

한국물리학회

# 회보

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ing scaling behavior of the current-voltage characteristics. The experimental values of  $\nu$  are found to be in disagreement with predictions of previous simulation studies. We discuss possible origins for the discrepancies. Values of the dynamic exponent  $z$  are also compared with those of a 2D superconducting wire network.

#### F-P002

**Efficiency of coding by neural ensemble** 권칠안(명지대), 국형태(경원대), 한승기(충북대) We present the study on neural coding by ensemble of neurons. Given a time-dependent stimulus, a spike train that is the temporal sequence of action potential firing transmits information. In real nervous systems, many neurons respond to external stimuli in a cooperative manner. We are interested in developing the theory of decoding to reconstruct stimuli from spike trains. Efficiency of information transmission can be measured by efficiency of decoding. We use the integrate-and-fire model to generate spike trains. Estimation of stimulus is found from the Volterra-Wiener functional expansion in terms of spike density functions for many neurons. Efficiency of reconstruction can be measured from the error  $\langle (s(t) - s_{est}(t))^2 \rangle$ . We find that decoding by neural ensemble is more effective than that by single neuron. We discuss the validity of the linear expansion and suggest a way to find the higher order expansion.

#### F-P003

**생명체 진화 모형인 등방적 & 비등방적 Bak-Sneppen 모형의 보편성군** 이경은(인하대학교), 이재우(인하대학교) 오랫동안 생명체의 진화론을 지배해왔던 다원의 이론은 상호작용하는 다체계를 설명하는데는 실패했다. 최근에 제어 변수를 가지지 않는 자체 조직화 현상을 보이는 계에 대한 연구가 활발하다. 거시적 생태계의 진화를 흥내내는 진화 모형인 Bak-Sneppen 모형은 자체 조직화 현상을 나타내는 대표적인 계이다. 등방적 및 비등방적 Bak-Sneppen 모형의 임계지수들을 몬테카를로 시늉

내기 방법으로 조사하였다. 등방적 모형과 비등방적 모형은 다른 보편성군에 속하였다. 개체의 멸종은 사태 구조를 나타내었으며, 사태의 분포  $P(s)$ 는 멸종 시간에 대해서 멱 법칙,  $P(s) \sim s^{-\tau}$  을 따른다. 사태의 시간-공간적 분포는 프랙탈 구조를 보였다.

#### F-P004

**Effect of Parameter Mismatch and Noise on The Loss of Chaos Synchronization** 임우창, 김상윤 (강원대) We investigate the effect of the parameter mismatch and noise on the loss of chaos synchronization in the case of unidirectional coupling. Through the first transverse bifurcation of an unstable periodic orbit embedded in the synchronous chaotic attractor (SCA), a riddling or bubbling transition occurs. For the riddling case, its basin of attraction becomes riddled with a dense set of "holes," leading to divergent orbits. In this case, any small parameter mismatch or noise transforms the SCA with the riddled basin into a chaotic transient. For a given coupling parameter  $c$ , the average life-time  $\tau$  of a chaotic transient is found to scale with the mismatching parameter or noise intensity. Near the riddling transition point  $c_r$ ,  $\tau$  exhibits an exponential scaling, while in the region away from  $c_r$ ,  $\tau$  exhibits an algebraic scaling. For the bubbling case, any small parameter mismatch or noise causes a persistent intermittent bursting inside an absorbing area, acting as a bounded trapping vessel. At first, with variation of  $c$  from the bubbling transition point, the maximum bursting amplitude increases continuously from zero. However, as  $c$  passes through a threshold value, it increases abruptly, in contrast to the case of symmetric coupling, because the absorbing area, confining the bursting, becomes suddenly widened through an interior crisis.

#### F-P005

**Tricritical Behavior of Period Doublings in Unidirectionally Coupled Maps** 임우창, 김상윤 (강원대) We study the scaling behavior of period doublings in two unidirectionally