한국물리학회

회보

BULLETIN OF THE KOREAN PHYSICAL SOCIETY

제22권 제1호

제80회 정기총회 프로그램, 논문초록집

2004년 4월

사단법인 한국물리학회
THE KOREAN PHYSICAL SOCIETY

Transition LEE Changhan, KIM Jin Min(*Department of Physics, Soongsil University.*) We study the pinning-depinning transition of a driven interface specially for the quenched Kardar-Parisi-Zhang(QKPZ) equation. We consider the average velocity of the interface growth as an order parameter and show that the average velocity follows a finite size scaling at or near critical point. The results for the quenched Edwards-Wilkinson equation are also discussed.

F-P003 **Temperature dependent behavior of the conserved lattice gas model** KIM In-mook, KANG Sehoon, WANG hyung sun(*Department of Physics, Korea University.*) The conserved lattice gas model(CLG) is a simple system which exhibits an absorbing phase transition at a finite particle density ρ_c. For large densities($\rho>\rho_c$), the system reaches a stationary active state characterizing by the nonzero density of active particles. But the system falls into an absorbing state if $\rho<\rho_c$. On two dimension, the CLG model suppose to have an absorbing state at $\rho_c=0.5$, but other studies have found much smaller critical values of an active particle density, 1.e., 0.23875(Rossi et al), 0.34494 (Lubeck), 0.34779(Kim et al). In this study, we are able to observe an absorbing phase transition at $\rho_c=0.5$ by introducing a thermal fluctuation on the particle dynamics. The critical value of the particle density ρ_c is now dependent on temperature. At the critical temperature Tc, the absorbing phase transition occurs exactly at $\rho_c=0.5$. But the critical value of ρ_c decreases as temperature increases above Tc and ρ_c increases as temperature decreases below Tc. The smaller critical value of ρ_c founded earlier corresponds to one for infinite temperature.

F-P004 **Modified model for the first order phase transition of a driven interface in disordered mdeia** KIM In-mook, SOHN Jang-il(*Department of Physics, Korea University.*) We introduce a modified growth model which exhibits a first order pinning-depinning(PD) transition in disordered media. The first order PD transition is triggered by the local inertial force $F_l=pL\upsilon$, where p denotes a constant between 0 and 1, L is the system size, and υ is the average velocity in a local region of the growing interface. If $p<p_c$, our model shows a continuous PD transition. However, if $p<p_c$, our model shows a discontinuous PD transition. We obtain a hysteresis curve characterizing a first order phase transition.

F-P005 **Establishment of stochastic discrete models for continuum Langevinequation of surface growths** YOON Sooyeon, KIM Yup(*Kyunghee Univ. Dept. of Phys..*) Based on the relations among Langevin equation, Fokker-Planck equation, and Master equation for the surface growth phenomena, itcan be shown that the deposition(evaporation) rate of oneparticle to(from) the surface is proportional to $W=| W_d | \Theta(W_d)+| W_e | \Theta (W_e)$. Here , $W_d =(\Phi+\eta(\vec x, h))/2 +D$ and $W_e=-(\Phi+\eta(\vec x, h)) /2 +D$ are from theLangevin equation $\partial h/ \partial t=\Phi(\nabla^2 h,\nabla^4 h, |\nabla h|^2, \cdots)+\eta (\vec x , h)+\eta(\vec x, t)$. From these rates, we can construct easily the discretestochastic models of the corresponding continuum equation, whichcan directly be used to analyze the continuum equation. It isshown that this analysis is successfully applied to the quenched Edward-Wilkinson (EW) equation and quenched Kardar-Parisi-Zhang(KPZ) equation as well as the thermal EW and KPZ equations.

F-P006 **Universality for the Intermittent Route to Strange Nonchaotic Attractors in Quasiperiodically Forced Systems** 임 우창, 김 상윤(*강원대.*) To examine the universality for the intermittent route to strange nonchaotic attractors (SNAs), we investigate the quasiperiodically forced Henon map, ring map, and Toda oscillator which are high-dimensional invertible systems. In these invertible systems, dynamical transition to an intermittent SNA occurs via a phase-dependent saddle-node bifurcation, when a smooth torus collides with a "ring-shaped" unstable set. We note that this bifurcation

mechanism for the appearance of intermittent SNAs is the same as that found in a simple system of the quasiperiodically forced noninvertible logistic map. Hence, the intermittent route to SNAs seems to be "universal," in the sense that it occurs through the same mechanism in typical quasiperiodically forced systems of different nature.

F-P007 **Effect of Parameter Mismatch on Weak Chaotic Synchronization in Coupled Invertible Systems** 임 우창, 김 상윤(*강원대.*) We investigate the parameter-mismatching effect on weak chaotic synchronization in high-dimensional invertible systems such as coupled Henon maps and coupled pendula. Due to the existence of positive local transverse Lyapunov exponents, a weakly stable synchronous chaotic attractor (SCA) becomes sensitive with respect to the variation of the mismatching parameter. To quantitatively characterize such sensitivity, we generalize the method proposed in coupled noninvertible one-dimensional maps to high-dimensional invertible systems. Thus, a quantifier, called the parameter sensitivity exponent (PSE), is introduced to measure the"degree" of the parameter sensitivity. In terms of the PSE, we characterize the effect of the parameter mismatch on the bubbling and riddling of the weakly stable SCA. The scaling exponent for the average characteristic time spent near the synchronization plane for both the bubbling and riddling cases is found to be given by the reciprocal of the PSE.

F-P008 신경발화패턴 및 뇌파의 위상 분석: 알파 리듬의 위상 조정 김 원섭, 김 정애[1], 조 선영[2], 한 승기[1](*충북대학교 의용생체공학과 [1]충북대학교 물리학과 [2]충북대학교 기초과학연구소*) 다중 채널로부터 측정한 신경세포의 발화 패턴과 뇌파 신호에 wavelet과 band-pass filter를 적용하여 여러 가지의 리듬성분을 추출하고, 각 성분에 대한 위상 변화에 대해 조사했다. 또한 반복된 자극에 따른 발화 신호와 뇌파에 대해, 자극 이전의 신경계 리듬이 자극에 의해 어떻게 조정되는 지를 분석하였다. 반복된 자극에 의한 신경세포의 발화 신호와 뇌파 신호를 자극 제시 시점을 기준으로 정렬하여, 반복된 뇌파의 평균치, Event-Related-Potential(ERP),를 측정하였을 때, 자극 제시 이전에는 ERP가 매우 작으나, 자극 제시 이후에는 ERP가 급격히 증가는 것을 볼 수 있었다. 이것은 자극이 전에는 알파리듬의 위상이 고르게 분포되었으나, 자극 제시후 알파리듬의 위상분포에 변화가 생긴것으로 볼 수 있다. 자극제시 시점의 알파리듬 위상에 따른 위상속도 변화 분포도와 자극시 위상에 따른 위상속도의 비선형성으로 부터 이러한 현상을 설명하고자 한다.

F-P009 **Bifurcation Analysis of Cell Cycle Regulation in the Budding Yeast** NGUYEN Cuong, 윤 장로, 한 승기(*충북대학교 물리학과.*) Bifurcation analysis of cell cycle regulation in the budding yeast is performed based on the mathematical model by Chen et al.(MBC, 11, 369). On the bifurcation diagram, location of the stable and the unstable solutions of the nonlinear differential equations is presented taking mass of the cell as a control parameter. Based on the bifurcation diagram, dynamic mechanism underlying the 'start' transition, initiation of a new round of a cell cycle, and the 'finish' transition, completion of a cell cycle and returning back to the initial state, is discussed: the 'start' transition is a transition from a stable fixed solution for a small mass and to an oscillatory state for a large mass, and the 'finish' transition is a switching back to the stable fixed solution from the oscillatory state. To understand the role of the genes during the cell cycle regulation, bifurcation diagrams for the mutants are compared with that of the wild type.

F-P010 **Punctuated Equilibrium and Criticality on Network Structures** LEE Sungmin, KIM Yup(*경희대학교 물리학과.*) We study a simple model for punctuated equilibrium and criticality on several network structures, where the neighbor of each node is distributed heterogeneously, given as its own degree. Each node has a fitness value f. On evolution a node who has the smallest value of fitness and its linked neighbors are updated to new random value of fitness. After a while the system goes to the critical state, where the