

ILLUSIONS IN SOUND: THE APPLICATION OF PSYCHOACOUSTICS TO AUDIO

ABOUT THE CONFERENCE

The 22nd AES UK Conference will cover the whole gamut of techniques, technologies and controversies involved in the art of creating convincing illusions in audio through the use of psychoacoustics – our knowledge of how the ear/brain combination works to enable us to hear and localise sounds around us.

Among almost 20 papers, the role of psychoacoustics in consumer and sound reinforcement audio system and loudspeaker design will be examined, along with an overview of the latest developments in spatial recording and reproduction. The latest, stunning techniques for realising full 3D surround will be unveiled, and dramatically different approaches to the art of creating surround recordings will be contrasted, along with a panel that asks the question, "What do we really want from surround-sound?"

Presenters will look at how the 'sound' of real acoustic spaces can be captured for use in surround reverberation systems, provide an overview of audio in the electronic games industry and discuss the applications of surround-sound in radio drama. Wavefield synthesis techniques and hierarchical structures for delivering highest quality surround to a range of target systems will be examined along with the art of creating music in space – and spaces for music.

Presentations will cover both the most recent research and the latest practical developments in the art of creating sonic illusions.

In addition to the papers there will be two demonstration rooms in which current 3D and planar spatial reproduction systems can be experienced, compared and enjoyed, with a wide variety of content.

WHO SHOULD ATTEND

The Conference is a must for anyone who is involved, or intends to be involved, in surround and spatial audio in the broadcasting, professional or consumer electronics industries or the academic world; from gaming to movies, radio and TV, to rock or classical recording, sound reinforcement, or the design of consumer entertainment replay and production systems.

CONFERENCE INFORMATION

The Conference will be held on Wednesday 11 April and Thursday 12 April, 2007 at New Hall College, Cambridge.

Conference proceedings, lunch, refreshments and Wednesday evening's dinner are included in the registration fee of £348 +VAT (£298 +VAT for AES Members) and optional on-site accommodation is available at a very reasonable rate (see booking form or web site for details).

A special discounted rate is available for students. In addition, a limited number of bursaries is available to bona-fide UK students, sponsored by companies in the audio industry. Full details of student rates and bursaries can be obtained by contacting the AES UK office.

The venue for the event is New Hall, the Cambridge college for women founded in 1954. The college buildings were constructed from 1964 onwards and are regarded as modern architectural masterpieces, arranged around the stunning Dome dining hall. The college is set in 11 acres of grounds with informal lawns and gardens.

Optional overnight accommodation for the conference has been organised within the college, and this residential arrangement will allow for the full networking potential of the conference as well as the chance to experience the true ambience of a Cambridge college near the heart of this ancient, world-renowned seat of learning.

The AES 22nd UK Conference will be an event not to be missed!

For more information and a booking form, visit the Conference web site:

www.aes.org/ukconference

– or email uk@aes.org.

The AES logo consists of the letters "AES" in a bold, white, sans-serif font, centered within a red rectangular background.

Audio Engineering Society 22nd UK Conference

The title "ILLUSIONS IN SOUND" is displayed in a large, stylized font. "ILLUSIONS" is in blue with a starry pattern, "IN" is in grey, and "SOUND" is in red. Below it, the subtitle "the application of psychoacoustics to audio" is in a smaller, black, sans-serif font. The entire text is set against a white background with a faint silhouette of a person's head and shoulders, and is framed by four large black semi-circles at the corners.

**ILLUSIONS
IN SOUND**
the application of psychoacoustics to audio

2D & 3D surround-sound • multichannel listening room acoustics
speaker, sound reinforcement and audio system design • audio for gaming
surround radio drama • multi-mic & single-point recording
capturing reverberant spaces • hierarchical distribution systems
music for spaces/spaces for music • broadcasting & internet surround
discussions • demonstrations
and more...

Co-Chairs: John Dawson & David Errock

New Hall, Cambridge, 11–12 April, 2007

ILLUSIONS IN SOUND

the application of psychoacoustics to audio

WEDNESDAY 11TH APRIL 09:45–18:00

09:45 Introduction by John Dawson, conference co-chair

10:00 Psychoacoustic insights in audio system design

—*J Robert Stuart, Meridian Audio Ltd.* In order to design audio components effectively there has to be a methodology that connects the science of psychoacoustics with both electronic and acoustic engineering, and with the art of interesting sound. This presentation looks at how we can use relatively simple psychoacoustic ideas to guide the design process and minimise potential errors.

11:00 COFFEE & DEMONSTRATIONS

Two demonstration rooms will be available (the Vivien Stewart Room and the Council Room), in which current 3D and planar spatial reproduction systems can be experienced, compared and enjoyed, with a wide variety of content.

11:30 Perceptual organization of mixtures of sounds from different sources—*Brian C J Moore, University of Cambridge.* Sounds reaching our ears arrive from many different sources. Our hearing acts as a frequency analyser; separating components in a complex sound mixture. The brain assigns sources to these components. How do we do it?

12:30 LUNCH IN THE DOME & DEMOS

14:00 Basic psychoacoustics for surround recording—*Francis Rumsey, University of Surrey* A review of the current state of the art in spatial audio, including both surround and binaural recording and reproduction.

14:45 Recording and reproduction of surround and 3D audio—*Arnaud Laborie, Trinnov Audio.* This presentation reviews both objective and subjective

aspects of the latest developments in the acquisition and reproduction of surround and 3D audio, including high spatial resolution microphones, adaptation of the sound to the environment, loudspeaker/room equalisation and image remapping.

15:15 TEA & DEMONSTRATIONS

16:15 Multiple stereo miking techniques in the creation and delivery of immersive surround music—*Mark Waldrep, AIX Records.* AIX Records' award-winning surround recordings rely extensively on the use of multiple ORTF stereo pairs placed near the performers, combined with an acoustically rich recording environment. This approach allows the listener to be brought into the circle of instrumentalists in a live performance – or listen from the audience.

16:45 Recording the pure space—*Crac Downes, Nimbus Records.* Nimbus Records has been recording live musical performances in surround for almost 40 years, using a special single-point microphone array. From vinyl to CD and now high-resolution DVD releases, their technique employs a soundfield capture approach that is virtually unique in the commercial recording world.

17:15 Panel Session: What do we really want from surround? —*Panelists include: Mark Waldrep, AIX; Adrian Farmer, Nimbus; J Robert Stuart, Meridian Audio Ltd; Francis Rumsey, University of Surrey. Moderator: Richard Elen, Meridian Audio Ltd.* Do we want to bring the concert hall to the living room or transport the listener at home to the best seat in the house? Should you place the listener on stage with the musicians or just keep the rear stage for ambience? What happens when there's a picture? These and other questions about practical aspects of working in surround will be addressed.

**18:00 CLOSE followed by
19:00 DINNER IN THE DOME
DEMONSTRATIONS continue after Dinner**

THURSDAY 12TH APRIL 09:00–17:45

09:00 The application of psychoacoustics to small loudspeaker configurations—*Ronald Aarts, Philips Research.* The requirements for a good sound reproduction system generally conflict with those of consumer products as regards both size and price. A possible solution lies in enhancing listener perception and reproduction of sound by exploiting a combination of psychoacoustics, loudspeaker configurations and digital signal processing.

09:30 Room acoustics for multichannel listening: early reflection control—*Bob Walker, Wave Science Technology.* One of the main problems in surround listening room design is the destructive effect of early reflections on imaging precision. This paper discusses how to control them acoustically.

10:00 Measuring impulse responses containing complete spatial information—*Angelo Farina, University of Parma.* Modern digital reverberation systems allow the ambient 'sound' of a natural environment to be used in the studio. To capture these environments in the first place, however, requires a fascinating combination of psychoacoustic research and spherical harmonics.

10:30 Psychoacoustics in sound reinforcement and PA system design—*Peter Mapp, Peter Mapp + Associates.* Modern sound reinforcement systems make extensive use of psychoacoustic effects, as this paper describes. Haas and precedence effects are used to maximise loudness while maintaining localisation. Head Related Transfer Functions (HRTF) are employed and psychoacoustics also impacts the intelligibility of PA systems.

11:00 COFFEE & DEMONSTRATIONS

11:30 Hollywood sound for Cricklewood money—*Jerry Ibbotson, Media Mill.* This presentation offers a general overview of audio in the games industry, exploring the audio illusions created and used currently within the field of computer games and the field's unique possibilities and limitations.

12:00 Recent developments in parametric coding of spatial audio—*Juergen Herre, Fraunhofer IIS.* This paper will review the principles and current status of Spatial Audio Coding schemes – one of the most remarkable recent innovations in low-bitrate audio – and discuss their evolution towards Spatial Audio Object Coding with particular focus on the ongoing ISO/MPEG Audio standardisation activities in this field.

12:30 The uses of Ambisonic recording and mixing techniques in radio drama—*Eero Aro, Radio Theatre of the Finnish Broadcasting Company.* The aesthetics of surround sound in radio plays will be discussed, including practical solutions to surround drama production and distribution via radio and the internet.

13:00 LUNCH IN THE DOME & DEMOS

14:30 Wave field synthesis: reality or illusion at your choice—*Diemer de Vries, Delft University of*

Technology. Wave Field Synthesis allows spatial sound reproduction without the usual sweet spot limitations. Using arrays of loudspeakers around the audience area, sound sources and their acoustic environment can be (re)produced with natural properties in time and space. During the presentation, the physical background, technological tools and some interesting applications will be discussed.

15:00 Getting the best surround around—*Richard G Elen & Peter Carbines, Pyramedia Productions.* Imagine you're using the most advanced surround recording/ reproduction system ever devised, but virtually nobody can play it back. How do you enable everyone to hear the results of your labours? One answer is to convert to a format that everybody can already enjoy. But are the inevitable compromises worth it? This presentation describes practical examples of how it can be done.

15:30 The hierarchical view—*Peter Craven, Algor Research.* In 1992, Michael Gerzon proposed a hierarchical representation of multichannel signals as a means of handling the conversion between formats having differing numbers of speakers, providing a framework for cascaded conversions and in particular requiring that conversion to a higher resolution and back should recover the original signals. This presentation suggests applications of this approach to current formats such as 5.1, 7.1, and with-height layouts.

16:00 TEA & DEMONSTRATIONS

16:30 Quality degradation caused by bandwidth-limiting hierarchical encoding schemes—*Yu Jiao, University of Surrey.* In order to find optimum trade-offs between high data rate and high perceptual quality in multichannel audio transmission, a hierarchical bandwidth limitation algorithm was proposed by the authors. In this presentation, subjective effects of bandwidth limitation based on two hierarchical transform techniques are examined via formal listening tests.

17:00 Illusions of music in space and spaces for music—*Bill Martens, McGill University.* Creating illusions of musical instruments positioned in virtual space seems to have been the focus during the early years of spatial sound reproduction, but more knowledge is required for the artistic creation of virtual spaces within which musical sound is to be presented. This paper looks at what has been learned from investigations so far, and explores current research on the auditory spatial imagery associated with virtual acoustic environments.

17:45 CLOSE