Local Outbreak Dynamics

A Basic Model for the Simulation of Local Infectious Disease Outbreaks
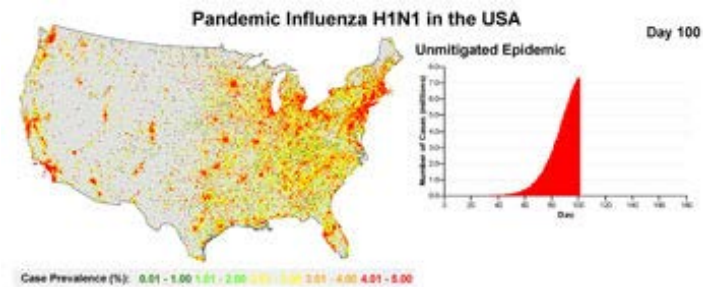
Lukas Schmid & Corinne Dickenmann

Basel, 24. August 2011
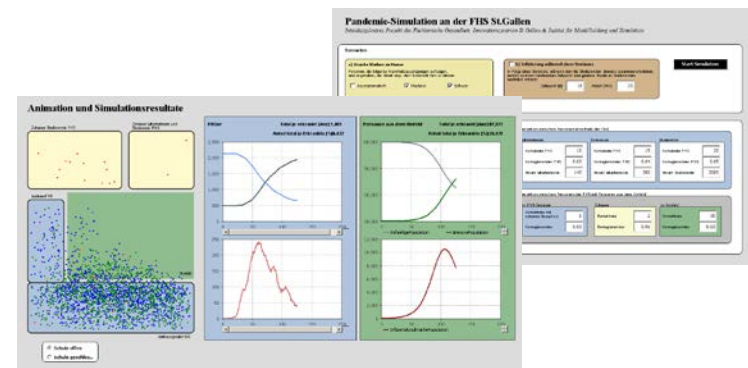Swiss Meeting for Infectious Disease Dynamics (SMIDDY)

Pandemic Influenza H1N1 in the USA

Global Pandemic
Influenca H1N1 Simulations

Simple FHS-Simulation
for local H1N1 out brakes

➢ **Interest in an easy to use simulation instrument
   for analyzing local disease dynamics**

Simulation Instrument

- – Model of local outbrakes caused mainly by contact interactions
- – Possibility to parameterize the setting (environment, type of virus, etc.)
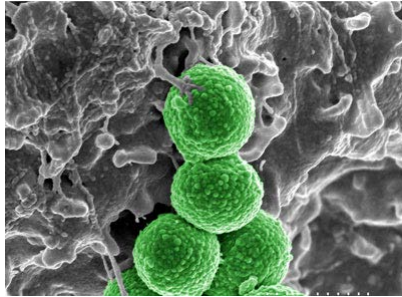- – User-friendly interface with animation and visualization of simulation results

Scenario Analysis

- – Analysis of different control measures (i.e. hand wash, gloves, patient/HCW ratio, screening, isolation, etc.)
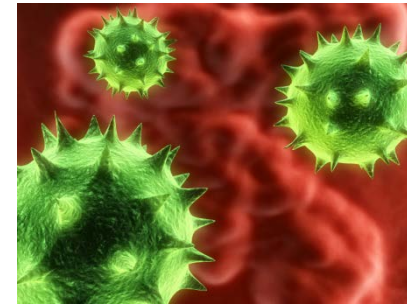
Awareness Training

- – Tool and concept for the sensitizing of HCW

Basic Model
Cases
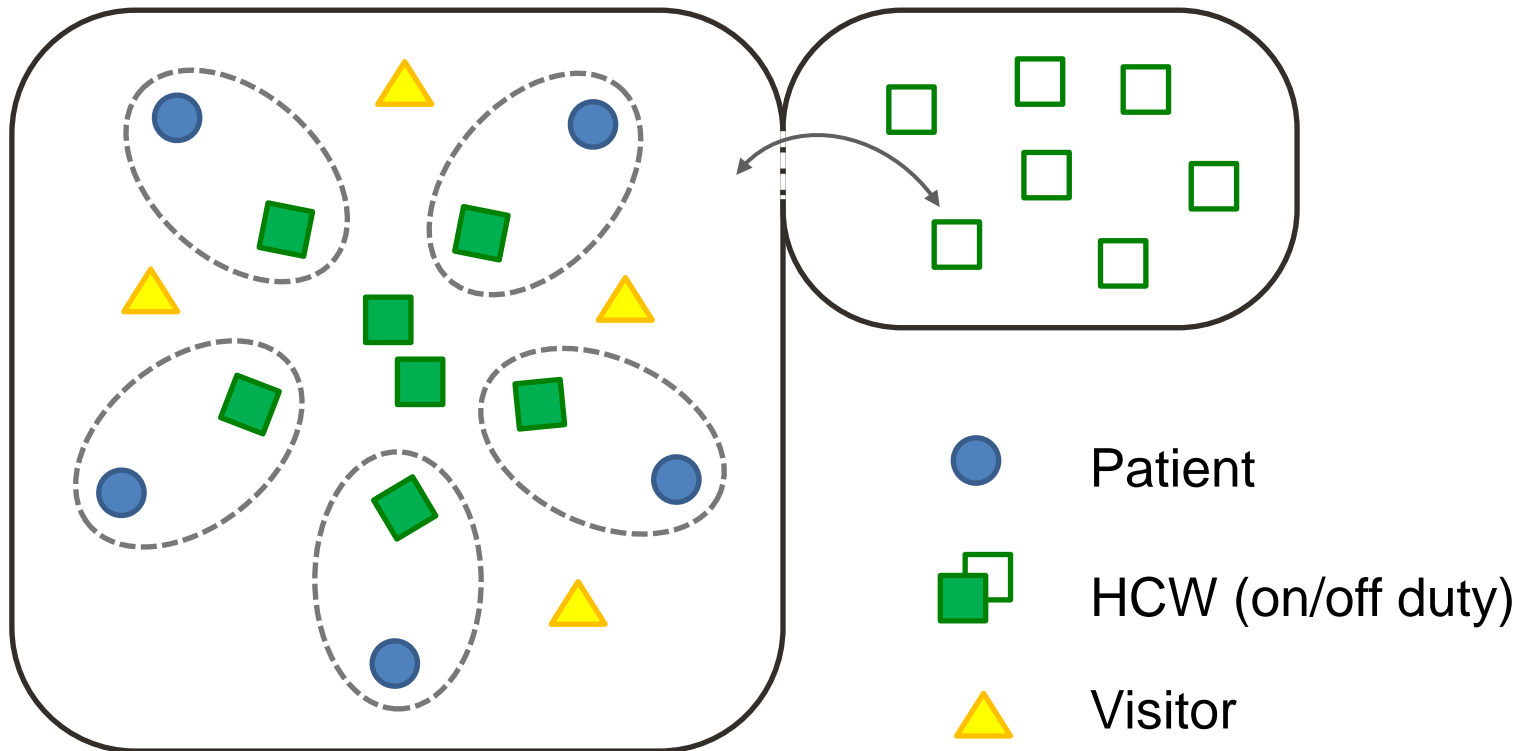

Transmission of methicillin-resistant Staphylococcus areus within an intensive care unit (KSSG)
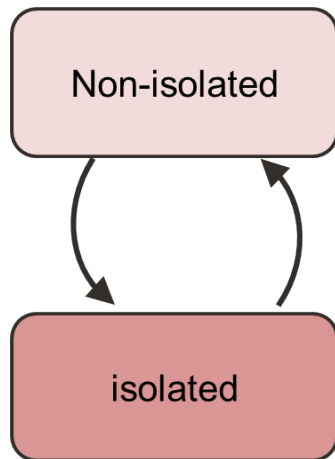
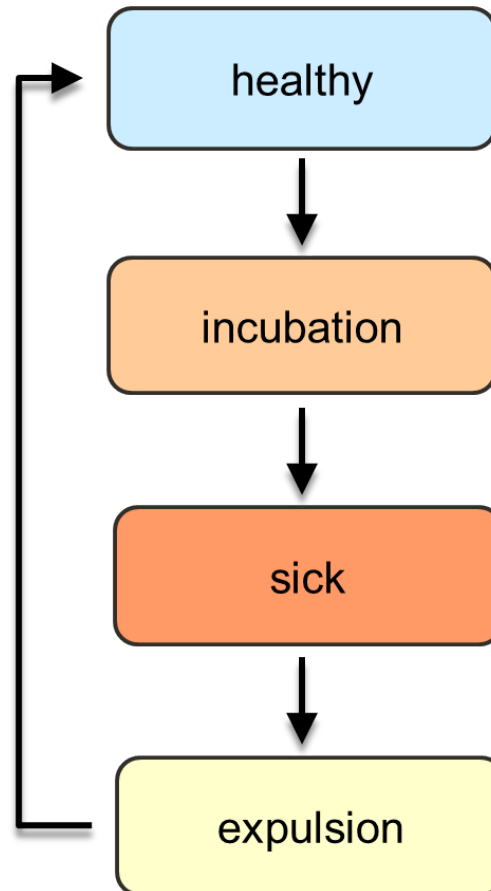Transmission of norovirus within a geriatric ward (SSH)
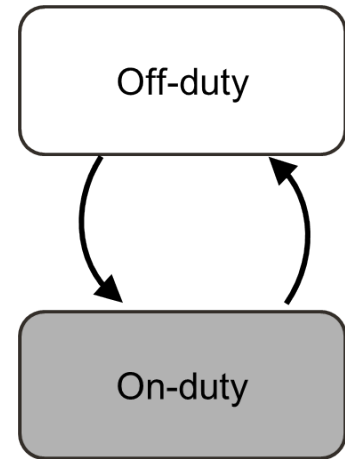
Patient

HCW (on/off duty)

Visitor

Health state:

Isolation state:

Work state:

Basic Model
Modeling Paradigm

Systemdynamic (SD):
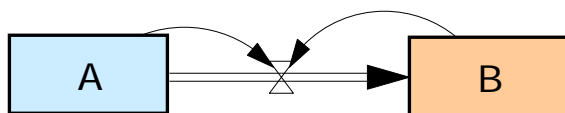
Rate R(t) = f(A, B, c, ...)

Agentbased (ABM):

State A

if signal event occurs

State B

contacts

«Systemic Agents»:

A(t)

B(t)
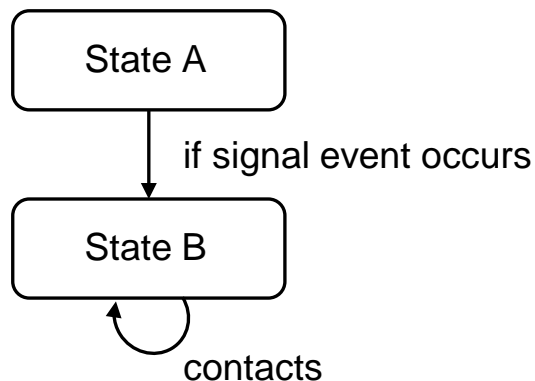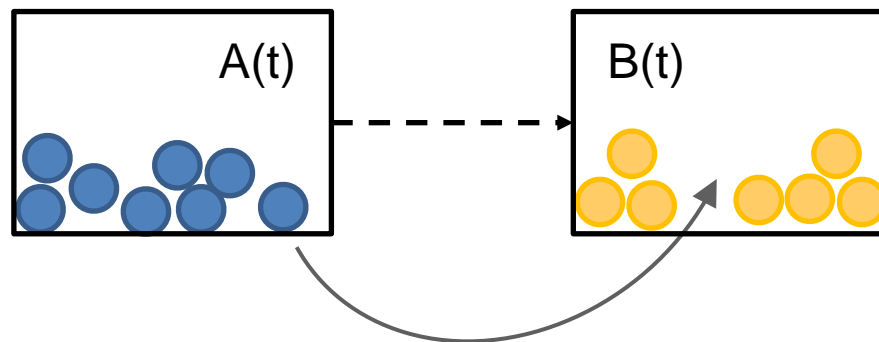
Probability p(t) = R(t) / A(t) · Δt

with Δt small in the sense, that p(t) << 1

Advantages

- Use of abstract systemic descriptions regarding the transmission mechanism (no need for detailed interaction datas)

- Possibility to have discrete events (i.e. change of shift, patient entry, etc.)

- Patients, HCW and visitors have a history
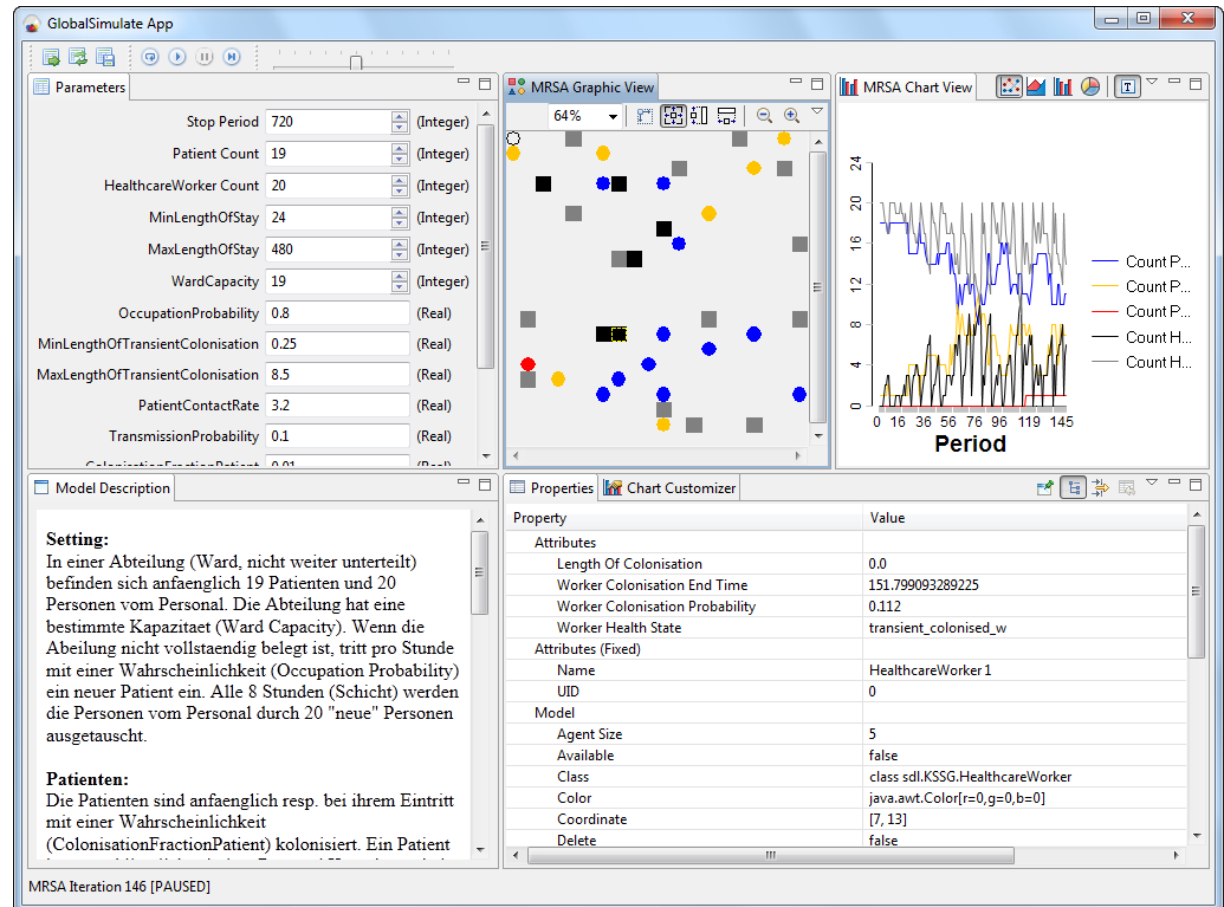
- Animation for better plausibilization through experts

Simulation Application

Application with a user-friendly interface is built with the open source modeling software GlobalSimulate®

Goal

Creation of an easy to configure and to use instrument for simulating local disease dynamics

Status

Basic model building on a model paradigm in between SD and ABM

To dos

– Plausibilization and pointwise validation of the specific models

– Scenario analysis: effectiveness of different measures and strategies

– Further development of the user-interaction (GUI)

– Concept for awareness trainings with the simulation model

Hospitals
- Kantonsspital St.Gallen
- Spitäler Schaffhausen

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