Wave Propagation In A Turbulent Medium Dover Books

Numerical Simulation of Optical Wave Propagation is solely dedicated to wave-optics simulations. The book discusses digital Fourier transforms (FT), FT-based operations, multiple methods of wave-optics simulations, sampling requirements, and simulations in atmospheric turbulence.

The observation fundamental to this work is that the ocean is usually in a state of turbulent motion. Correspondingly, the value of the temperature at every point in the ocean undergoes irregular fluctuations. In particular, since the index of refraction of the ocean is a function of temperature, we shall take the viewpoint that the refractive index is random and assume that the Kolmogorov theory of locally homogeneous and isotropic turbulence provides a sufficiently good description of the refractive index microstructure. To extract information concerning the randomness of an acoustic wave propagating through this turbulent and unbounded ocean, we make use of the wave equation to connect the statistical properties of the random medium to the impiled statistical properties of the wave parameters within the framework of a correlation theory. We accomplish this only to first order in perturbation theory, thus restricting the realm of validity of our results to high frequencies and small refractive index fluctations. The structure function of the logrithmic amplitude we find, generalizes similar results of Tatarski and Chernov away from the transversal, correspondingly longitudinal restrictions inherent in their work. (Author).

The Application of Invariant Imbedding Techniques to Wave Propagation Through Turbulent Media

Numerical Simulation of Optical Wave Propagation with Examples in MATLAB

Optical Wave Propagation in the Turbulent Atmosphere

Second Order Effects

With contributions by numerous experts

This research used Huygens-Fresnel wave optics computer simulations to investigate the effects of high turbulence strength and inner scale on the normalized irradiance variance and coherence length of electromagnetic waves propagating through a turbulent atmosphere. These investigations developed several guidelines for validity of propagation simulations employing a numerical, split-step, Huygens-Fresnel, method, and within these guidelines, considered five types of turbulence spectrum inner scale: (1) zero inner scale, (2) Gaussian inner scale, (3) Hill's and (4) Frehlich's viscous-convective enhancement inner scales, and (5) turbulence spectrum truncation from the discrete grid representation. The simulation results showed that the normalized irradiance variance generally decreased (-30%) below the zero inner scale values in the Rytov regime with increasing inner scale size, but increased monotonically in the saturation regime, and agreed within 2% of the Rytov- Tatarski predictions at low turbulence strengths. The E-field coherence length in a spatially confined beam, with either spherical or plane wave divergence and zero inner scale, followed the Rytov-Tatarski-Fried predictions in the Rytov regime, but departed from the theory in the saturation regime. Increasing inner scale size modified this finite beam behavior by raising the coherence length (up to -50%) in the saturation regime.

Modeling the Ocean - Introduction to Wave Propagation in a Turbulent Medium

Wave Propagation in a Turbulent Medium, Translated from the Russian

Computer Simulation of Wave Propagation Through Turbulent Media

This monograph describes the phenomena associated with the propagation of electromagnetic and acoustic waves through

atmospheric turbulence. Geared toward specialists in radiophysics and atmospheric acoustics and optics, the treatment is also suitable for advanced undergraduates and graduate students. The author stresses applications to phase and amplitude fluctuations, scintillation of stars, radio scattering, and other problems. Part I covers topics from the theory of random fields and turbulence theory, including statistical description. Part II, on the scattering of waves in the turbulent atmosphere, is supplemented by an appendix on scattering of acoustic radiation. Part III offers a detailed presentation of line-of-sight propagation of acoustic and electromagnetic waves through a turbulent medium. Part IV concludes the text with a comparison of theory with experimental data
Electromagnetic Wave Propagation in Turbulence is devoted to a method for obtaining analytical solutions to problems of electromagnetic wave propagation in turbulence. In a systematic way the monograph presents the Mellin transforms to evaluate analytically integrals that are not in integral tables. Ample examples of application are outlined and solutions for many problems in turbulence theory are given. The method itself relates to asymptotic results that are applicable to a broad class of problems for which many asymptotic methods had to be employed previously.

Wave Propagation in a Turbulent Atmosphere

Wave Propagation and Turbulent Media

Effects of the Turbulent Atmosphere on Wave Propagation/Tt6850464

Wave Propagation in a Turbulent Medium

Wave or weak turbulence is a branch of science concerned with the evolution of random wave fields of all kinds and on all scales, from waves in galaxies to capillary waves on water surface, from waves in nonlinear optics to quantum fluids. In spite of the enormous diversity of wave fields in nature, there is a common conceptual and mathematical core which allows to describe the processes of random wave interactions within the same conceptual paradigm, and in the same language. The development of this core and its links with the applications is the essence of wave turbulence science (WT) which is an established integral part of nonlinear science.The book comprising seven reviews aims at discussing new challenges in WT and perspectives of its development. A special emphasis is made upon the links between the theory and experiment. Each of the reviews is devoted to a particular field of application (there is no overlap), or a novel approach or idea. The reviews cover a variety of applications of WT, including water waves, optical fibers, WT experiments on a metal plate and observations of astrophysical WT.

Ground-breaking contribution to the literature, widely used by scientists, engineers, and students. Topics include theory of wave propagation in randomly inhomogeneous media, ray and wave theories of scattering at random inhomogeneities, more. 1960 edition.

Wave propagation through a turbulent tropospheric layer

Statistics of Electromagnetic Wave Propagation Through a Turbulent Atmosphere

Advances In Wave Turbulence

The Moliere Approximation for Wave Propagation in Turbulent Media

A solution is presented to the wave propagation equation obtained by direct analogy from a method commonly used to solve the Schroding equation for high-energy potential scattering. In optical communications and related devices, the random variations in the received signal d to atmospheric turbulence can represent a severe limitation to system performance. Studies of these fluctuations have been based on solu to the wave propagation equation that are correct only to the first order in the refractive index deviation. This memorandum demonstrates a solution that is correct to all orders in the refractive index deviation and to lowest order in the stationary phase approximation. Although the solution is readily extended to next order in stationary phase, such an extension is recognized in scattering theory as unwarranted since it neglects terms of the same order from outside the region of stationary phase. The conventional Born and Rytov solutions in propagation th are of questionable validity since they represent approximations to the extended solution. (Author).

Wave Propagation and Scattering in Random Media, Volume 2, presents the fundamental formulations of wave propagation and scattering random media in a unified and systematic manner. The topics covered in this book may be grouped into three categories: waves in random scatterers, waves in random continua, and rough surface scattering. Random scatterers are random distributions of many particles. Examp are rain, fog, smog, hail, ocean particles, red blood cells, polymers, and other particles in a state of Brownian motion. Random continua are the media whose characteristics vary randomly and continuously in time and space. Examples are clear air turbulence, jet engine exhaust, tropospheric and ionospheric turbulence, ocean turbulence, and biological media such as tissue and muscle. Rough surface examples are ocean surface, planetary surfaces, interfaces between different biological media, and the surface roughness of an optical fiber. This book is intended for engineers and scientists interested in optical, acoustic, and microwave propagation and scattering in atmospheres, oceans, an biological media, and particularly for those involved in communication through such media and remote sensing of the characteristics of thes media.

Wave propagation in a turbulent medium

High-frequency Beam Wave Propagation in a Turbulent Stratified Ionosphere

Electromagnetic Wave Propagation in Turbulence

Statistical Aspects of Optical Wave Propagation Through a Turbulent Atmosphere

Contents: Empirical data on the small-scale structure of atmospheric turbulence; Turbulence characteristics of wind speed and temperature in the boundary layer of the atmosphere; Turbulent exchange in the thermally stratified planetary boundary layer of the atmosphere.

Wave Propagation in a Random Medium

Modeling of Acoustic Wave Propagation in Turbulent Flow

Evaluation and Application of Mellin Transforms

Multiple Scattering, Turbulence, Rough Surfaces, and Remote Sensing