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GLOBAL STOCHASTIC FIELD SIMULATOR

Center for Computational Epidemiology and Response Analysis

THE UNIVERSITY OF NORTH TEXAS

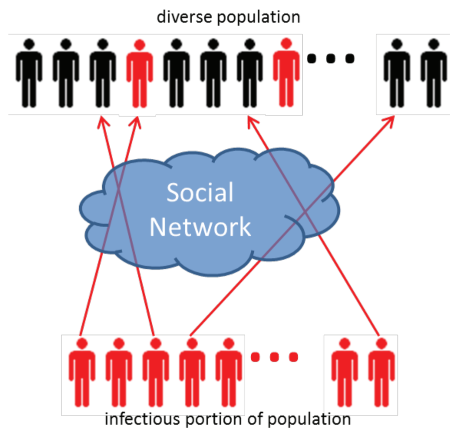
CeCERA

PURPOSE OF THIS SIMULATOR

The Global Stochastic Field Simulator was conceived in the Summer of 2011. The goal was to design a tool that allowed computational epidemiologists to experiment with different disease and vaccination parameters using agent-based and stochastic models. This simulator provides a framework for scientists to visualize and experiment with different types of disease outbreaks and intervention strategies.

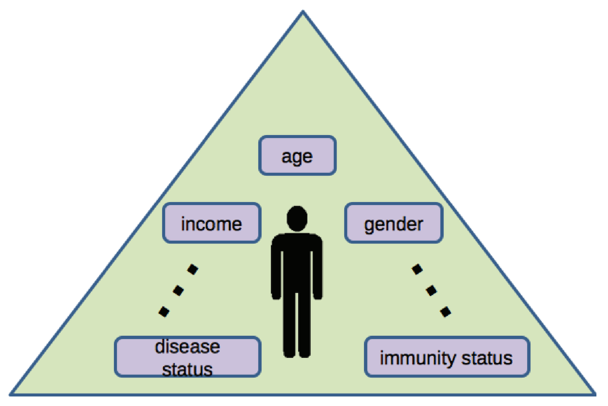
THE AGENT BASED MODEL

An agent-based model is one in which each of the members of a population is represented as an individual agent. Agents can come into contact with each other. As infectious agents come into contact with susceptible agents, the disease spreads through the population.



THE STOCHASTIC MODEL

A stochastic model is one that is based upon random processes. This is useful for modeling complex real-life situations in which choices and actions appear to be random occurrences.

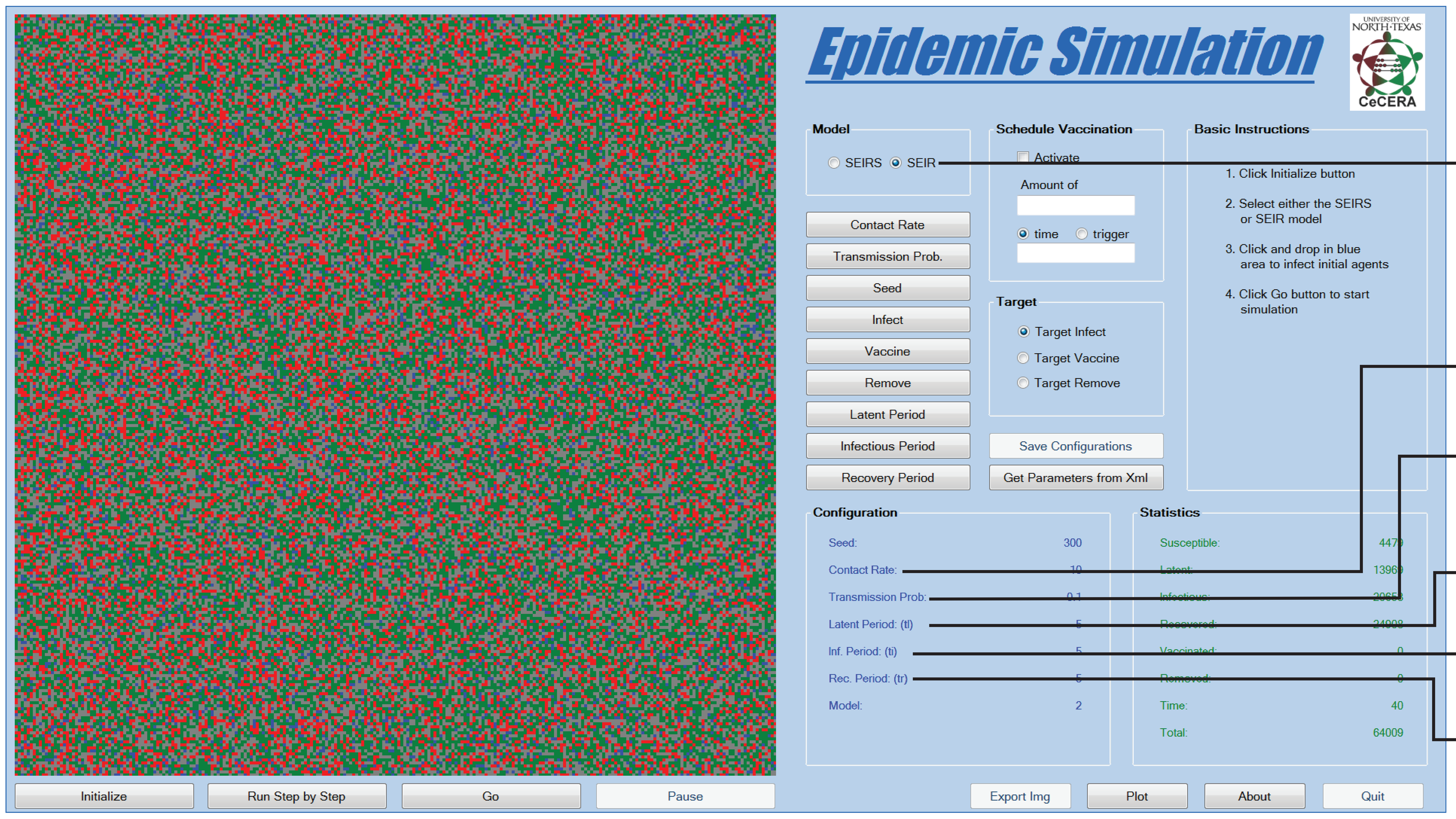


THE GLOBAL STOCHASTIC CONTACT MODEL

The global stochastic contact model uses a hybrid approach based on stochastic and agent-based modeling. It combines the stochastic model's ability to make random choices with the agent-based representation of individuals. In this simulator, the computer randomly selects a limited number of contacts between individuals. These contacts create a pathway for the disease to spread through the population.

THE GLOBAL STOCHASTIC FIELD SIMULATOR

The Global Stochastic Field Simulator combines these models into a single framework. It allows the user to infect a section of the population of agents and examine how different parameters affect the spread of the disease. It enables the user to explore different vaccination intervention strategies to see how best to control a particular disease. This allows computational epidemiologists to gather data and visualize different types of disease outbreaks.



PARAMETERS

Below is a list and description of the different parameters that can be adjusted in this simulator.

SEIR/SEIRS: Determines whether the SEIR or SEIRS model is used for the stages an agent goes through in relation to the disease. In the SEIR model, once an agent recovers it cannot become infected again. In the SEIRS model an agent can become infected again following the end of its recovery period.

Contact Rate: The number of contacts each agent will make per day.

Transmission Probability: The probability of a susceptible agent getting a disease after coming into contact with an infectious agent.

Latent Period: The number of days an agent will remain non-infectious after being exposed and infected.

Infectious Period: The number of days an agent will remain infectious after it stops being latent.

Recovered Period: The number of days an agent will have immunity from a disease before becoming susceptible again. In the SEIR model this period is infinite.

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