Alice in Stretch & SqueezeLand: 8 Basis Sets of Orbits

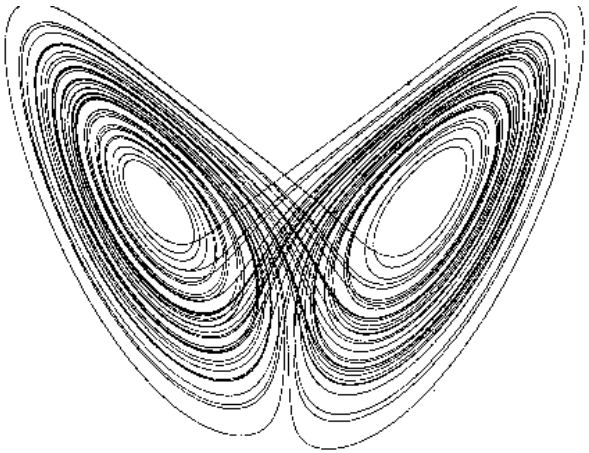
August 12, 2012

Chapter Abstract

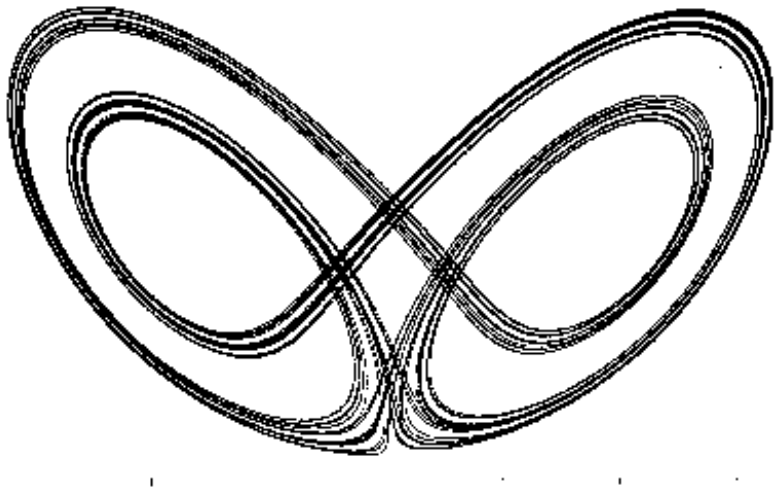
As parameters change (current flow, modulation intensity, temperature, $\cdots$) the shape of the attractor changes and the spectrum of unstable periodic orbits (UPOs) "in" the attractor changes.

It is easiest to describe these changes by identifying a small set of UPOs whose presence "forces" all the other UPOs in the attractor.

There Are Some Missing Orbits

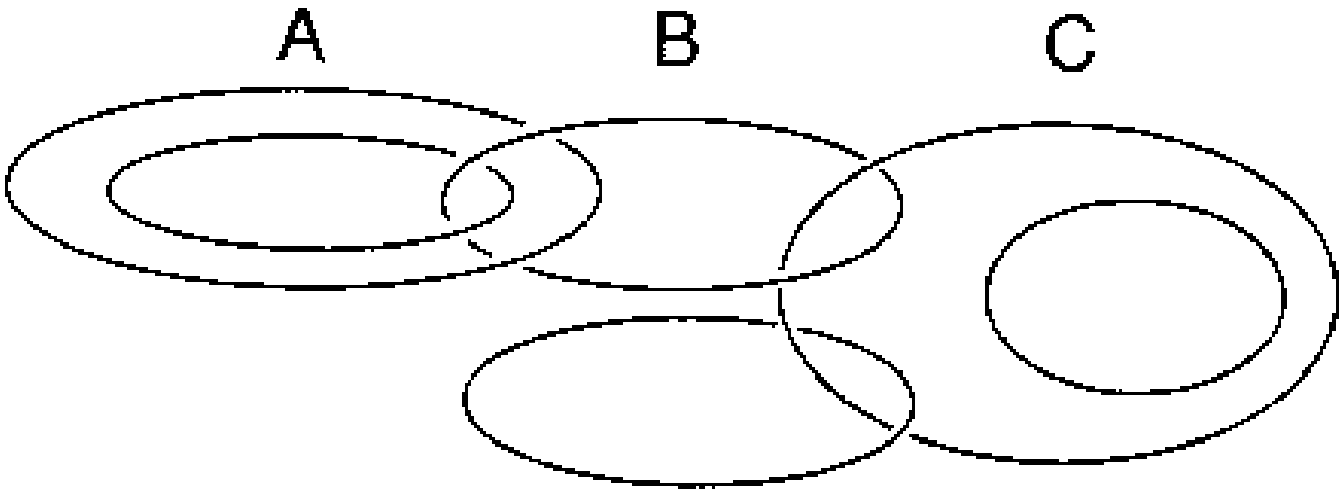


Lorenz



Shimizu-Morioka

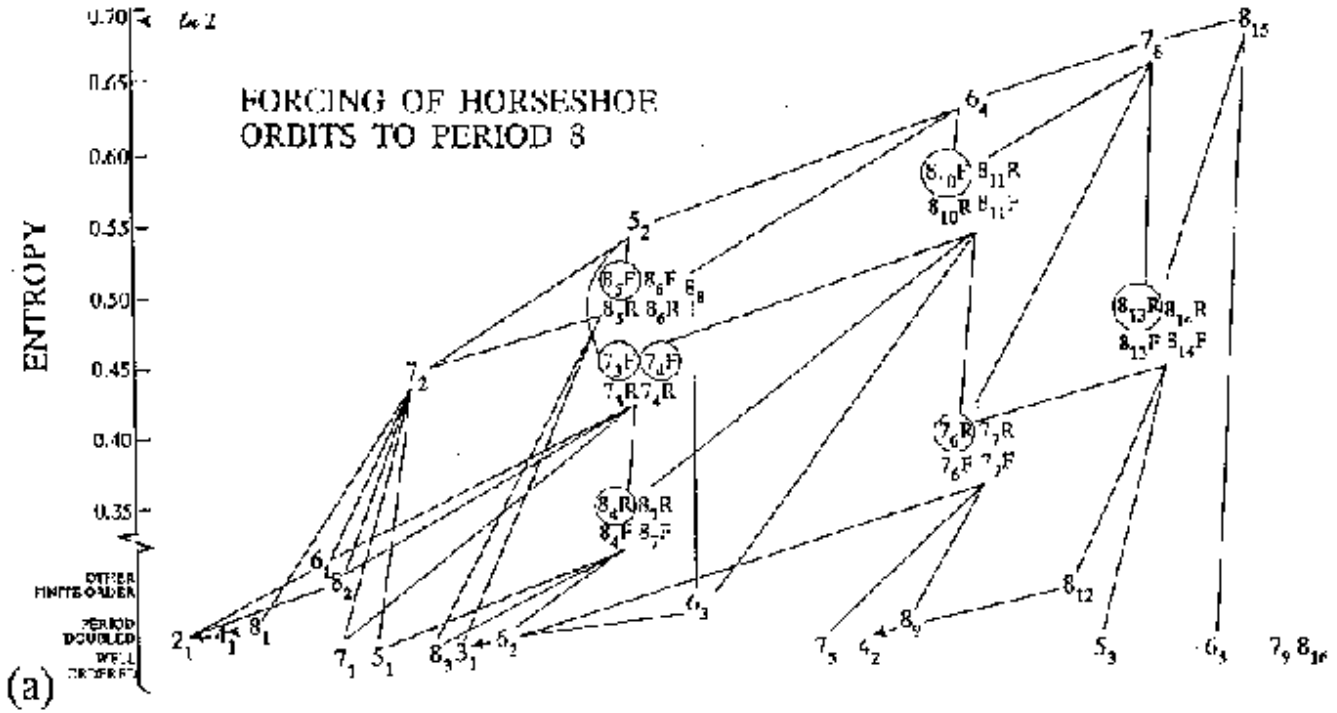
Orbit Forcing



$A \Rightarrow B$ $\quad$ $B \Rightarrow C$

$A \Rightarrow C$

Forcing Diagram - Horseshoe



Algorithm

List all orbits found up to period p by topological entropy, use 1D entropy as tie-breaker:

$$\underline{2_1}, \underline{4_1}, \underline{8_1}, \underline{6_1}, \underline{8_2}, \underline{7_1}, \underline{5_1}, \underline{8_3}, \underline{3_1}, \underline{6_2}, 6_3, 7_5, 4_2, 8_9, \underline{8_4},$$

$$8_7, 7_6, \underline{7_2}, \underline{7_3}, 7_4, \underline{8_5}, 8_6, 8_8, 5_2$$

Remove rightmost orbit and all orbits it forces (underlined):

$$\underline{6_3}, 7_5, 4_2, 8_9, 8_7R, 7_6, 7_4F, 8_6F, 8_8$$

Continue until completed. List all "rightmost orbits" removed, right to left. This is the basis.

$$8_7R, 7_6, 7_4F, 8_6F, 8_8, 5_2$$

Status of Problem

- Horseshoe organization - active
- More folding - barely begun
- Circle forcing - even less known
- Higher genus - new ideas required