LOGISTIC MAPS AND BIFURCATION THEORY

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Attractors in Predictions

- Data corresponding to systems with simple behaviors can be represented in the form of ***simple attractors***
- Data corresponding to systems with strange behaviors can be represented in the form of ***strange attractors***
- ***Simple Attractors*** possess low dimensionality, whereas ***Strange Attractors*** possess high dimensionality
- The predicting predictability of the systems with low dimensional attractors is rather straightforward.
- The predicting predictability of the systems with hight dimensional attractors is complex.

BIG Question(s)

- Do we have information thus retrieved precisely from DATA (whether Small or Big) that leads to construction of system-specific *attractor*?
- How big is the data that we require to construct such an attractor? An ad hoc answer is another question: What is the system that we are targeting?
- Can we categorize the systems as ‘soft’ and ‘hard’.
    - Soft – *simple attractor* – prediction possible
    - Hard – *strange attractor* – prediction (locally) is possible

Some Roots, of 'Predictive Analytics', that I know

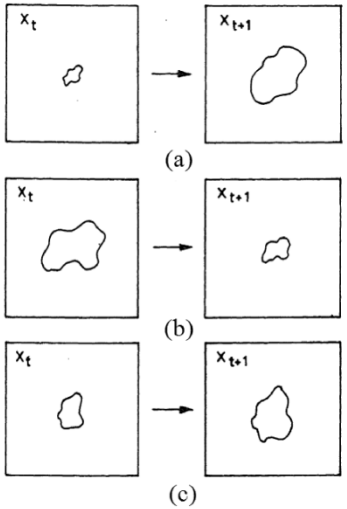
- Some philosophical speculations!

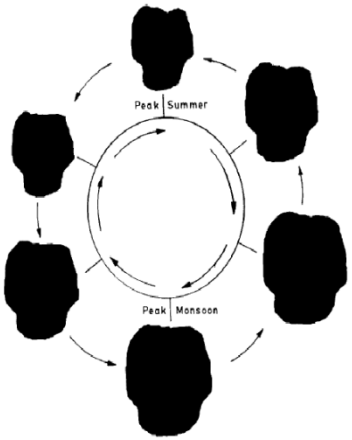
Wonderful Recipe!

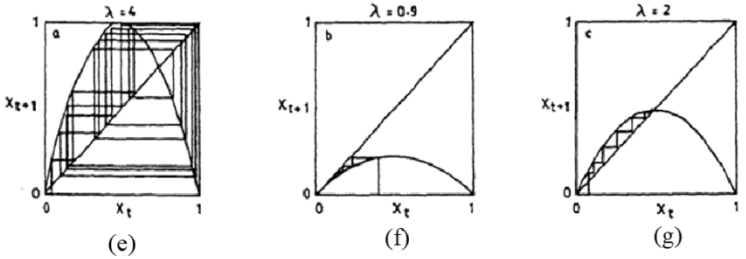
- Rise is to fall.
- Make it larger when it is small
- Make it small when it is large
- Follow above in a nonlinear fashion to simulate several dynamical processes mimicking realistic dynamical processes.
- Numerous controls control a system (be it a business-systems or a natural system).
- What is(are) the strength(s) of control(s) that control(s) the control of another system: Systems behaviors are highly coupled.

Examples of Attractors: Toy Models

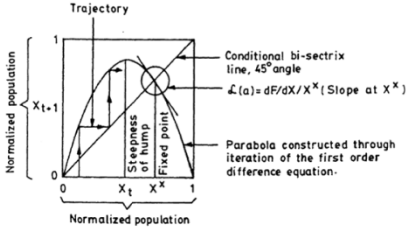
Numerical Data





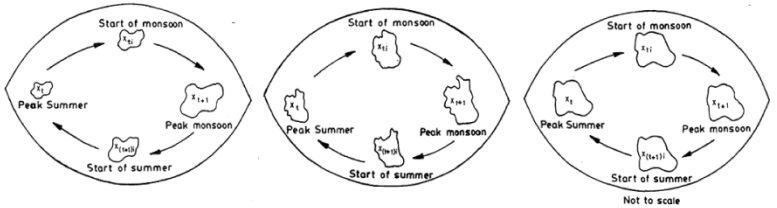


Attractors

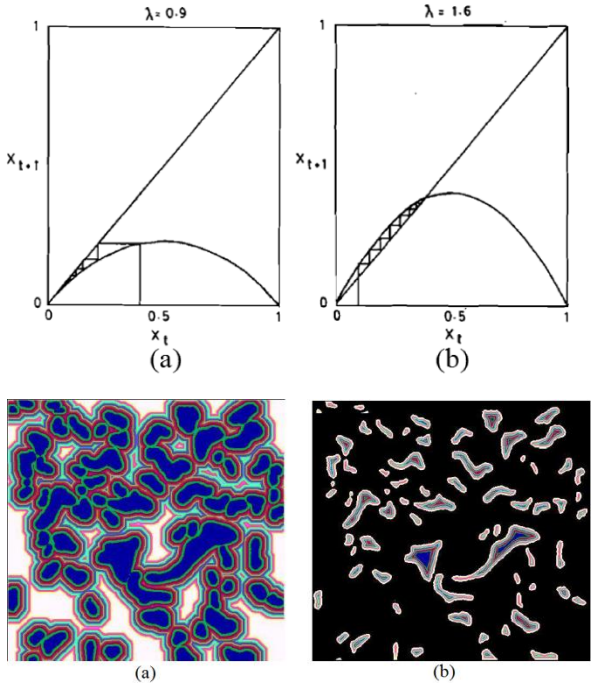


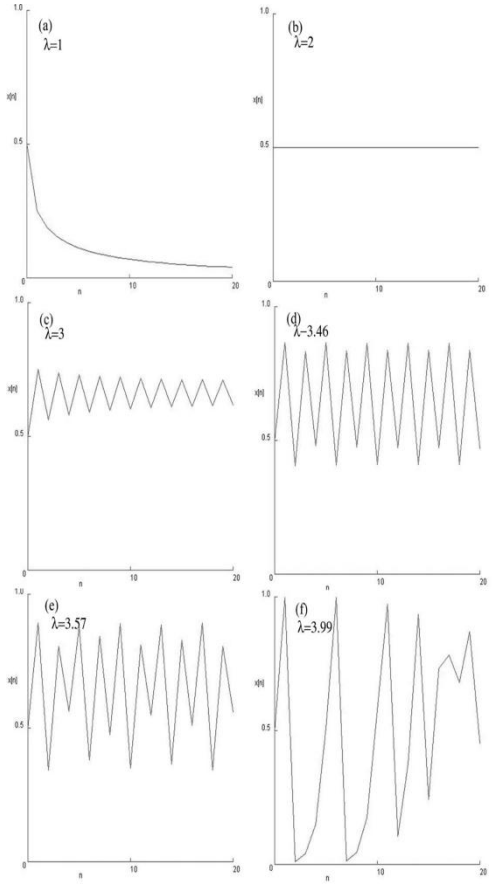
Hypothetical lakes	X_t	X_{t+1}	λ
1			λ_1
2			λ_2
3			λ_3

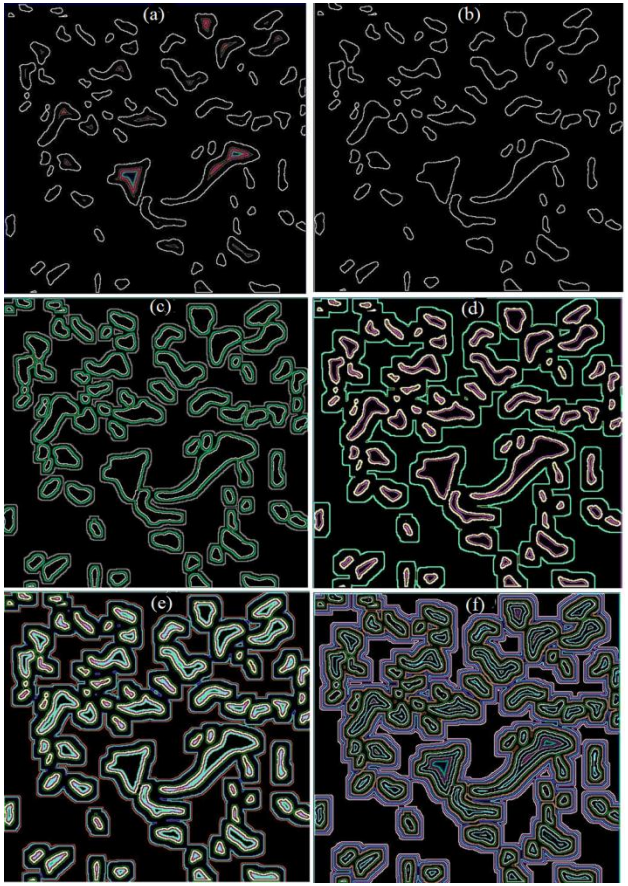
(b) $\lambda_1 > \lambda_2 > \lambda_3$



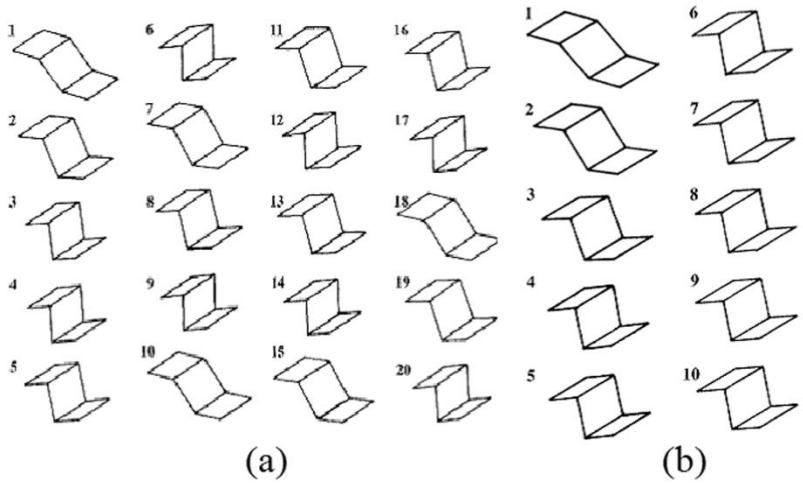
Behavior of Lakes

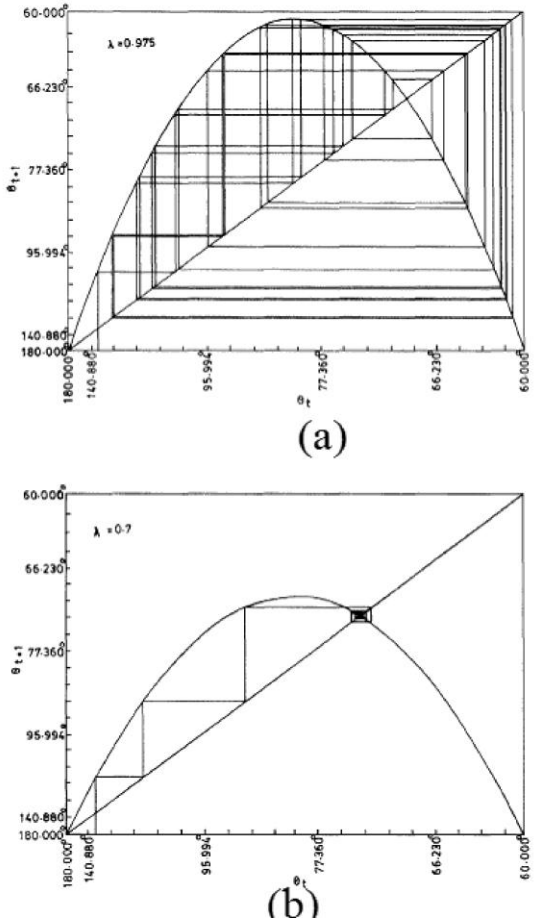




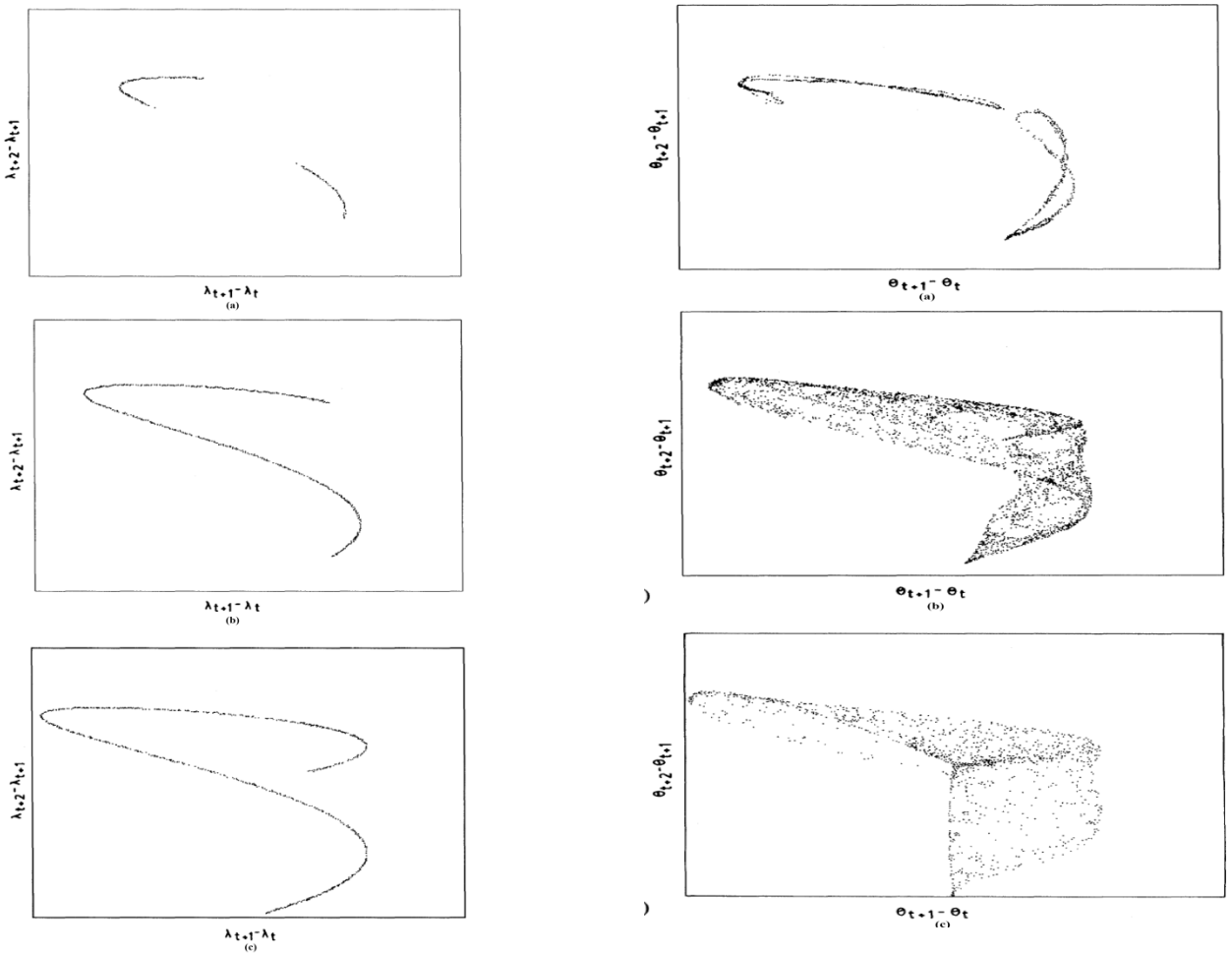


Behavior of Folds





Attractors as Phase Space Maps



Behavior of Sand Dunes