



SIGGRAPH 99, Course #23

Virtual Worlds / Real Sounds

Course Syllabus: Morning Session

- Perry** 1) Welcome, overview of course, introduction of speakers
- Robin** 2) Sound in Digital Media, Opening Thoughts
- (a) What you Might Be Thinking About Sound (Isn't Sampling the End?)
 - (b) What We Hope You Will Think About Sound
(If Sampling Isn't The End, What Else is There?)
 - (c) Parallels Between Sound Synthesis and Animation/Rendering
 - (d) Goals, and How We Propose to Achieve Them
- Perry** 3) Views of Sound
- (a) Time Domain and Frequency Domain
 - (b) Production and Perception
- 4) Survey of Sound Synthesis Algorithms
- Xavier** (a) Additive Analysis and Synthesis
- (b) Subtractive Analysis and Synthesis
- (c) Non-Linear Synthesis (FM, WaveShaping)
- (d) Spectral Modeling / Synthesis
- Nadine** (e) Wavelet Modeling / Synthesis
- Perry** (e) Modal Synthesis
- (f) Physical Modeling
- (g) Pseudo-Physical and Physically Informed Modeling
- Tom** 5) Modeling of Spaces
- (a) Sound propagation and reflection
 - (b) The Image Model
 - (c) Lumped models of reverberation
 - (d) Ray-tracing models
 - (e) Beam-tracing models, sparse object trees
- Perry** Summary of morning, preview of CAL demos and afternoon topics
- Adjourn to CAL for Demos of Sound Synthesis and Control**
(demos of systems we'll be covering in the afternoon session)



SIGGRAPH 99, Course #23

Virtual Worlds / Real Sounds

Course Syllabus: Afternoon Session

Perry 6) Re-Welcome, afternoon overview, (re)introductions

7) Controlling and Scripting Sound Synthesis

- Robin** (a) Note and Event Lists
(b) MIDI
(c) XG, GS, XMIDI, ZIPI and others
(d) Control in HTML, VRML, MPEG4 (SAOL), etc.
- Perry** (e) Sound Effects and Environment Control

8) Hardware, Software, and Computing Issues

- Perry** (a) Specialized Hardware vs. Software Synthesis
Robin (b) Networked Audio, Synchronization with Graphics, Other Issues
Tom (c) Parallel Sound Computation

9) Sound Synthesis/Processing Systems and Software

- Tom** (a) Interactive Walk-through Beam-Traced
Audio Environment, and Multi-User/Position Audio
- Perry** (b) Physical and Pseudo-Physical Models
Xavier (c) Spectral Modeling Systems
Nadine (d) Wavelet manipulations of environmental sounds
Robin (e) Sound Connected to Animation software

Nadine 10) Measuring Success: Psychoacoustics and Testing

- (a) Psychoacoustics
(b) Designing experiments and testing subjects
(c) Some results from thesis

All 11) Animation Applications and Demos

Perry 12) Wrap up: Bibliography, CDROM Course Notes Summary, Thanks.

Adjourn to CAL for Demos of Sound Synthesis and Control



SIGGRAPH 99, Course #23

Virtual Worlds / Real Sounds

Course Notes Table of Contents:

Title	Presenter/Author	Page#
Morning:		
Intro Slides	Perry Cook	Morn-1
Opening Thoughts on Sound in VR	Robin Bargar	Morn-3
Sound: Time, Frequency, Perception, Production	Perry Cook	Morn-15
Spectral Modeling: Additive, Subtractive, FM, SMS	Xavier Serra	Morn-23
Wavelet Modeling	Nadine Miner	Morn-40
Modal, Physical, and Pseudo-Physical Modeling	Perry Cook	Morn-44
Acoustic Modeling of 3D spaces	Tom Funkhouser	Morn-58
Afternoon:		
Intro Slides	Perry Cook	Aft-1
Control: Note Lists, MIDI, etc.	Robin Bargar	Aft-3
Sound Effects and Synthesis , Hardware vs. Software	Perry Cook	Aft-23
Networked Audio, Synchronization With Graphics	Robin Bargar	Aft-27
Synthesis Toolkit Software	Perry Cook	Aft-32
SMS Software	Xavier Serra	Aft-35
Wavelet Manipulation Software	Nadine Miner	Aft-40
Sound in Animation/VR Software	Robin Bargar	Aft-42
Psychoacoustic Testing	Nadine Miner	Aft-48
Bibliography (pointer to Bibliographies in appendix papers)		Aft-58
Papers:		
Sound Transformations Based on the SMS High Level Attributes	Xavier Serra and Jordi Bonada	A-1
Integrating Complementary Spectral Models in the Design of a Musical Synthesizer	Serra, et al	A-8
Physically Informed Sonic Modeling (PhISM): Percussive Synthesis	Perry Cook	A-21
Wavelet Synthesis and Psychoacoustic Validation of Real-world Sounds for Virtual Environments	Nadine Miner and Thomas Caudell	A-25
A Beam Tracing Approach to Acoustic Modeling for Interactive Virtual Environments	Funkhouser et al.	A-48
Synthesis ToolKit in C++, Version 2.02	Perry Cook and Gary Scavone	A-65
Structure and Method of Synchronous Sound Generation for Interactive Graphical Computing Environments	Robin Bargar	A-74