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ferent nature as the driving amplitude is increased: First, a pair of small strange attractors appears via the period doubling cascade. Then a crisis occurs, leading to a large strange attractor with intermittent behavior. The bifurcation diagram dispalying these chaotic transitions is obtained and the associated universality is pointed out. The fractal dimensions of the strange attractors and basin boundaries are also measured, and the crisis-induced intermittency is revealed to produce power spectra inversely proportional to the frequency, over several decades in the frequency.

F-P015 **Bifurcations and Chaos in A Horizontally-Driven Pendulum** *Sang-Yoon Kim and Jaeyong Jeong (Kangwon National University)* We consider a forced pendulum with a horizontally oscillating suspension point. As the normalized amplitude A of the horizontal oscillation is increased from 0, a symmetric period-1 orbit (SP1O) arises from the "unforced" lowest stationary point. Bifurcations associated with stability of the SP1O are particularly investigated by varying the two parameters A and Ω (normalized frequency of the horizontal oscillation). It is found that, as A is increased above a threshold value A_{th}, the SP1O loses its stability via pitchfork or saddle-node bifurcation. Note that the threshold curve $A_{th}(\Omega)$ in the $\Omega - A$ plane consists of an infinite number of discontinuous bifurcation curves, B_n $(n = 0, 1, 2, \ldots)$, characterized by the winding numbers ω_n $(= n)$. The SP1O becomes unstable via pitchfork bifurcation when crossing a bifurcation curve of even order n, while it loses its stability through a saddle-node bifurcation when crossing a bifurcation curve of odd order n. We also note that an infinite sequence of period-doubling bifurcations, leading to chaos, follows each pitchfork bifurcation and ends at an accumulation point. The critical behaviors near the accumulation point are also discussed.

F-P016 **Quantum Localization and Broken Separatrices in the Paul Trap** *SANG WOOK KIM, HAI-WOONG LEE (KAIST)* We investigate the quantum behavior of the chaotic transport in the Paul trap. In particular we discuss how the interplay between quantum localization and the partial barrier of classical dynamics, the broken separatrices, influences the quantum transport.

F-P017 **크기가 공간에서 일정하지 않는 외력이 가해진 단진자에서 비선형 양자 공명의 bifurcation과 양자 흔든 현상에 관한 연구** *이승우,이해웅(한국과학기술원)* 크기가 공간에 의존하고, 시간 주기를 가지는 외력이 가해진 단진자의 비선형 양자 공명의 생김과 양자 흔든에 대해서 연구한다. 고전적으로 작은 외력에서 점점 큰 외력으로 변할 때, 비선형 공명이 생기고 이 비선형 공명이 흔든 현상을 유도한다고 알려져 있다. 우리는 수치적인 적분을 통해 이 계의 Floquet state를 구하고 Husimi distribution function을 통해 이러한 고전적인 결과와 비교 분석한다. 고전적으로 비선형 공명이 생기는 parameter근처에서 비선형 양자 공명이 나타남을 관찰하며 이론적인 분석을 통해서 논의한다.

F-P018 **Noise effects on synchronization in systems of coupled oscillators** *H.Hong, M.Y.Choi, B.-G.Yoon, K.Park, and K.-S.Soh (Center for Theoretical Physics, Seoul National University and Dept. of Physics, University of Ulsan)* We study the synchronization phenomena in systems of globally coupled oscillators, each possessing finite inertia, with particular attention to the noise effects. The self-consistency equation for the order parameter as well as the probability distribution is obtained from the Smoluchowski equation, and analyzed in the presence of thermal noise. It is found that the hysteresis present in the system without noise disappears as the thermal noise comes into the system. Numerical simulations are also performed to give results gererally consistent with the analytical ones.

F-P019 **Synchronizations in systems of**