

Towards Cellular Robotics

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Abstract:

Inspired by robotics and enabled by the nascent area of synthetic biology, a team of cellular robots is a population of bacteria engineered with basic communication and decision making capabilities. Synthetic biology is focused on creating small gene networks of transcriptional control and inserting them into living cells in order to "program" cellular behavior. Recent achievements of such technology include the creation (in bacterium *E. Coli*) of a toggle switch, an oscillator, logical gates, and sensing and communication mechanisms. Most of the above successes were driven by intuition and the approaches were experimental by trial and error. The future of this area depends on our ability to construct reliable circuits, with predictable behaviors under changing environmental conditions and partial knowledge of kinetic parameters.

In this talk, I will present a method for automatic tuning and robustness analysis of piece-wise affine models of gene networks. The method is based on discrete abstractions and model checking. I will show an example to tuning and analysis of a synthetic transcriptional cascade.