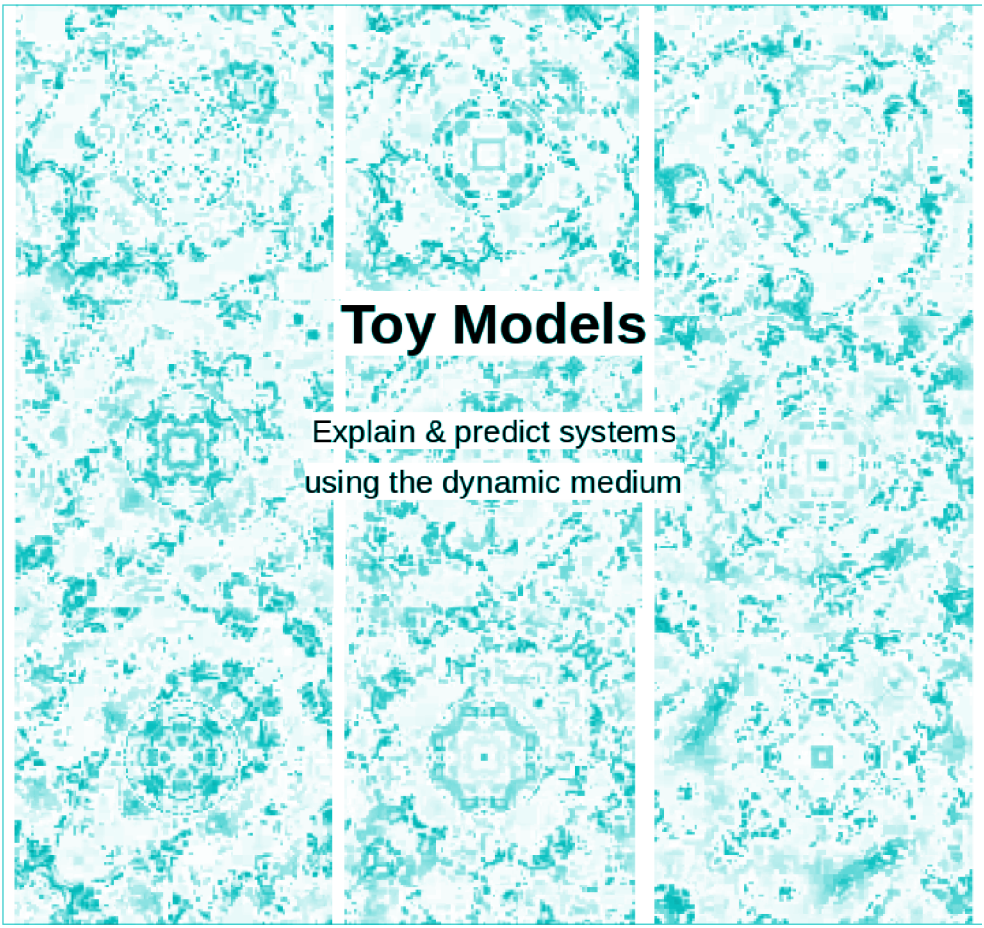

dict systems

e generative ecology

sketches

@jatazak

Computery Zine Fest, 2/24/19 @ !!Con West

Explorable methods

for scientific development in an open & replicable ecosystem.

Reproducibility lets us ask ‘what-if’ questions:

What if this rule fired more often? Knock out its precondition.
What if this rule had stronger effect? Knock out its antagonist.
Etc.

Biology is living computation.
An opinionated medium that resists and generates.

Human-computer interaction techniques naturally engage us with alternative physiologies and ecologies.

everyone accesses the thing on the web
or in the wild, same difference, same chance of rotting away

Biology computes optimal self-reproduction on a physical substrate.
Every creature a canvas.

Homeostasis is robustness of oscillators, an entropy pump.
Morphogenesis is procedural generation of form, through gradients.

So we perturb our subject,
and sample its latent space.

Small Data

abhor redundant items

low input latency -> continuous deformations for free

not 10k rows but 100

not seconds but ms

salient examples lie at the boundary[1] of some parameter or feature

make equations that make your solver happy

Visual Debugging

use OpenGL thru Processing

or SVG thru D3.js

or GLSL thru VisPy

etc.

visualize during development

Some bugs don't fit into the console. They're a signal with 1000 elements. They're a misalignment of strokes.

Visualize to ground your intuition & to share with human audiences.

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[1] To navigate is to exploit continuity between the map and its territory, so that small changes in direction produce small changes in position.

Boundaries are narrow features over which a large change is measurable. Some boundaries on the map are invisible on the territory, or inexistent until reified. The assumption of a boundary creates a boundary.

visual parameter space + realtime feedback

parameters don't start orthogonal, or scaled well, or bounded well
features don't come bounded well, or scaled well, or perceptually independent

A scaffold parameterizes a manifold in artifact space: it is a latent space, a vibe[2]. A scaffold can be stepped through by enumerating points in its parameter space.

A scaffold is a collection possessing actions and identities: it can be stepped through by successive actions on one of its points.

A scaffold is a technique for escaping basins of attraction (familiar ruts) through measured constraint.

A scaffold is a collection of properties.

'the space of driving strategies is *made of* turning strategies and degrees of road bendiness[3]'
'the organ is *made of* cells *made of* protein assemblages in a signalling bath'
'the sketch is *made of* coherent volumes *made of* a gestalt of shapes built from strokes and marks'

2 in @peligrietzer's sense

3 in @worrydream's ladder of abstraction

but you can nudge them closer.

Your mapping representation matters. Is it playful? delicate?
redundant? complete?

Every input shoots a point in our **expressive range**. If automated, or dedicated[4], our input may trace a path (continuous perturbation) over this curved manifold.

Thus we sketch the elephant, and declare that it is a grey and coarse thing, but also ivory and smooth.

We may sample points spanning the domain without necessarily spanning the range, if the mapping to our manifold is not 'uniform'. If we cannot sample many points, errors of omission will occur.

Thus the scaffold is truer than the utterance.

Every rhythm is a scaffold.
Every consistent ground truth is described by some scaffold.
Any scaffold that describes all ground truths returns noise.

4 in the manner of Calvino or Cage

Model-Making Toys

what is rich input?

static plot generators — static flow, rich output

linear notebook cells — mostly static flow, rich input

short chunks

An interpretable input follows one of a few possible execution paths. More than that, and you're doing work the computer is better at.

neat representation

Data possesses hidden structure, and a manifold over it is called intuition. This dimension reduction lets us ask high-level questions, like what-ifs. It can be encoded into a model.

Equations possess explicit structure, and can be read for intuition. More likely, the computer can read them, and represent them as data, encoded into a visualization.

algebraic internal interfaces

Vector arithmetic.

Explicit Some[T] (either T or None) types.

More monads like these, please.

All languages of improvisation - motions of pointers & joints
reconfigurations of inter-agent distances & social geometries
cadences of overtones & stringed instruments, - **can be used as input.**

To teach these to the computer, we can't just trip on statefulness, nor be restricted to input files.

Operational Logic: Discovery

Graphics are structured data bound to a visual artifact's parameters.

motif	verb	idiom

Signals are arrays of floats[5] indexed by time or frequency.

Finite-length signal data is a shape.

Signal data with spatial coordinates is a field.

dataframe	sort	coherence
	filter	‘show less’
oscilloscope	trace	streaming
timeline	mark	perturbation

Dataframes are arrays of object-state, indexed by identity.

Finite-length dataframes have block-structure(s), revealed by sorting.

Dataframes with spatial coordinates are a map of features.

canvas	pan	‘show more’
	zoom	‘go deeper’
tabletop	drag	tokens
tooltip	select	etc.

Agents are rows in dataframes, equipped with local interaction (in spacetime), which yields coherence of shape.

Their spatial relationships form a topology. Their temporal relationships form a trace.

From agents arise emergent behaviors.

5 in @galaxykate's rephrasing of 'vectors over the reals'

explorables are interpretable artifacts

all experiments are designed to tell a story about theory

all codes perform an experiment

an explorable is a code that tells a story
through an artifact

an artifact that is interpretable
affords the experimenter
a useful interface

to methods that enable them to see