## **Final Report of Chaos Team**

## (Universal Scaling Behavior And Fractal Geometry)

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## **1. Universal Scaling Behavior**

We study the period doubling transition to chaos and the critical scaling behaviors in the Hénon map and the Parametrically forced pendulum. Through the scaling factors obtained from the period doubling bifurcation sequence, we know that the critical scaling behaviors for these systems are the same as that for the 1D map. For the clear confirmation of the scaling behaviors near the accumulation point, we magnify the bifurcation diagram and the chaotic attractor with the parameter and orbital scaling factors ( $\delta \& \alpha$ ). Thus, we understand that the period doubling transition to chaos is the universal route to chaos in the nonlinear dynamical systems and the critical scaling behavior near the same as that in the abstract system of the 1D map.

## 2. Fractal Geometry

The Hénon chaotic attractor is the strange attractor with the fractal structure. To investigate the fractal geometry of the Hénon strange attractor. We characterize the fractal geometry of the Hénon attractor in terms of various dimensions. We obtained that each dimension of the Hénon attractor has the non-integer value between 1 and 2. It means that The Hénon attractor has the fractal geometry that is intermediate between a line and a plane.