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ABSTRACT BOOK

rod placed in the center of the coils. The outer coils generate the dc field, while the inner coils generate the ac field. The ac field is a square wave with a duty cycle of 50%, which is controlled by a desktop computer via its parallel port. The oscillating current signal generated by a function generator or the computer is amplified by an integrated circuit. The oscillations are detected optically by using a coding wheel and a pair of led photodetectors commonly found in old computer mouses; the transduced signal is sent back to the computer via the PS2 port. Initially, we investigate, numerically (by integrating the equations of motion) and experimentally, the boundaries of the unstable regions of motion, which are known as Arnold tongues. We also study the bifurcations of the stationary points of oscillations (obtained from Poincare maps) and the route to chaos as the drive amplitude is increased. We further investigate the control of the magnet in the unstable position and how to flip it by 360 ^{o} with carefully-designed pulses.

The 1/t algorithm: Fast method to calculate the joint density state function for the adsorbed phase with multisite occupancy

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We present a modified 1/t algorithm for calculate the properties of the adsorbed phase with multisite occupation. We demonstrate this algorithm with the calculation of the joint density of state of dimer adsorbed on square lattices with anisotropic interactions. The joint density of states contains more information than the density of states of a single variable-energy, but is also much more time consuming to calculate. Different interaction energies are proposed depending on the orientation respect of the symmetry axes of the dimers, i.e., JL(JT) are the interaction energy parallel (perpendicular) respect to the principal symmetry axes of the molecule. The adsorption is monitored by the behavior of equilibrium observable as the adsorption isotherms, internal energy, specific heat of adsorption, order parameter, etc. Different phases are observed and critical points as well as the characterization of the phase transitions are presented.

On the topology of optical transport networks

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In this communication we present a study of the topology of the SDH telecommunication network operated by Telefónica in Spain. SDH (Synchronous Digital Hierarchy) network is the standard technology for the information transmission in broadband optical networks. The system transports different traffic types, such as voice, video, multimedia, and data packets (as those generated by IP) over the same fiber wire. We observe that the SDH network shows emergent complexity in all the Spanish provincial networks analyzed, despite being largely dependent on strict planning policies [1,2]. Particularly, we found power-law scaling in the degree distribution and properties of small-world networks, signs of self-organization in the evolution of complex systems. These complex topological properties have been related to the robustness of systems. Thus, complex networks are considered robust against random failures but sensitive to planned attacks in highly connected nodes. Under this perspective, we study the robustness of the Spanish SDH systems by the simulation of direct attacks to those equipments that control the flow of information. We have found that the robustness depends not only on the connectivity of equipments but also on the capacity and type of links associated to those equipments. Consequently we have also observed that the robustness of SDH networks depends on the particular initial design and evolution of each Spanish province. Considering the results obtained by the empirical study, we developed an ad hoc model to describe the topological structure of the networks. The model, that considers real planning directives and geographical and technological variables, generates networks in good agreement with the real Spanish SDH systems [2].

[1] J. P. Cárdenas, M. L. Mouronte, A. Santiago, V. Feliu and R. M. Benito, IJBC. (2009) in press; [2] A. Santiago, J. P. Cárdenas, M. L. Mouronte, V. Feliu and R. M. Benito. IJMPC 19 (2008) 1809-1820.

Multifractal analysis from vertical total electron content obtained in two different locations in Brazil

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In this paper, we have analyzed the Vertical Total Electron Content (VTEC) obtained in two different locations in Brazil, Belém (PA) and São José dos Campos (SP). The characterization of the VTEC fluctuations was performed using the singular power spectra deviations obtained from a wavelet transform modulus maxima (WTMM) approach. The results suggest the existence of different multifractal processes driving the intermittent in two different geographic coordinates on the VTEC time series. The characteristic time scales found, using the WTMM, a simple simulation approach, and possible related physical mechanisms are discussed in the context of nonlinear geomagnetic field response.

Dynamic behavior of a social model for opinion formation

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A model of opinion formation of a social group influenced by both a strong leader and the mass media, which is modeled according to the social impact theory developed by Latané, exhibits sharp (first-order like) transitions between a leader-dominated regime and a mass media dominated state. The dynamic behavior of the model is studied when the strong leader changes his/her state of opinion periodically while the mass media are not considered. Under this condition, the leader is capable of driving the group between a dynamically ordered state with a weak leader-group coupling (high-frequency regime) and a dynamically disordered state where the group follows the opinion of the leader (low-frequency regime). On view of these results, we conclude that the dynamic behavior characteristic of the studied social opinion model shares many features of physical systems that are relevant in the fields of statistical mechanics and condensed matter, such as the dynamic phase transitions of the Ising model under the influence of an oscillatory magnetic field, electrochemically deposited monolayers in the presence of an oscillatory chemical potential, etc.