

1077-VG-473

Franziska Hinkelmann, Matt Oremland, Hussein Al-Asadi, Atsya Kumano, Laurel Ohm* (ohm@stolaf.edu), **Alice Toms** and **Reinhard Laubenbacher**. *Methods for Reducing and Transforming Agent-Based Models into Polynomial Dynamical Systems*.

Discrete models, including agent-based models, are important tools for modeling biological systems, but model complexity may hinder complete analysis. Representation as a polynomial dynamical system (PDS) provides a framework for efficient analysis using theory from abstract algebra. In this manuscript, we provide general polynomials that describe common agent interactions as well as methods to reduce the complexity of the model while preserving key system dynamics. These methods lay the foundation for model translation. Algebraic tools are used in the construction of polynomials as well as in the reduction of the model. We demonstrate the feasibility of our methods by translating a complex agent-based model of the human innate immune response system (approximately 11,000 agents) into PDS of lesser complexity that we were able to simulate. We hope to eventually be able to apply optimal control to the resulting PDS. (Received September 03, 2011)