임시총회프로그램, 논문초록집

that the statistical properties of low-lying energy levels are not much different from those of high- lying energy levels.

F-P020   Chaotic Synchronization in Coupled Chaotic Pendula   임승환, 김칠민(배재대학교 광혼돈제어 연구단) 김명운, 황동욱, 박영재(서강대학교 물리학과)
We analyze the intermittent synchronization in coupled chaotic pendula which has recently been a controversy. The controversy of coupled chaotic pendula is whether the synchronization is a numerical effect or not. In order to resolve this controversy, we use the simple numerical scheme in error dynamics. Using this scheme, we find the synchronization region in coupled chaotic pendula. In the synchronization region, we observe that the average time for synchronization linearly depends on the numerical precision. According to the Longa et al's criterion, we find that the observed synchronization is genuine. Also, we find that on-off intermittency is a route to synchronization in coupled chaotic pendula.

F-P021   표면 플라즈몬 공명을 이용한 알부민 흡착에 관한 실험 연구   유다운, 김상윤 (강원대), 조용구, 이자일, 김현정, 김종원 ((주)바이오메드랩)
표면 플라즈몬 공명(Suface Plasmon Resonance, SPR)은 광학 기술로서, 최근들어 생물학적 상호작용 연구에 유용하게 많이 사용되어지고 있다. 이러한 SPR 측정방법과 디지털 신호 처리 기술을 결합시켜 텍사스 인스투루먼트사에서 최근 개발한 Spreeta^{TM} 센서는 감지표면에 묻은 액체의 굴절지수를 실시간으로 정밀하게 측정할 수 있다. 이러한 Spreeta^{TM} 센서를 이용하여 금속 표면에 알부민 흡착에 관한 연구를 다음과 같이 수행하였다. 금 박막이 코팅된 감지 표면에 알부민 용액을 흘려 보내면 화학 반응-확산 과정을 통해서 알부민의 흡착이 일어나게 된다. 이 때 Spreeta^{TM} 센서를 이용하여 흡착 과정에서 나타나는 공명각과 굴절률의 변화를 실시간으로 측정할 수 있다. 또한 흡착이 포화될 때까지 걸리는 특성시간도 측정할 수 있다. 알부민을 흡착시키기 전 표면에 완충용액을 흘려보내 기준을 잡고, 알부민의 농도를 $10\mu g/ml$부터 $100\mu g/ml$까지 변화시키면서 실험했다. 그 결과 각 농도에서 기준으로부터 흡착이 포화될 때까지 $10^2 s$ 정도의 시간이 걸렸고, 그 사이에 0.1°정도의 공명각 변화와 10^{-3}정도의 굴절률 변화를 관찰할 수 있었다. 그리고 알부민 농도가 커짐에 따라 공명각 변화의 차이가 커졌고, 그 결과로 굴절률 변화의 차이도 커졌다. 또한 흡착이 포화되는 특성시간도 단축 되었다.

F-P022   Characterization of The Parameter-Mismatching Effect on The Weak Synchronization   임우창, 김상윤 (강원대), A. Jalnine, S. Kuznetsov (Saratov State Univ., Russia)
We investigate the effect of the parameter mismatch on the loss of chaos synchronization in coupled one-dimensional maps. Loss of strong synchronization begins with the first transverse bifurcation of a periodic saddle embedded in the synchronous chaotic attractor (SCA) on the diagonal, and then the SCA becomes weakly stable. Depending on the global dynamics, bubbling or riddling may occur in the regime of weak synchronization. As successive transverse bifurcations of periodic saddles occur, local transverse repulsion of the SCA becomes intensified, and thus the SCA becomes sensitive with respect to the variation of the mismatching parameter. In order to quantitatively characterize the strength of such local transverse repulsion of the SCA, a new quantifier, called the parameter sensitivity exponent (PSE) μ, is introduced. As μ increases from zero, local transverse repulsion of the SCA from the diagonal becomes strong, and hence the average time τ (the average interburst interval for the bubbling case and the average lifetime for the riddling case) that a typical trajectory spends near the diagonal becomes short. Note also that τ may be quantitatively characterized in terms of the PSE.

F-P023   Torus Bifurcations and Dy-

namical Transitions in Quasiperiodically Forced Maps 임우창, 김상윤 (강원대) For the quasiperiodically forced maps, we investigate bifurcations of smooth tori and dynamical transitions in a sequence of periodically forced maps resulting from the rational approximations (RAs) to the quasiperiodic forcing. Note that the torus bifurcations may or may not depend on the phase of the external forcing. Like the periodic bifurcations, new smooth tori may appear through the phase-independent torus bifurcations. However, for the phase-dependent torus bifurcations strange nonchaotic attractors that are geometrically strange but nonchaotic (no positive Lyapunov exponent) appear. The mechanisms for the birth of such SNAs and smooth tori may be illuminated through the bifurcation analysis of the RAs. Note also that a transition from a smooth torus to chaos is generally mediated by a SNA. Furthermore, as in the case of the chaotic attractor, band-merging and interior crises may occur for such SNAs. Using the RAs, these dynamical transitions may also be illuminated.

F-P024   Chaotic Behaviors in Coupled Kim-Kong Map Lattices   김규희, 이종림, 공영세, 최점수, 김경식(부경대)   The chaoticity of spatiotemporal behaviors is investigated in coupled Kim-Kong map lattices. The fluctuation of mean Lyapunov exponent for our model is numerically discussed, and the thermodynamic functions such as the free energy, the entropy, and the susceptibility are also calculated from the probability distribution function. According to our result, we explain in details the spatiotemporal pattern from the irregularity between chaotic and stable regions. The numerical result is also compared with that in the coupled logistic map lattice.

F-P025   Diffusive Motion Generated by a Deterministic Map with Intrinsic Bias   김경식, 공영세, 최점수(부경대) B. I. Henry(Univ. of New South Wales)   We present basically chaotic properties and Lyapunov exponent of the deterministic Kim-Kong map with two control parameters β and γ. For maximum values of our map, it is shown that the cut-off value β^* can be obtained in a range of γ and expected to monotonically take the value near one as γ goes to four. Especially, the diffusive motion that results from pseudo-random numbers generated by our map is also investigated. For our corresponding random walk process, the mean-square displacement is found to scale linearly with time by computing for typical parameter values in the chaotic windows.

F-P026   Coherent and incoherent motions on an infinite Cayley tree lattice   김장일, 김봉수, 남기권 (창원대 물리학과)   The propagation of particles moving on an infinite Cayley tree with a defect governed by the Schrödinger equation and the Pauli master equation is explicitly examined. These two equations are analytically solved. Comparing the two time-dependent solutions, the coherent motion and the incoherent motion on the lattice are found to be fundamentally different. The former motion shows that the defect gives rise to trapping effect while the latter motion does not. Their long-time behaviors are also discussed.

F-P027   세차운동을 고려한 XY 모형의 상질서화 동역학   남기권, 김봉수(창원대 물리학과), 이승종(수원대 물리학과)   지금까지 연구된 XY 모형의 상질서화 동역학은 거의 모든 경우 순수한 흩어짐 동역학 (dissipative dynamics) 에 근거하고 있다. 우리는 넬슨-피셔의 모형을 일반화하여 스핀에 대한 세차운동을 함께 고려한 1차원 XY 사슬의 상질서화 동역학을 살펴보았다. XY 스핀의 상질서화는 흩어짐 동역학만을 고려한 경우와 동일하게, 동역학적 축척을 보이며 성장지수는 1/4 이다. Z 방향 스핀은 XY 스핀의 상질서화 동역학에 종속된 복잡한 동역학적 거동을 보인다.