APM560 Applied Dynamical Systems Methods

Instructor: Wenbo Tang
Time: MW 3:00-4:15pm
Location: ASU Sync
Line Number: 23939
Credits: 3

Course Description: In this class we study applied dynamical systems methods on the analyses of vector fields arising from various disciplines. Our aim is to examine the nonlinear dynamics and formation of patterns (cycles, coherent behaviors, stability of phenomena) prescribed by the governing equations of motion. We start by surveying some basics on nonlinear oscillations but will focus on what these tools can tell us about patterns of motion. These studies form fundamental understandings of the physics that carry, to name a few, industrial, environmental and biological processes in the real world. Two examples of its application are highlighted below.

Prerequisits: Ordinary differential equations and linear algebra. Knowledge of Partial Differential Equations is also helpful.

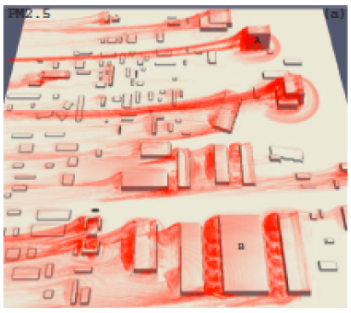
Textbooks: (Optional)

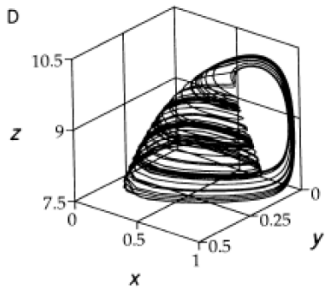
S.H. Strogatz [1994], Nonlinear Dynamics and Chaos with Applications to Physics, Chemistry, and Engineering, Addison-Wesley.

J. Guckenheimer and P.J. Holmes [1983], Nonlinear Oscillators, Dynamical Systems, and Bifurcations of Vector Fields, Springer-Verlag (5th printing 1997).

J.M. Ottino [1989], The Kinematics of Mixing: Stretching, Chaos, and Transport, Cambridge University Press.

S. Wiggins [1990], Introduction to Applied Nonlinear Dynamical Systems and Chaos, Springer.





Left: Transport pattern of PM2.5 in urban environment.
Right: Strange attractor in a food chain model.