunch**
- 1:30 **Prototyping and Portability of Hardware-Assisted 3D Games**
 Eric Johnston - *LucasArts*
- 2:15 **Action!**
 Scott Watson - *Walt Disney*
- 3:00 **Break**
- 3:15 **Creating Compelling Real-Time Content**
 Steve Rotenberg - *Angel Studios*
- 4:15 **Panel Discussion, Q & A**
 All
- 5:00 **Close**

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