회보

BULLETIN OF THE KOREAN PHYSICAL SOCIETY

제79회 정기총회 프로그램, 논문초록집

2003년 4월

한국물리학회
THE KOREAN PHYSICAL SOCIETY
behavior of coupled nonlinear oscillators in d-dimensional lattice in relation with dynamic surface growth model such as Edwards-Wilkinson (EW) equation. Phase synchronization and frequency entrainment are probed, where these behaviors are examined and estimated through the previous corresponding results of the surface roughness measure W and the height-height correlation function C(r), respectively. The probability density is numerically obtained, and from it the ordering behavior is examined. It is found that the effective coupling strength for d=2 is increased as $K_{\text{eff}} \sim \ln L$ with the system size L. The ordering behavior for d=3 is also discussed.

**F-07(조)**
Entropic Resonance in Globally-Coupled Ising Model  
김범중, 최부영(아주대, 서울대)  
The entropic sampling dynamics of the globally coupled Ising model in the presence of the oscillating external magnetic field is numerically investigated. When the driving frequency $\Omega$ is small enough, the resonance between the magnetization and the external magnetic field is observed, which call the entropic resonance. The intrinsic relaxation time scale in the entropic sampling dynamics is also measured in the absence of external magnetic field, and the time-scaling matching between the intrinsic and extrinsic time scales is used to explain the disappearance of the entropic resonance as the system size becomes larger.

**F-P001**  
Jamming Transition in Highly Dense Granular System under Vertical Vibration  
문종균, 김기범, 박중진, 김형국, 박혁규(부산대학교 물리학과)  
The dynamics of the jamming transition in 3D granular system under vertical vibration is studied using diffusing-wave spectroscopy. When the maximum acceleration of the external vibration is large, the granular system behaves like a fluid, with the dynamic correlation function G(t) relaxing rapidly. As the acceleration of vibration approaches the gravitational acceleration g, the relaxation of G(t) slows down dramatically, and eventually stops. Thus, the system undergoes a phase transition and behaves like a solid. A theory of supercooled liquids close to the glass transition is used to explain the relaxation data.

**F-P002**  
Effect of Asymmetry on Blow-Out Bifurcations in Coupled Chaotic Systems  
김주현, 임우정(경북대)  
We investigate the effect of asymmetry of coupling on blow-out bifurcations in a system of coupled one-dimensional maps by varying a parameter $\alpha$ tuning the "degree" of asymmetry from symmetric coupling ($\alpha=0$) to unidirectional coupling ($\alpha=1$). For the case of symmetric coupling, an asynchronous hyperchaotic attractor with a positive second Lyapunov exponent is born through a blow-out bifurcation. However, as the parameter $\alpha$ passes a threshold value $\alpha^*$, a transition from hyperchaos to chaos occurs. Hence, for $\alpha^* < \alpha \leq 1$ an asynchronous chaotic attractor with a negative second Lyapunov exponent appears. It is found that the sign of the second Lyapunov exponent of the newly-born asynchronous attractor, exhibiting on-off intermittency, is determined through competition between its laminar and bursting components.

When the "strength" (i.e., a weighted second Lyapunov
exponent) of the bursting component is larger (smaller) than that of the laminar component, an asynchronous hyperchaotic (chaotic) attractor appears. Similar results are found in examples of higher dimensional invertible systems, in particular, for coupled Henon maps and coupled parametrically forced pendula.

**F-P003** Chaotic bursting as chaotic itinerary in coupled neural oscillators

한승기, D. Postnov

We show that chaotic bursting activity observed in coupled neural oscillators is a kind of chaotic itinerary. In neuronal systems with phase deformation along the trajectory, diffusive coupling induces dephasing effect. Because of this effect, an anti-phase asynchronous solution is stable for weak coupling, while an-phase solution is stable for very strong coupling. For intermediate coupling, a chaotic bursting activity is generated. It is a mixture of three different states: an anti-phase firing state, an in-phase firing state, and a non-firing resting state. As we construct numerically the deformed torus manifold underlining the chaotic bursting state, it is shown that the three unstable states are connected to give a rise to a global chaotic itinerary structure. Thus we claim that chaotic itinerary provides an alternative route to chaos via torus breakdown.

**F-P004** Understanding of visual map formations by analogy with vortex dynamics

조령환, 김승환

We propose a general method for generation of the visual cortex map including orientation and ocular dominance columns. Based on the known cortical structure, we build an anisotropic Heisenberg model with long-range lateral interactions of a Mexican hat type. This spin Hamiltonian model allows an interpretation of the map formation in the visual cortex in terms of the pattern formation in relaxation dynamics of spins. In particular, we predict various phenomena of self-organization in ocular and orientation map formations including the pinwheel annihilation and its dependency on boundary conditions and the columnar wave vector.

**F-P005** 취소

**F-P006** 취소

**F-P007** 담배이관의 소리인식 시동네기 노경보, 문재우(한국과학기술원 물리학과) Sound perception can be understood with nonlinear oscillator model of cochlea which is self-tuned near Hopf bifurcation. This model enables us to understand many strange features. Neural coding mechanism can be interpreted as mapping histogram of inter-spike intervals. We included inter-firing limit of neural pulse in which neuron can not response to external stimulus and could find parameter change may cause complexity in neural pulse signal.

**F-P008** 가중치를 갖는 행위자 기초 모형을 이용한 금융시계열 분석 (Financial Time Series Analysis on Weighted Agent-Based Model) 양재석(J.-S. Yang), 문희태(H.-T. Moon)(한국과학기술원 KAIST 물리학과) We simulate financial time series using weighted agent-based model. In our model weight is used for two ways. One is the influence of the information to other agents and the other is the amount of wealth. In both case the distribution of agents' weight is important to determine properties of financial market. In our model weight is evolving as iterating this system. We observe the change of the distribution of agents' weight and fine that the distribution of agents' weight is evolving to the power-law distribution in any initial conditions.

**F-P009** Herd Behavior of the Return in the Korean Financial Market 김경석, 윤성빈, 김elmet(부경대, 물리학과) The herd behaviors of the return for the KOSPI and the won-dollar exchange rate are investigated in Korean financial market. The probability distributions of the return for three types of herding parameter is found to scale as a power law $SR=\alpha$ with the exponents $S\alpha=2.1S$(the KOSPI) and $S2.2S$(the won-dollar exchange rate). For our case since the active state of