Abstract Submitted
for the CUWIP21 Meeting of
The American Physical Society

Analyzing chaos in the double pendulum ITZELLI SALAZAR, Universidad de Colima —

In this presentation, I will show the results of the project that I worked on during the computational physics course I am attending at Universidad de Colima. The goal of the project is to develop a code in Python that solves the equations of motion of the double pendulum and finds the conditions in which this system exhibits chaos. Chaotic behavior in a dynamical system occurs when there exists a significant dependence on initial conditions of the system evolution. In this work, I obtained the equations of motion using Lagrangian and Hamiltonian mechanics and solved them using numerical methods. There are different ways of detecting this type of behavior and, in this project, I used three tools to find chaos in the double pendulum: phase space plots, Lyapunov exponents, and Poincare sections. I found interesting curves for different initial conditions and I made animations comparing the behavior of different pendulums with slightly different initial conditions in order to understand, in a more visual way, how significant is the difference in the behavior of each one. Even though this project addresses a system that is well studied in the literature, it allows us to learn to code in Python and how to use the numerical methods seen during the course.

Itzelli Salazar
Universidad de Colima

Date submitted: 04 Jan 2021 Electronic form version 1.4