Overview of Key AnyLogic Infrastructure, Modeling Types and Interface

Nathaniel Osgood

CMPT 858

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Announcements

- Links to 3 installers distributed
- Department machines requisitioned
- Tutorial time feedback sought

Project Ideas

- HPV/Cervical cancer
  - Smoking/Age/Ethnicity/Vaccination
  - Adapting existing aggregate model
  - Contact: Karen Yee (returns Monday)
- eLearning system
  - Facilitating learning by tapping into social networks
- MRSA (nosocomial – institutional spread)
  - Tie-in with institutional flow models
- Gonorrhea
  - Mutation & drug resistance
  - Sexual networks
- Chronic Wasting Disease
  - Movement of animals over landscape
  - Seasonal changes in behaviour
  - Contact: Cheryl Waldner
- TB
  - Contact: NDO & Assaad Al-Azem
  - Work with TB Control

Project Ideas

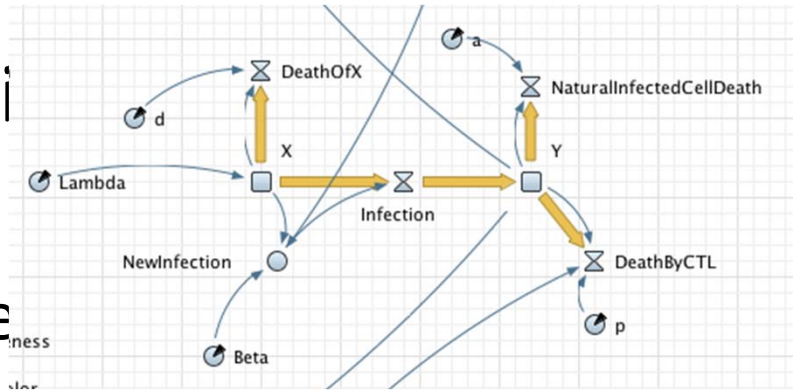
- Gestational & Type 2 Diabetes
  - Intergenerational effects of diabetes in the mother
- H1N1 Spread
  - Network micro-data
  - Aggregate data?
  - Contact: Cheryl Waldner & Simon Kapaj
- Lifecourse weight trajectories
  - 50 year longitudinal data (National Childhood Development Survey)
- Physiological model of weight & body composition
  - Interaction with
    - Food intake
    - Physical activity

AnyLogic basics

- Multi-platform
- Declarative graphical languages
- Basic language: Java
- Rich library of built-in objects
- Continuous or discrete time/space
- Modeling approaches supported
  - System Dynamics
  - Agent-based
    - Regular & irregular spatial embedding, network embedding
  - Discrete event

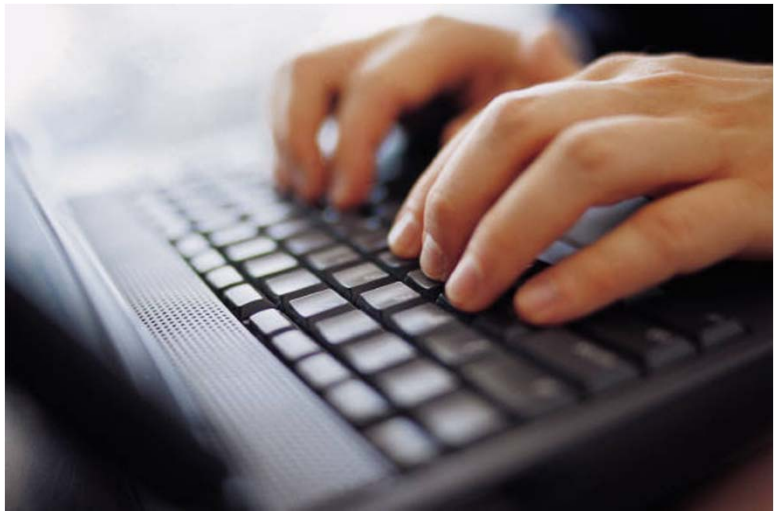
System Dynamics

- Feedback-focus
- Traditional graphical depicti
  - Stocks (state of system)
  - Flows (rates of change to the
  - Continuous variation in state



- Stocks are initialized, are then change according to flows
- Values of flows are determined by stocks & any other variables

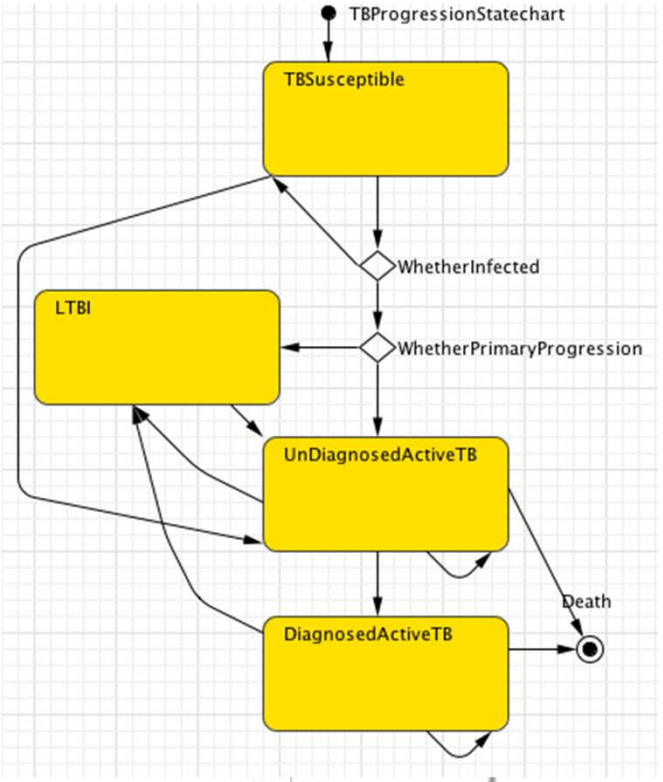
Hands on Model Use Ahead

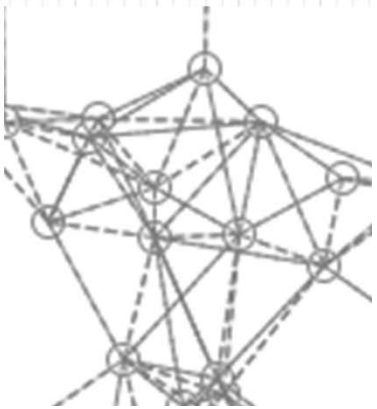


Load model: SIR Agent Based.alp

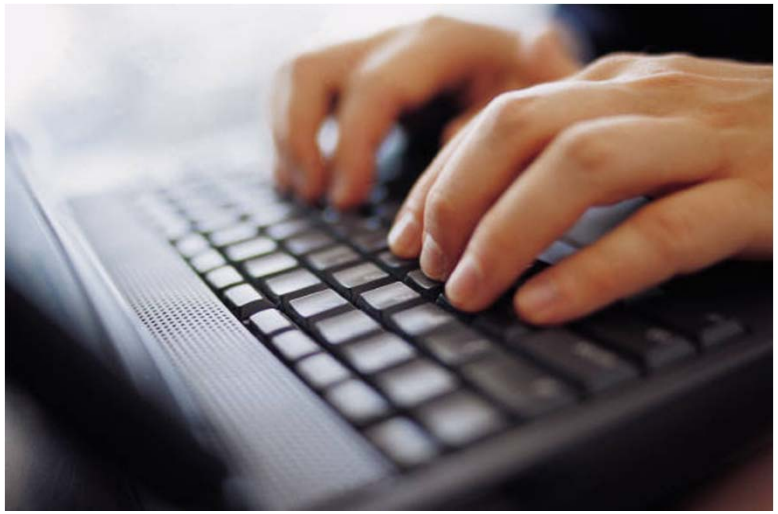
Agent-Based Approaches

- Agent (actor) focused
- Traditional graphical depiction:
  State transition diagram
  - States
  - Transitions
  - Discrete variation in state
- Regular or irregular topologies connect between agents
  - Messages sent via connections





Hands on Model Use Ahead

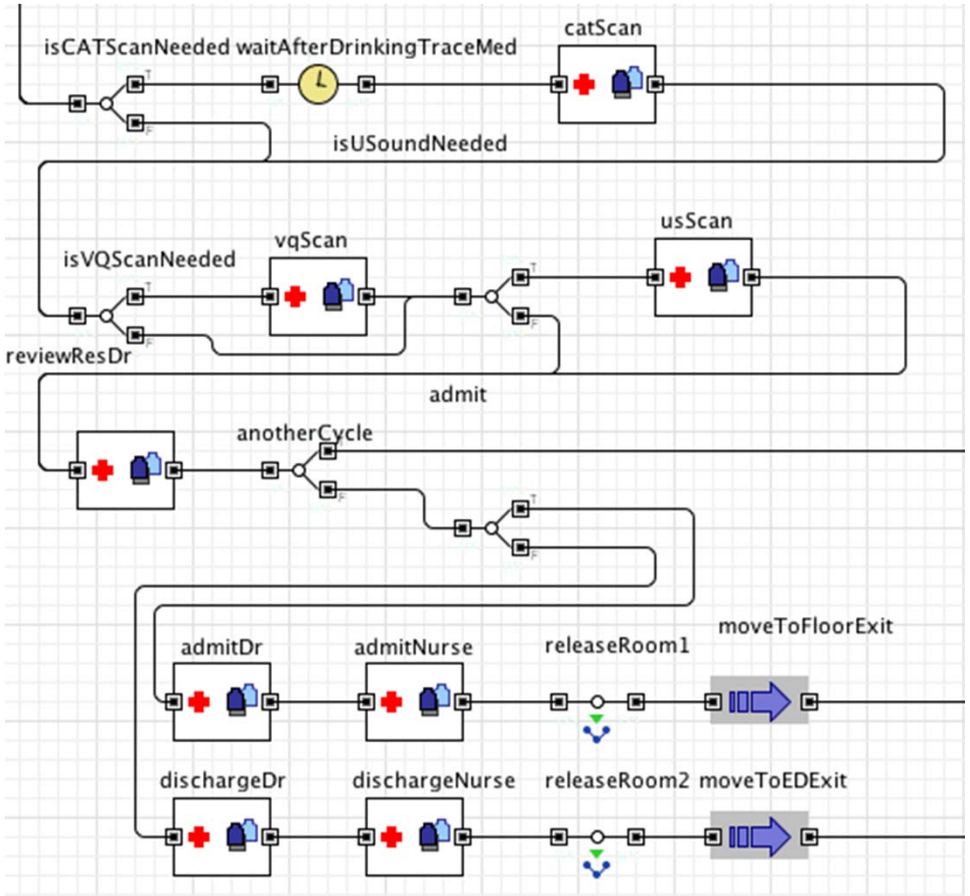


Load model:

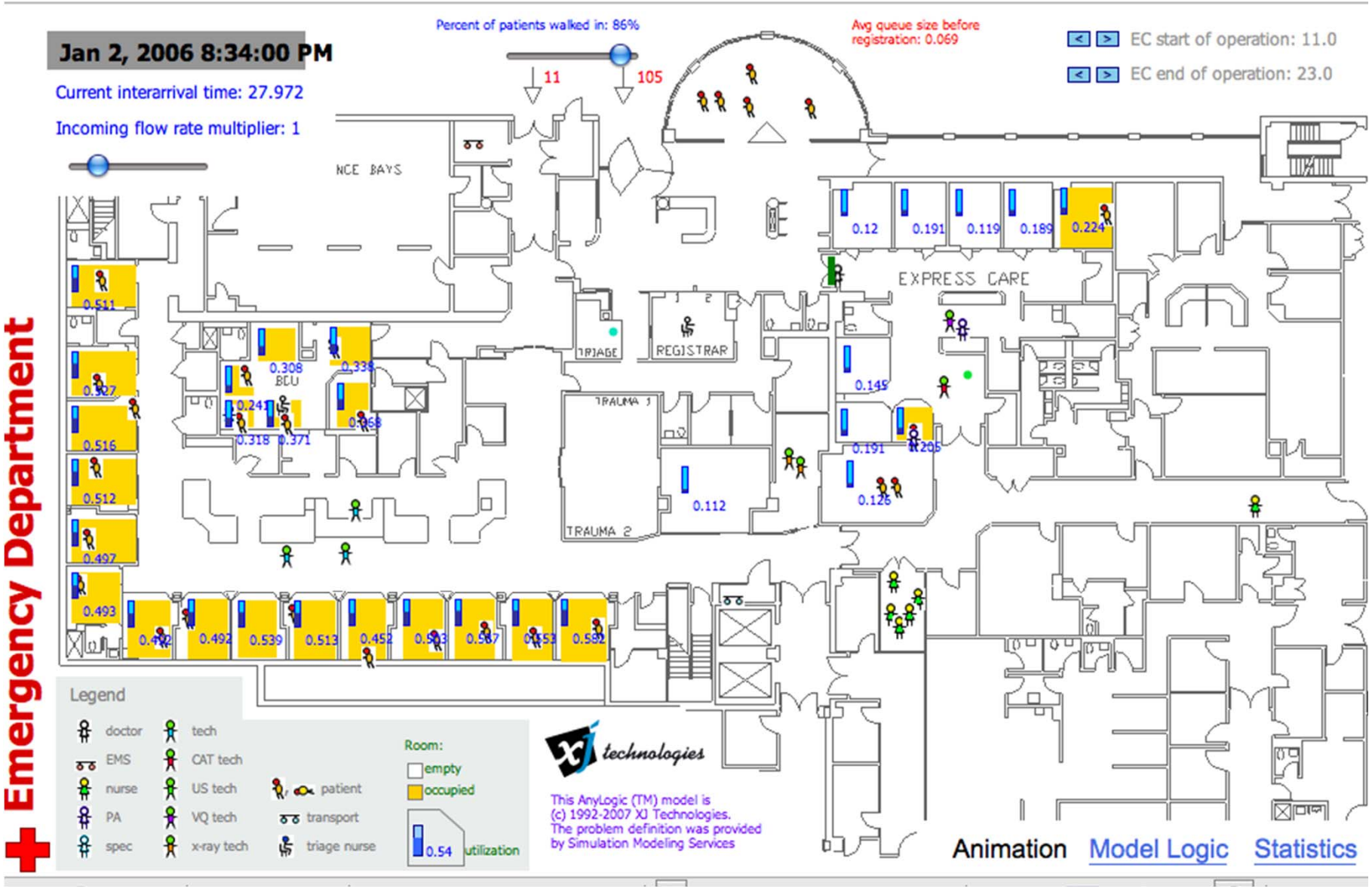
Emergency Department Tulsa.alp

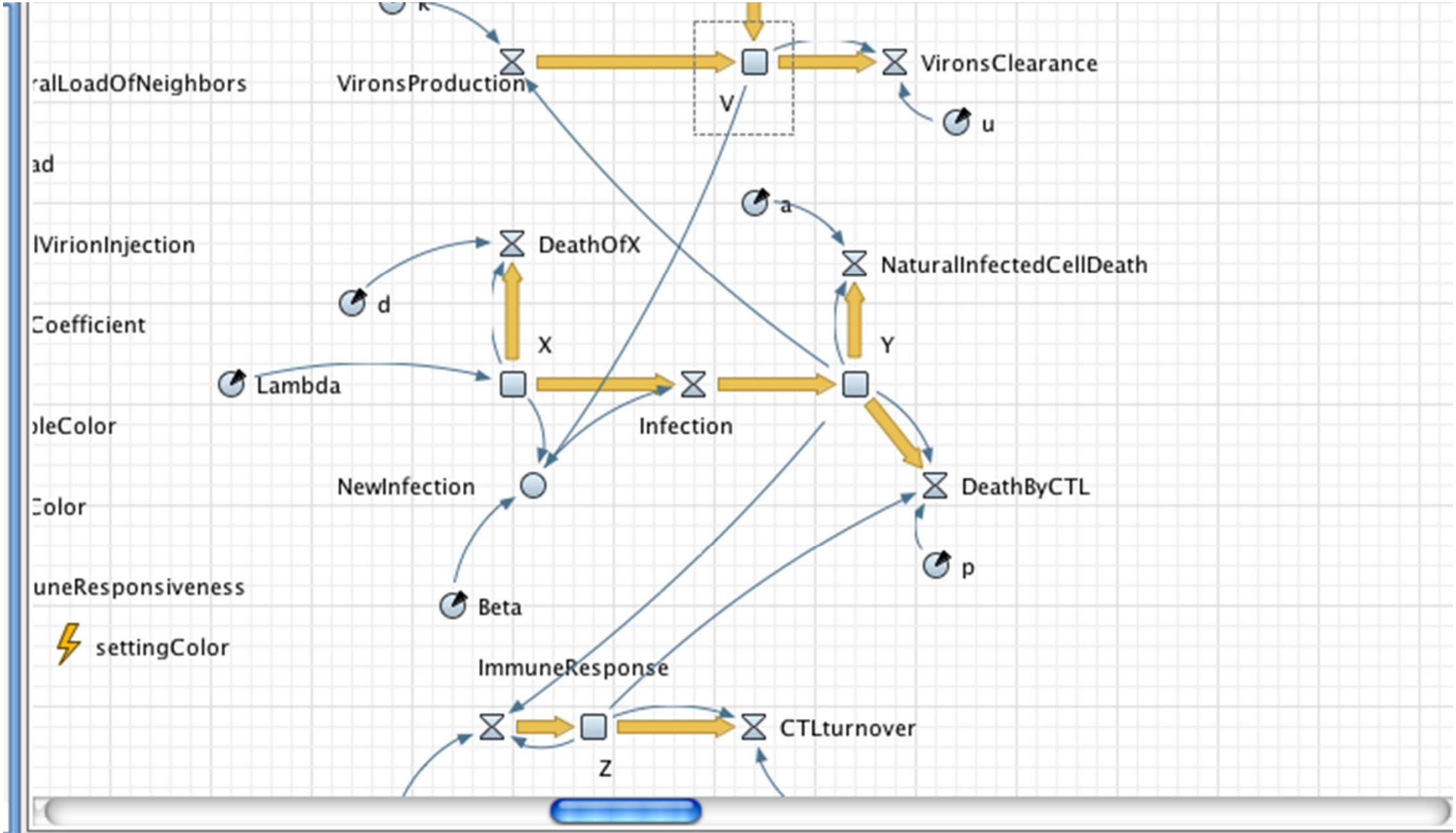
Discrete Event Modeling

- Resource-based modeling
  - Queues
  - Processes
  - Flow charts
  - Capacitated resource pools
  - Send to
  - Attachment/detachment



“Network Modeling”
Irregular Spatial Embedding





Properties | Console

Person – Active Object Class

General

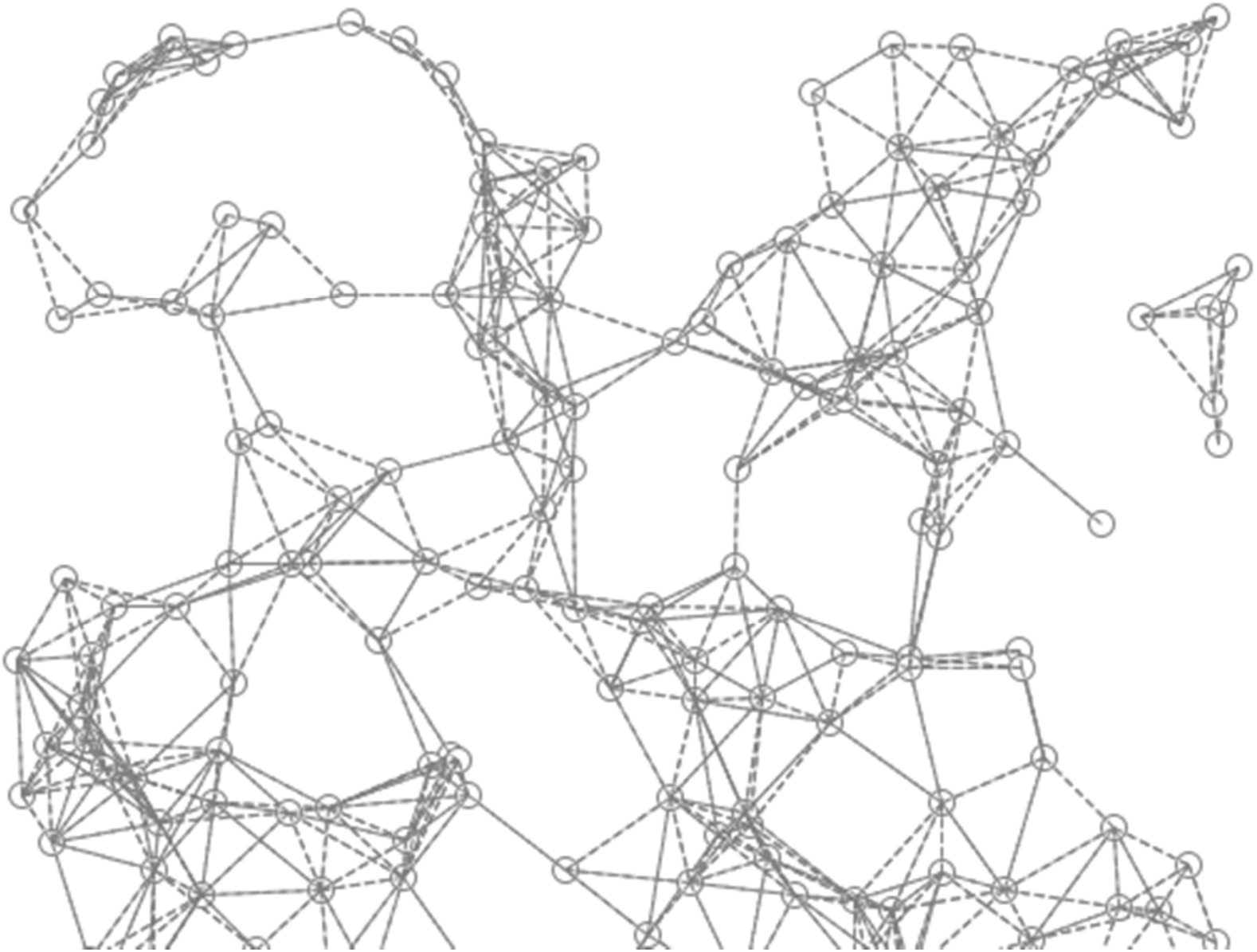
Advanced

Agent

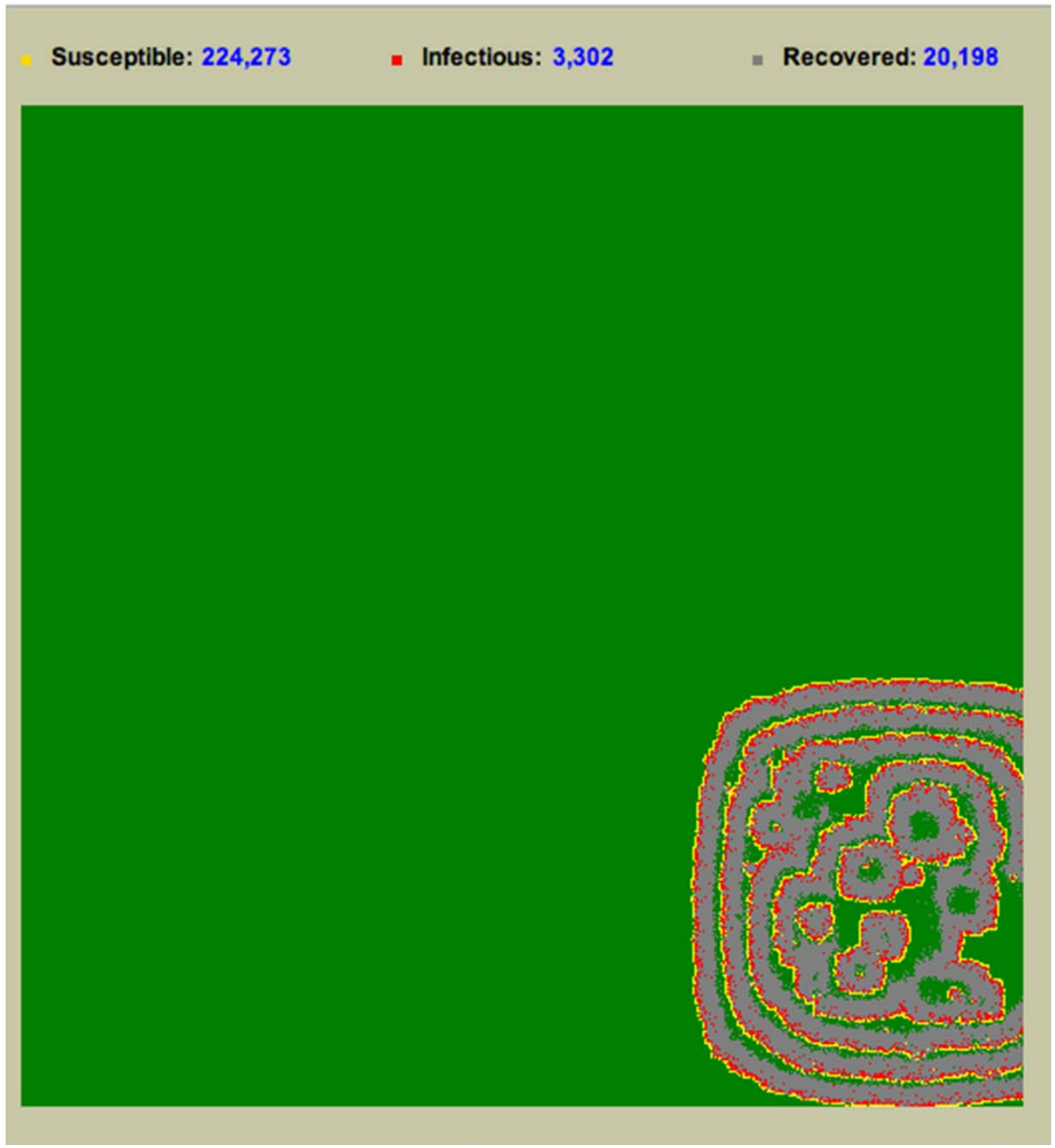
Name: Person

Ignore

Network Embedded Individuals



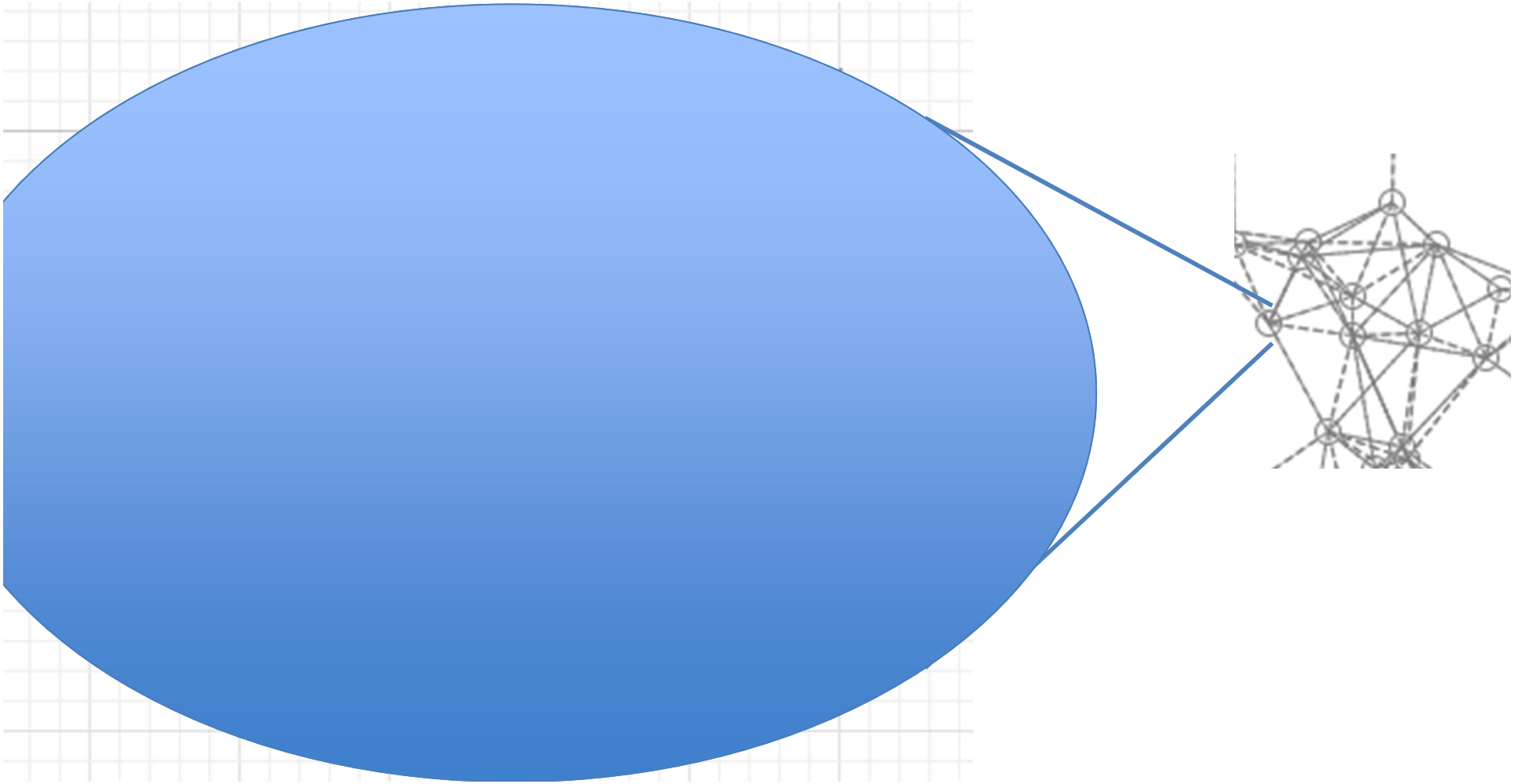
Regular Spatial Embedding



Hybrid Models

- Much of the power of AnyLogic lies in its ability to integrate multiple types of modeling in a single model
- Attractive schemes
  - Agent-based using system dynamics for continuous agent state (c.f. age)
  - System dynamics using agent-based to determine flows
  - Agent-based using system dynamics for global dynamics
  - Agents entering into process-based health services

Example Hybrid Model



Advantages of AnyLogic

(as compared to other Agent-Based Modeling Software)

- Primarily declarative specification
- Less code
- Great flexibility
- Access to Java libraries
- Support for multiple modeling types
- Support for mixture of modeling types

Painful Sides of AnyLogic Education/Advanced

- Export of model results: Lack of trajectory files
- Lack of debugger
- Need for bits of Java code
- Many pieces of system