Physically Based Modeling: Principles and Practice

Co-Chairs:

David Baraff and Andrew Witkin
Carnegie Mellon University

In recent years, *physically based modeling* has emerged as an important new approach to computer animation and computer graphics modeling. Although physically based modeling is inherently a mathematical subject, the math involved needn't be any more difficult nor esoteric than the math that underlies many other areas of computer graphics, such as ray tracing or surface modeling. Many papers on the subject have presupposed a specialized mathematical background that many members of the computer graphics community lack. Consequently, many capable computer graphics practitioners, despite their interest in the subject, have simply been put off by the density of the math.

This course course addresses the need to make the principles and methods of physically based modeling accessible to a broader computer graphics audience—those who are familiar with mainstream computer graphics and have the usual basic computer graphics math, such as vector/matrix manipulations, but whose first year calculus course may be only dimly remembered.

The course is divided into two broad sections: A series of five lectures that together form a systematic exposition of the core technical content; and a pair of lectures that discuss production experience with physically based modeling techniques.

For updates and additional information, see *http://www.cs.cmu.edu/~baraff/sigcourse*

Course Schedule

8:30 am	Introduction	
8:45 am	Differential Equation Basics	Witkin
9:30 am	Particle Dynamics	Witkin
10:15 am	Break	
10:30 pm	Rigid Body Dynamics	Baraff
11:15 am	Implicit Methods	Baraff
12:00 pm	Lunch	
1:30 pm	Dynamics in Feature Animation	Blum/Thumrogoti
2:30 pm	Constrained Dynamcs	Witkin/Baraff
3:45 pm	Break	
4:00 pm	Dynamics software	Monheit
5:00 pm	End	

Course Speakers

Andrew Witkin is a Professor of Computer Science and Robotics at Carnegie Mellon University. He received his B.A. from Columbia College, and his Ph D. from M.I.T. Prior to joining the faculty at Carnegie Mellon, he headed the perception and graphics group at Schlumberger Palo Alto Research. His research interests include computer animation, computer vision, and simulation. He has taught three previous Siggraph courses on physically based modeling.

David Baraff is an Assistant Professor in Carnegie Mellon University's Robotics Institute, and School of Computer Science. He received his Ph D. from Cornell University in 1992, where he was a graduate student in Cornell's Program of Computer Graphics and Department of Computer Science. He received his Bs.E. from the University of Pennsylvania in 1987. In 1995, he was named an Office of Naval Research Young Investigator. His research work focuses on physical simulations with constraints. He has taught lecture courses on dynamic simulation at previous Siggraph conferences.

Michael Blum. As technical lead for internal tool development at Walt Disney Feature Animation, Mike spends his days architecting animator-friendly tools for use in a variety of production environments. Before landing at Disney, he had worked at Primavera Systems and IBM. He earned his Masters degree in Computer Science from the University of Utah where he worked on animation tools for long form productions and his B.S. in Computer Engineering from the University of Massachusetts. Having been in LA for too long, he feels obligated to announce that he wants to direct.

Umakanth Thumrugoti has been working as Technical Director at Walt Disney Feature Animation for the past three and half years. He has a Masters degree in Visualization sciences from Texas A & M University. He worked on Disney's productions of 'Pocahontas' and 'Fantasia 2000.' Currently he is doing visual development for a future production.

Gary Monheit received a BA in chemistry from Princeton University in 1980 and an MSE in computer science from the University of Pennsylvania in 1990. His animation "Bend Me, Shape Me", featuring a kinematic human spine model, was shown at technical courses at SIGGRAPH in 1990–1992. He joined Wavefront Technologies (now Alias|Wavefront) in 1990, to work on product development. Monheit was the original author of Kinemation, a program for skeletal animation and skinning. Since 1995, he has been the team leader for dynamics, working on Project Maya.

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