Why you may want to model DNA replication in stochastic models of synthetic gene circuits (and how)

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Abstract

NO ABSTRACT YET.

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1. Suggested Models for Replicating DNA

TABLE:

1. Model name
2. CRN description
3. English description
4. Diagrammatic explanation
5. Steady-state distributions fit against Voigt's data
6. Relative simulation speed (plasmid only)

2. Model Details

2.1. What is this?

2.2. Why should I care?

See Section 4

2.3. What in the world is that "Dummy Molecule" in the first model? What kind of molecule is it supposed to represent?

2.4. There's a lot going on in the Brendel & Perelson model. What are all of those states?

2.5. What's the relationship between the "Brendel & Perelson" and "Reduced Brendel & Perelson" models?

3. Evaluating Models

3.1. What's with those "steady-state distributions"?

3.2. What are the "empirical distributions" you're showing for copy number?

3.3. How did you fit the models against the empirical distributions?

3.4. So these models will hold plasmids at constant copy number (± noise)?

3.5. Which model should I use and why?

4. Motivation

4.1. Why did you write this?

4.2. I've never had to model DNA replication in my models. Why would I ever need to?

4.3. Can't you just...?

4.4. So these models are only useful for stochastic simulations?

4.5. When would you actually need *to model DNA replication? Give me a concrete example.*

(CRISPRi oscillator)

4.5.1. Is there really *no other way to model this circuit?*

4.6. I'm not convinced these are necessary. Can you give another concrete example?

(temporal logic gate)

5. Data/Code Availability and Reproducibility

5.1. What software did you use to simulate this stuff?

Python. Python packages. BioSCRAPE. Whatever that tool was to scrape distributions from Voigt's paper.

Versions of everything!

5.2. Do you have code for any of this? Where can I get it?

Mention that you can set up a python env using code in repo, or just run it if you're confident you have everything you need.

5.3. What's the timing information about, and why is it there? What should I use those numbers for?

5.4. What machine did you run on to get timing information?

6. References

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