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MATHEMATICS

PHYSICS

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STOCHASTIC RISK MODELS I

Gheorghe OPRISAN

The propose of the first part of this paper is give to a concise but self-contained survey of classical risk models and their applications that might be interest to actuaries.

Keywords: Utility function; risk aversion; Von Neumann-Morgestern theorem; individual risk; aggregate claims; collective riks; Cramer-Lundberg model.

PROPER PROJECTIVE SYMMETRY IN SOME WELL KNOWN CONFORMALLY FLAT SPACE-TIMES

Ghulam Shabbir, Tauseef Ahmed Khan

A study of conformally flat- but non flat Bianchi type I and cylindrically symmetric static space-times according to proper projective symmetry is given by using some algebraic and direct integration techniques. It is shown that the special class of the above space-times admit proper projective vector fields.

Keywords: conformally flat space-times, projective vector field, direct integration technique

ON ELECTROMAGNETIC WAVELETS

Teodora Daniela CHICIOREANU

Signals carry codified and uncodified information. Information, as well as energy, has the generic property of being able to change its form repeatedly, without losing its essence. Fourier's theory of series and Fourier transformation plays a central role in mathematics and engineering sciences. Through the Fourier

transform, a time signal $L^1 \cap L^2$ changes only its means of representation in the frequency domain, and thus it can be retrieved at any time. Using sequential techniques, the information is light-speed transported and decodified at the reception point.

Keywords: signal, electromagnetic waves, wavelets, radar, sonar

THE CONCENTRATION GINI COEFFICIENT VERSUS A POLARIZATION INDEX

Poliana STEFANESCU, Stefan C. STEFANESCU

The Gini concentration coefficient g is frequently used to measure the poverty level from a given population P. A new indicator D was defined to evaluate the intensity of the polarization phenomenon in P. The present study emphasizes the differences between the indices g and D, giving new arguments to apply the coefficient D for establishing the degree of the income polarization for P individuals.

Keywords : Gini coefficient, polarization index, Lorenz order, antithetic variables.

MSC2000 : primary 62P25 ; secondary 62P20, 91B14, 91D99 .

MODELLING OF AN IMPROVED METHOD OF PHASE DETECTION SCHEME FOR DISPLACEMENT OPTIC SENSORS

Niculae N. PUSCAS

In this paper the modelling of an improved method for the measurement of small displacements and vibrations based on a novel

method for overcoming DC drift in RF subcarrier phase detection scheme for fibre optic sensors is presented. The method works in open loop and is characterized by low distortions in the modulation process, good signal-to-noise ratio and rather low cost. Considering the receiver ideal, we obtained for the measurements of small distances a minimum of 0.74 μm with a 6.6 $\times 10^{-7}$ dB dynamic range. We evaluated the probability density and modelled it vs the phase error for different values of the average number of photoelectrons generated by the signal and the phase noise parameter. Considering a stationary Gaussian stochastic process the dependence of the corresponding power spectral density was also evaluated. The presented results can be used in the measurement of small distances, vibrations and seismic detection.

Keywords: Optic sensor, Small displacement measurements, Phase detection scheme, Probability density, Phase error, Phase noise parameter, Power spectral density

BINDING ENERGY OF AN OFF-CENTER DONOR IN CYLINDRICAL QUANTUM-WELL WIRES UNDER INTENSE LASER FIELDS

Ecaterina C. NICULESCU, Adrian RADU

In this work, we have investigated the effect of the intense high frequency laser field on the ground-state binding energy of hydrogenic impurity in cylindrical GaAs-AlGaAs quantum well wires as function of the impurity position. The binding energies were obtained using the effective-mass approximation within a variational scheme. We have shown that in the strong confinement regime the presence of the linearly polarized laser radiation partially resolves the degeneracy of donor states corresponding to symmetrical position of the impurity.

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LASER - FIELD - INDUCED FERRONEMATIC-FERROCHOLESTERIC TRANSITION IN HOMEOTROPIC CELLS

Emil PETRESCU, Eleonora - Rodica BENA, Cristina CÂRTOAJE, Adrian Liviu PAUN

We investigate the influence of a laser beam on the director structure of a ferrocholesteric liquid crystal (FC) confined in homeotropic cells. Using the analytical method based on the Euler-Lagrange equations we find a correlation between the laser beam intensity and the confinement ratio $r = d / p$ *(*d *is the cell thickness and* p *is the cholesteric pitch) at the threshold of the transition from the nematic-like texture (homeotropic alignment) to the cholesteric-like texture (translationally invariant configuration with uniform in plane twist – TIC). Based on this correlation and using some practical values for the material's parameters we construct the spinodal line,(spinodal ellipse) separating the metastable homeotropic configuration from the unstable TIC.*