Stochastic Differential Equations for the Masses

Wednesday, September 12, 1984 12:00 p.m.

Alex Garcia
Applied Research Laboratories
The University of Texas at Austin

The field of ordinary Stochastic Differential Equations (SDE) has in the past 20 years progressed from the dangerous and unexplored jungles of the cutting edge of analysis to the paved and well-lit treatments in undergraduate texts. Soon most differential equation courses will cover SDE in that hectic last two weeks of the semester as a sort of icing on the cake. Don't be let out of the coming stochastic revolution. This talk will briefly cover the following:

1). Interesting situations in which SDB arise
2). Fundamentals of the random processes
3). The 0-U and Wiener processes
4). Ito and Stratonavich calculus
5). Numerical techniques

No dealers, please. This talk is strictly for neophytes. Emphasis is on "cookbook" techniques, no proofs.

Nonlinear Effects in Sound Beams

Wednesday, September 19, 1984 12:00 p.m.

Professor Mark F. Hamilton
Department of Mechanical Engineering
The University of Texas at Austin

Finite amplitude propagation of directional sound beams is well modeled by Kuznetsov's paraxial wave equation, which accounts consistently for nonlinearity, diffraction, and absorption. The solution of Kuznetsov's equation is found in the form of a Fourier series expansion, and the resulting coupled equations in the harmonic amplitudes are integrated numerically. Excellent agreement between theory and experiment will be presented for axial propagation curves and farfield beam patterns. Nearfield effects resulting in the splitting of sidelobes (the appearance of so-called fingers) in the harmonic beam patterns will be discussed. The numerical method also lends itself nicely to describing reflection of finite amplitude beams, for example from both finite and infinite pressure release surfaces.

The Directivity of a Laser-induced Thermoacoustic Array

Wednesday, September 26, 1984 12:00 p.m.

Yves H. Berthelot
Applied Research Laboratories
The University of Texas at Austin

A thermoacoustic array can be generated by modulating the intensity of a laser beam illuminating a liquid. The nearfield directivity pattern of a thermoacoustic array is found by taking the Fourier transform of the impulse response of the optoacoustic system. A simple expression in integral form has been derived for the directivity of a thermoacoustic array on a pressure release boundary such as an air/water interface. The integral is easily evaluated numerically and it clearly shows the presence of side lobes in the nearfield directivity. In the limiting case of farfield radiation the directivity computed numerically reduces to the farfield directivity derived analytically. Experimental results will also be discussed.

The Diverging Sound Field of a Spherical Piston

Wednesday, October 17, 1984 12:00 p.m.

Halvor Hobæk
Department of Physics
The University of Bergen
Bergen, Norway

Computations show that the nearfield of a spherical piston -in the sense that the directional properties are dependent on range- extends much farther out than for a plane source of similar dimensions. The reason for this can be seen by applying an approximate mapping of the spherical piston field to that of a plane piston with the same aperture. A simple method to characterize the structure of both fields is also discussed.

Transient Response of an Electret Microphone

Wednesday, October 24, 1984 12:00 p.m.

Whang Cho
Department of Mechanical Engineering
The University of Texas at Austin

Simplified analysis shows that the decay rate of the transient response decreases as the frequency mode increases.

Generic Models of Spatially Distributed Transducers

Wednesday, October 31, 1984 12:00 p.m.

Professor Ilene Busch-Vishniac
Department of Mechanical Engineering
The University of Texas at Austin

The typical means of modeling a transducer is to represent its behavior using discrete lumped elements. In such a model the transducer exists at a point in space and thus the distributed nature of the transducer is neglected. We have developed generic models for transducers with finite spatial extent. In one of these models the transducer is viewed as a continuum of locally-reacting, connected two-ports. In the other model, the transducer is represented by a transmission line which has been augmented to include energy exchange with the environment. In both models the physical properties of the transducer may vary with location. This amplitude shading may be used to produce desirable response characteristics.

Pictures at an Exhibition: Wind Turbines

Wednesday, November 7, 1984 12:00 p.m.

Jim Hawkins
Applied Research Laboratories
The University of Texas at Austin

The U.S. Government has built and is operating several wind turbine systems as part of its Federal Wind Energy Program. We have acquired a ‘canned’ slide presentation describing some of the machines and sites involved. These slides will be shown accompanied by a reading of the associated printed material.

Unusual Observations During Speed of Sound Experiments in the Arctic in the 1820's and their Effect on the Development of Nonlinear Acoustics

Wednesday, November 14, 1984 12:00 p.m.

David T. Blackstock
Applied Research Laboratories
The University of Texas at Austin

In 1821-22, during an exploration voyage to northern North America to try to discover a "Northwest Passage" (a quick route to the Pacific Ocean), some measurements of the speed of sound were made. The time between the flash of a ship's cannon and the arrival of the blast wave about a mile away was measured under a variety of conditions. One series of measurements was marked by the unusual observation that the blast wave always arrived before the officer's command to fire the gun. The apparent reversal of expected arrivals was later taken to be evidence that intense sound travels faster than weak sound. In particular, Earnshaw's prediction that the propagation speed of a sound wave is u+c, where c is sound speed and u is particle velocity, seemed to be supported by experimental observations. Some comments about the applicability of the experiments to Earnshaw's prediction will be given. Some alternative explanations for the reversed arrivals will also be explored.

Transduction Efficiency for Sound Waves Systematically Pumped by Controlled Motion of Laser Beams Across Water Surfaces

Thursday, December 13, 1984 10:30 p.m.

Allan D. Pierce
Regent's Professor
School of Mechanical Engineering
Georgia Institute of Technology

No abstract available.