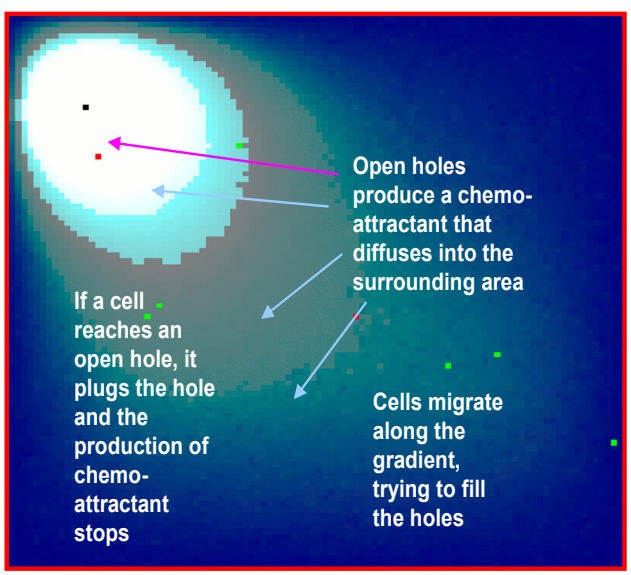
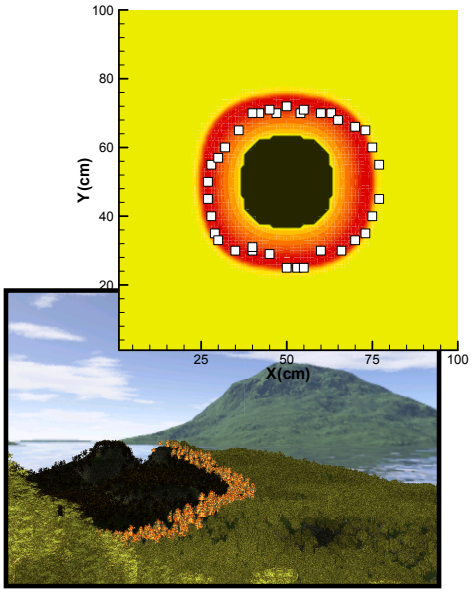
Scientific Computing within the ORNL Modeling and Simulation Group: System-of-Systems Simulation - A Discrete Event System Simulator

The ORNL Modeling and Simulation Group (MSG) develops sophisticated numerical solutions for a wide range of scientific, engineering, and operational applications. MSG's core competency is computational physics and engineering, and within this context we have developed the Discrete Event System Simulator (***ADEVS***) software. ***ADEVS*** is an object oriented discrete event simulation engine based on the DEVS system modeling formalism. ***ADEVS*** has been applied to social networks, force on force engagement models, forest fire modeling, communications networks, event driven rule based control systems, manufacturing systems, and event based numerical methods for ordinary and partial differential equations. ***ADEVS*** supports hybrid discrete/continuous system modeling via formal system transformation techniques. It is designed to support complex and computationally intense hybrid system simulation problems. ***ADEVS*** exports an object oriented modeling interface that is used to described discrete event systems expressed using the DEVS structures. Formal methods for exactly representing a wide variety of discrete systems allow for direct simulation of coupled difference equations, Petri nets, Markov chains, finite state machines, process and event oriented discrete event models, and numerous other discrete system modeling frameworks. Rigorously characterized approximations of continuous processes as DEVS models make it possible to efficiently and reliably simulate hybrid systems. The ability to integrate disparate models into conceptually sound and computationally efficient simulation framework is essential for studying large and complex systems. This need is met by the ***ADEVS*** through its efficient simulator implementation, highly usable object-oriented modeling interface, and a firm grounding in the DEVS methodology. ***ADEVS*** represent an extremely versatile complex-systems simulation resource for a broad range of R&D, industrial, homeland defense, and military applications. We welcome the opportunity to discuss your potential applications and ways ***ADEVS*** can contribute to a solution.



MSG & the University of Tennessee developed a model of cell migration during intimal hyperplasia using ADEVS



MSG used ADEVS to simulate forest fire burn patterns on the island of Corsica

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