Chaotic Systems

Alexander Pan

Abstract

Using a fourth-order Runge Kutta subroutine, the motion of a nonlinear pendulum is computed and plotted as a phase space trajectory, ω vs. θ. The Runge Kutta subroutine computes the chaotic motion of a forced nonlinear pendulum. The phase space motions are plotted using different sets of initial conditions. By perturbing the initial conditions by a small δZ_0 for a second pendulum, we observe the motions to exponentially drift apart in time. The Lyopunov exponent, λ_L is calculated. The pendulums' chaotic motions are plotted simultaneously, and the positional difference, δZ, is plotted in order to show the exponential drift in time.