Phoenix
A Systems Engineering Approach to Genetic Circuit Synthesis

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Motivation

Systems engineering is an interdisciplinary field that focuses on building and maintaining complex engineering systems over their entire life cycles. Applying standards and core concepts of related sub-fields such as **performance engineering** (ensuring that a system meets its expected performance requirements) and **reliability engineering** (a system does not fail more than expected during its life cycle) is a promising way to advance synthetic biology's potential applications in research areas.

Approach

We have created a software platform (Phoenix) that encapsulates the procedures required during the **specify**-**design**-**build**-**test** workflow to enable iterative design of complex genetic systems. The framework is designed to ensure that the **functional**, **performance,** and **structural** specifications of the genetic system are well defined, reproducible, and reliable. The iterative process will use principles of **reinforcement learning** to improve the performance of the synthesis and assignment algorithms.

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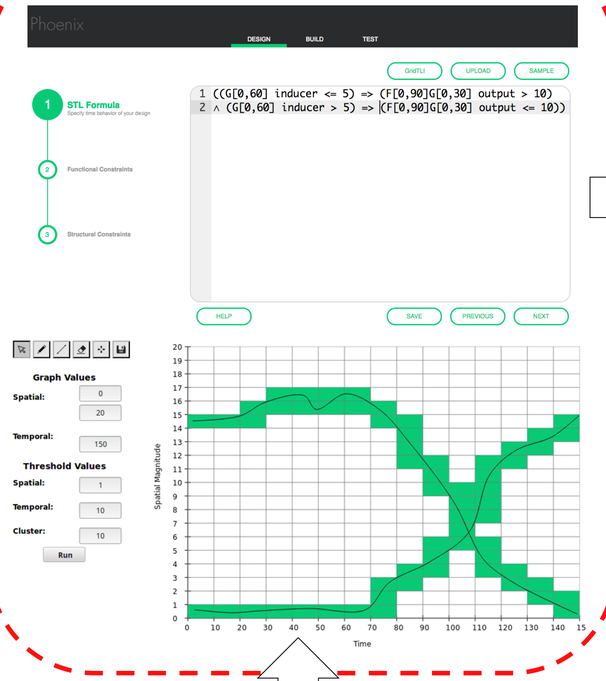
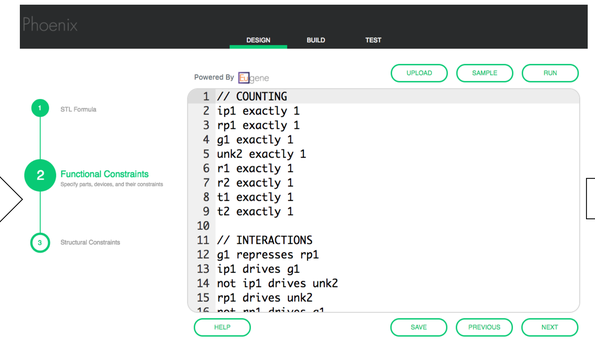
Phoenix Workflow

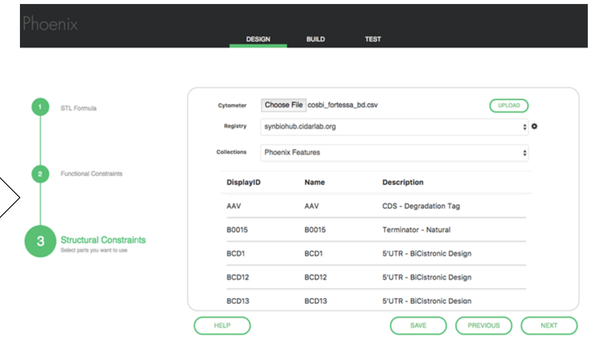
Specify STL Formula



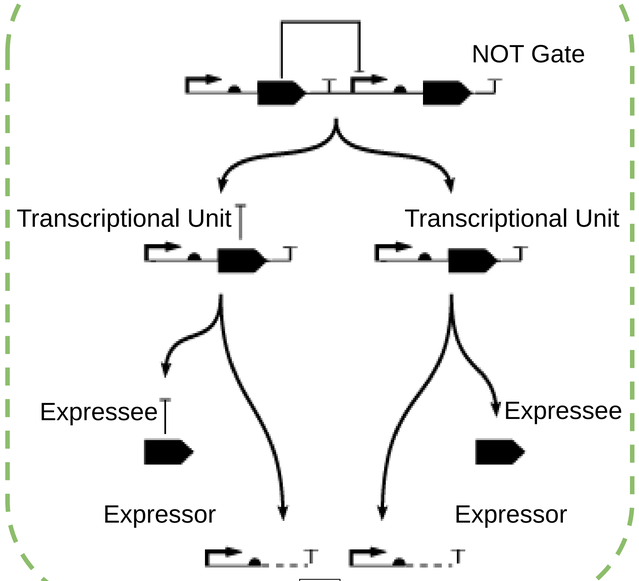
Structural Constraints



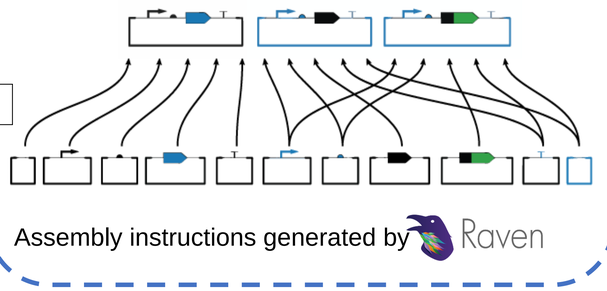
Library of Components



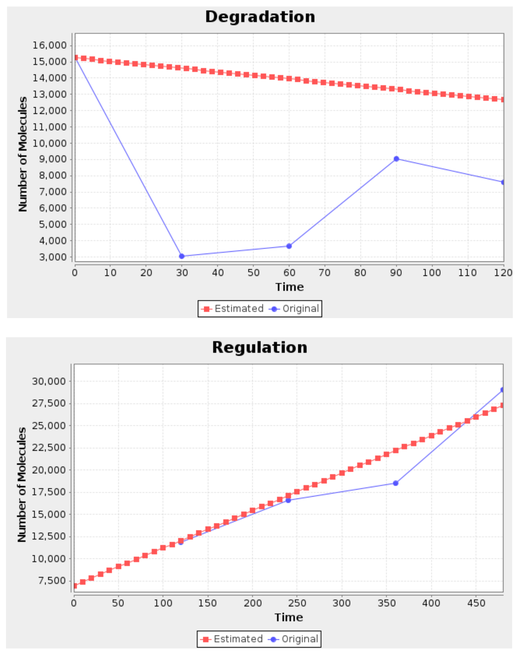
Decompose Structure



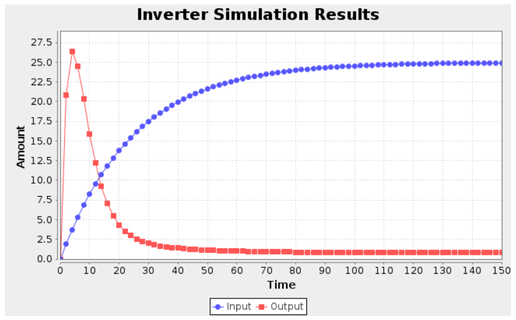
Generate Assembly Instructions



Estimate Parameters



Simulate



Test & Verify