Sound for Animation and Virtual Reality

Organizer
JAMES HAHN
The George Washington University

Lecturers
PETE DOCTER
Pixar

SCOTT FOSTER
Crystal River Engineering Inc.

MARK MANGINI
Weddington Productions

TOM MYERS
Skywalker Sound

ELIZABETH WENZEL
NASA Ames Research Center

course 10
NOTES

Sound for Animation and VR

Course Notes for SIGGRAPH'95

Course Organizer

James K. Hahn
The George Washington University

Course Speakers

Pete Docter
PIXAR

Scott Foster
Crystal River Engineering, Inc

Mark Mangini
Weddington Productions

Tom Myers
Skywalker Sound

Elizabeth M. Wenzel
NASA-Ames Research Center

Abstract

Sound is an integral part of the experience in computer animation and VR. In this course, we will present some of the important technical issues in sound modeling, rendering, and synchronization as well as the "art" and business of sound that are being applied in animations, feature films, and virtual reality The central theme is to bring leading researchers and practitioners from various disciplines to share their experiences in this interdisciplinary field.

The course will give the participants an understanding of the problems and techniques involved in producing and synchronizing sounds, sound effects, dialogue, and music The problem spans a number of domains including computer animation and virtual reality. Since sound has been an integral part of animations and films much longer than for computer-related domains, we have much to learn from traditional animation and film production. It is expected that the audience will be able to apply what they have learned from this course in their research or production.

Contents

Lunch   **(12:00-1:30)**

E. Sounds for Feature Films   **(Mangini, 1 hour)**

    1 Sound and its use in dramatic presentation

    2 Slight of ear

        - When what you think you heard is not really what you heard

    3 The digital audio workstation

    4 The state of the art in film sound technology

        -an overview of recording and reproduction of sound for films

    5 Name that sound!!!

        A brief history of great sound FX for films played out of context

        Contest and prizes

    6 Tregg Brown and Jimmy McDonald

        Defining sonic metaphor and the cartoon sonic idiom

F. Sound in Virtual Reality   **(Wenzel & Foster, 2 hours)**

Break   **(3:00-3:15)**

    1 Introduction to virtual acoustic environments (Wenzel)

        Definition, performance advantages & applications

    2 Acoustical cues used by human listeners for sound localization (Wenzel)

        Head-Related Transfer Functions (HRTFs)

    3 Approaches to synthesizing spatial cues (Foster)

        a. Measurement of the HRTF

        b Headphones vs. loudspeaker presentation

        c Realtime systems (demo of a realtime HRTF measurement & synthesis

            system)

    4 Perceptual consequences of spatial sound synthesis (Wenzel)

        Overview of psychoacoustical studies e g , individual differences

            in HRTFs, reflective environments, dynamic cues (moving heads &

            moving sources)

    5 Directions for future research and development. (Wenzel & Foster)

Presenter's Backgrounds

Pete Docter

TITLE	Directing Animator
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On October 9th, 1968, a handsome, mightily muscled, breathtakingly talented child was born. We don't know his name or what happened to him.

But Pete Docter was also born on the same date, a fact which vitally concerns us as this is his biographical sketch.

Pete's interest in animation began when he made his first flip-book at the age of eight. He attended college at the California Institute of the Arts (this was some time later) where he produced "Winter" (1988), "Palm Springs" (1989), and "Next Door" (1991) The films toured in *The Festival of Animation*, and "Next Door" won a Student Academy Award.

Pete worked as a traditional animator at Bajus-Jones and Reelworks in Minneapolis, and at Bob Rogers and Disney Feature Animation in Los Angeles Pete has been at Pixar since May 1991, where he animated and directed several commercials, most of which contain happy, bouncy products Currently Pete is hard at work as a directing animator on the Pixar/Disney computer animated feature film "Toy Story "

Scott Foster

TITLE	CEO, Crystal River Engineering, Inc
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Scott Foster founded Crystal River Engineering in 1987 to develop digital signal processing equipment for spatial audio and navigation systems. One of his first clients was NASA-Ames, for which he developed the Convolvotron 3-D sound system for applications including audio research, communications, navigation, virtual reality and telepresence Before establishing Crystal River, Mr Foster was an engineer at Hewlett-Packard Laboratories working on digital signal processing for audio and instrumentation, a research scientist at Atari, Inc where he designed a VLSI audio synthesis chip, and a project leader at Systems Control, Inc where he worked with Stanford's Center for Research in Music and Acoustics on a study of automatic music analysis and transcription Mr Foster received a B S in mathematics from the Massachusetts Institute of Technology in 1976

James K. Hahn

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James Hahn is currently a faculty member at the George Washington University where he is leading research in motion control, sound, virtual environments, and scientific visualization. He has been involved in previous SIGGRAPH tutorials (including organizing last year's tutorial "Sound Synchronization and Synthesis for Computer Animation and VR") as well as authoring SIGGRAPH technical papers His animations have been shown at the SIGGRAPH film and video shows as well as a number of television programs and museum exhibits around the world. He received an M.S. in physics from the University of California, Los Angeles and an M S. and a Ph.D in computer and information science from the Ohio State University

Mark Mangini

TITLE.	Sound Designer-Supervising Sound Editor
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During the past decade, Mark Mangini has been involved with a number of major motion pictures as supervising sound editor including "Raiders of the Lost Ark," " Poltergeist," "48 Hours," "Explorers," "Gremlins," "Star Trek IV," "Innerspace," "Three Men and a Baby," "Sex Lies and Videotape," "Kafka," and "Beauty and the Beast " Mangini's work on Disney's "Aladdin" earned him both an Academy award nomination and an MPSE Golden Reel Award. He also wrote and recorded a number of songs for film including "Star Trek V," "Innerspace," "Alien Nation," and "Sex Lies and Videotape " He also plays guitar in a "funk" band in East L.A.

Tom Myers

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Tom Myers has worked for the past seven years at Skywalker Sound Having performed most duties in post production audio he has worked as a sound designer/mixer for the past several years on a wide variety of projects They've included feature film, Japanese animation, Disney

Theme Park specials and numerous commercials He received a Bachelor's Degree in Communication from Northwestern University in 1980, (majoring in film) and did graduate work at San Francisco State before entering the film industry work force

Elizabeth M. Wenzel

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Beth Wenzel received a Ph D in cognitive psychology with an emphasis in psychoacoustics from the University of California, Berkeley in 1984 From 1985-1986 she was a National Research Council post-doctoral research associate at NASA-Ames Research Center working on the auditory display of information for aviation systems Since 1986 she has been Director of the Spatial Auditory Displays Lab in the Aerospace Human Factors Research Division at NASA-Ames, directing development of real-time display technology and conducting basic and applied research in auditory perception and localization in three-dimensional virtual acoustic displays. Dr Wenzel is an Associate Editor of the journal Presence and has published a number of articles and spoken at many conferences on the topic of virtual acoustic environments