

Alice in Stretch & SqueezeLand: 10 Biological Algorithm

August 12, 2012

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Characteristics of Time Series

	Length	S/N
Geometric	Very Long	Very High
Dynamical	Long	High
Topological	So-So	So-So

If only lots of little pieces are available through measurements, they can be “stitched together” and an analysis carried out.

The Setup

- Suppose you want real-time data from a certain subject.
- And the subject is:

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The Setup

- Suppose you want real-time data from a certain subject.
- And the subject is:

CALVIN



Brain Rampant

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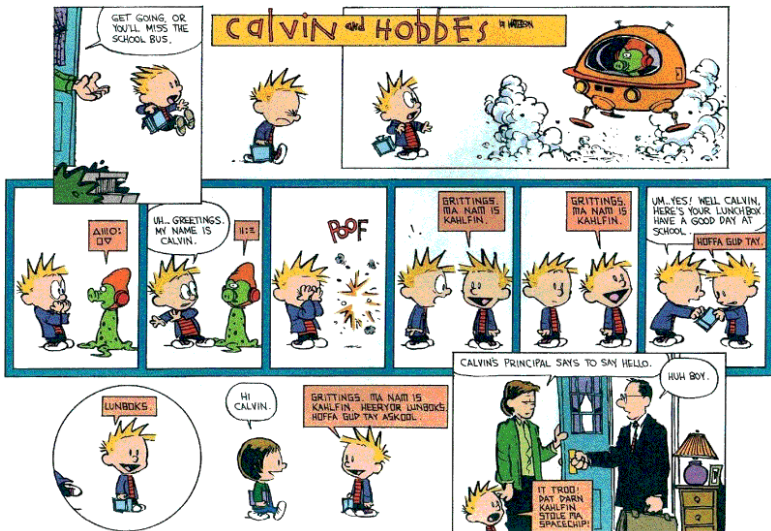
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Dad's of the World – Watch Out !

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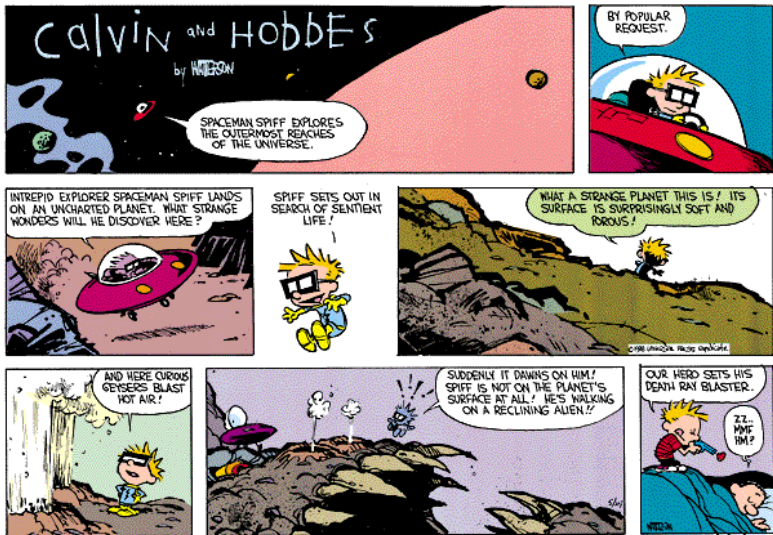
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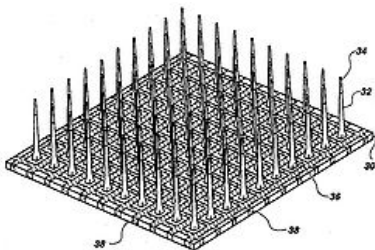


Advance in Technology

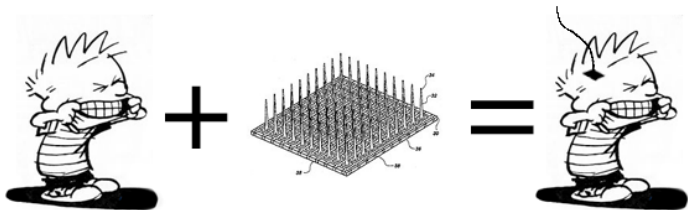
A normal implant would provide one time series.

This guy has a behavioral time scale approx. 10^{-1} sec.

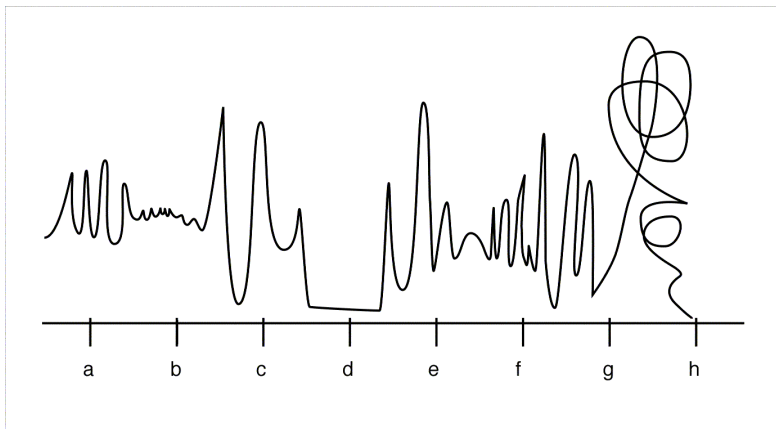
Use an electrode array implant to record lots of time series simultaneously.



Now Calvin is Wired



Highly Effervescent Time Series



a: PB & J Sandwich

b: Skool

c: Toboggan on Hobbes

d: Dad Explains Something

e: Drives Spaceship

f: Speaks with Martian

g: **A GIRL !!!**

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Biological Algorithm

Use the Ergodic Theorem (Hypothesis, Guess, Hope, Desperation Wish) to assume lots of short snippets from the $10^{2.5 \pm 0.5}$ electrodes can be reconstructed into a single long times series, one for each behavioral mode.

The reconstruction can be carried out via a “biological algorithm”.

Biological Algorithm for Data Annealing

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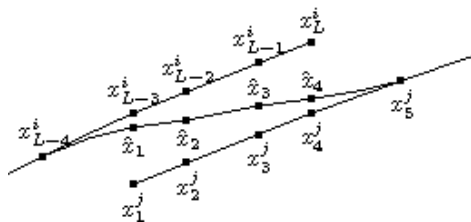
- Time-tag time series from each electrode
- Cut out short snippets w. same time-tag from each electrode record
- Use DNA type comparison to join them

...G A C T C T A G C
A T C G T A T T...

- Study each longer time series to determine behavior fingerprint

Biological Algorithm for Data Annealing

Interpolating Connection Between Snippets



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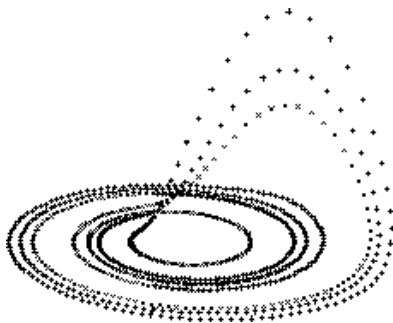
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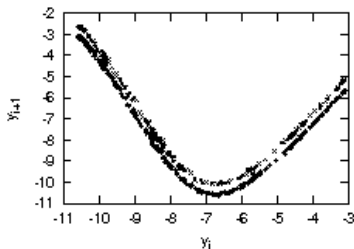
Rossler Attractor

This period-7 orbit was reconstructed from 4 short snippets.



Rosler Attractor

Return maps for the original attractor and the attractor reconstructed from many short snippets.



Lorenz Attractor

Return maps for the original attractor and the attractor reconstructed from many short snippets.

