Instructions

Question 1

The UC Santa Cruz Chaos Cabal's prediction strategy for roulette was one of the first applications of delay-coordinate embedding.

- True

- False

Question 2

The basic model in the UC Santa Cruz Chaos Cabal's prediction strategy for roulette was...

- An ARMA ("autoregressive moving average") model.

- Linear models built in small patches of the embedded trajectory.

- Lorenz's method of analogues.

- A linear model of the embedded trajectory.

- A neural net.

Question 3

Why is it useful to embed scalar time-series data before building a prediction model of a deterministic dynamical system?

- It exposes the temporal patterns in spatial form.

- If you don't do that, the false crossings created by the projection involved in the measurement can make your predictions wrong.

- Both of the above.

- Neither of the above.

Question 4

How can you modify Lorenz's method of analogues to make it less sensitive to noise when working with chaotic systems?

- Use a low-pass filter on the data first.

- Rather than looking for each point's nearest neighbor and using the forward image of that point as the forecast, look for a bunch of nearest neighbors and average their forward images.

- Run it on lots of different points and average the resulting forecasts.

Question 5

If a feedback controller like a thermostat uses positive feedback, what will the results be?

- The system state will saturate.

- The system state will stabilize at the desired setpoint.

- The system state will oscillate.

Question 6

OGY control can be used to stabilize a chaotic system at any point in its state space.

- True
- False

Question 7

OGY control employs local-linear control to stabilize a chaotic system at the desired destination. What role does the denseness with which trajectories cover chaotic attractors play in OGY control?

- Reachability: assuring that the system trajectory will get close enough to the desired destination so that the linear controller can grab & stabilize it.
- Leverage: it's how you exploit sensitive dependence on initial conditions to get to the desired destination faster.
- No role at all.

Question 8

What kinds of physical systems has OGY control been applied to?

- Heart fibers.
- Hippocampus cells.
- Magnetoelastic ribbons.
- Electronic circuits.
- All of the above.
- None of the above.

Question 9

Name a satellite in the solar system that is tumbling chaotically right now.

- Earth's moon.
- Saturn's moon Hyperion.
- Mars's moon Phobos.
- Jupiter's moon Ganymede.

Question 10

What's an orrery?

- A computer program that solves the ODEs that model how mass falls into a black hole.
- A machine (physical or computational) that simulates the orbits of the planets in the solar system.
- Something else.

Question 11

Chaos is a potential explanation for the existence of at least one of the Kirkwood gaps in the asteroid belt between Mars and Jupiter.

- True

- False

- True

- False