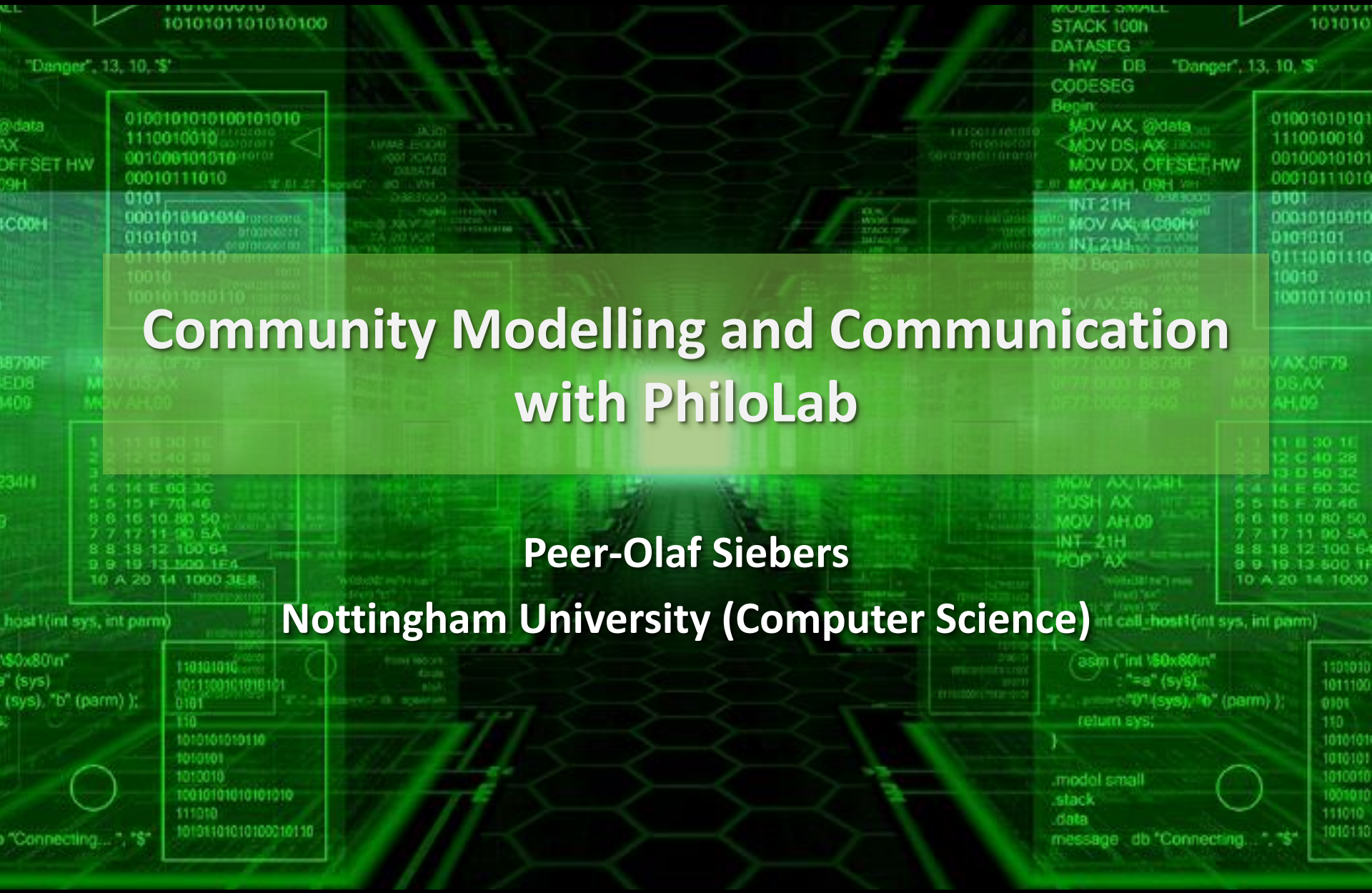


Community Modelling and Communication with PhiloLab

Peer-Olaf Siebers

Nottingham University (Computer Science)

The Story

- A while ago I have created an Agent-Based Social Simulation (ABSS) **model development & documentation** framework called the Engineering ABSS framework (or EABSS for short)
  - Grounded on the concepts of co-creation (using focus groups)
  - Uses tools and techniques from Software Engineering

- Colleagues studying Organisational Behaviour were interested in using the EABSS as a **communication and idea generation** tool; for this application we named it PhiloLab
  - Use a guided conversation to capture the diversity of perspectives held by the various stakeholders on a specific topic

The Story

- EABSS applications in **model development**
  - Understanding the business process for regenerative medicine
  - Multi-method simulation of antiviral treatment for A(H1N1) pandemic influenza
  - Studying opportunities to arrive at a general equilibrium without central authority
  - Studying new concepts in adaptive architecture

- EABSS Applications in **model documentation**
  - Adoption of photovoltaic panels in the United Kingdom
  - Investigating global climate change

The Story

- PhiloLab workshops for **generating ideas**
  - DigiTech-MH Workshop: Exploring the ethics of digital technology for mental health
  - Plasticity Workshop: Exploring what differentiates a plastic organisation setup from a conventional organisation setup

- PhiloLab workshops to **support communications**
  - EABSS in HealthCare: Supporting the communication between healthcare stakeholders

The Story

- My reason for coming here is to find out if there is any room in the field of **Philosophy** for something like this

- In particular I would be interested in exploring **some more philosophical questions** about **societal changes** over time

Engineering Agent-Based Social Simulations

The Need for EABSS

- Social Simulation (formal definition)
  - Studies **socio-economic phenomena** by investigating the social macrostructures and **observable regularities** generated by the behaviour and relationships between individual **social agents**, and between agents and **the environment** in which they act.

- How do we develop more complex Social Simulation models?
  - It would be good to have **a structured approach** …
    - to support multi disciplinary collaboration
    - to work with all kinds of stakeholders (academics / non academics)
    - to develop conceptual models for exploratory and explanatory studies

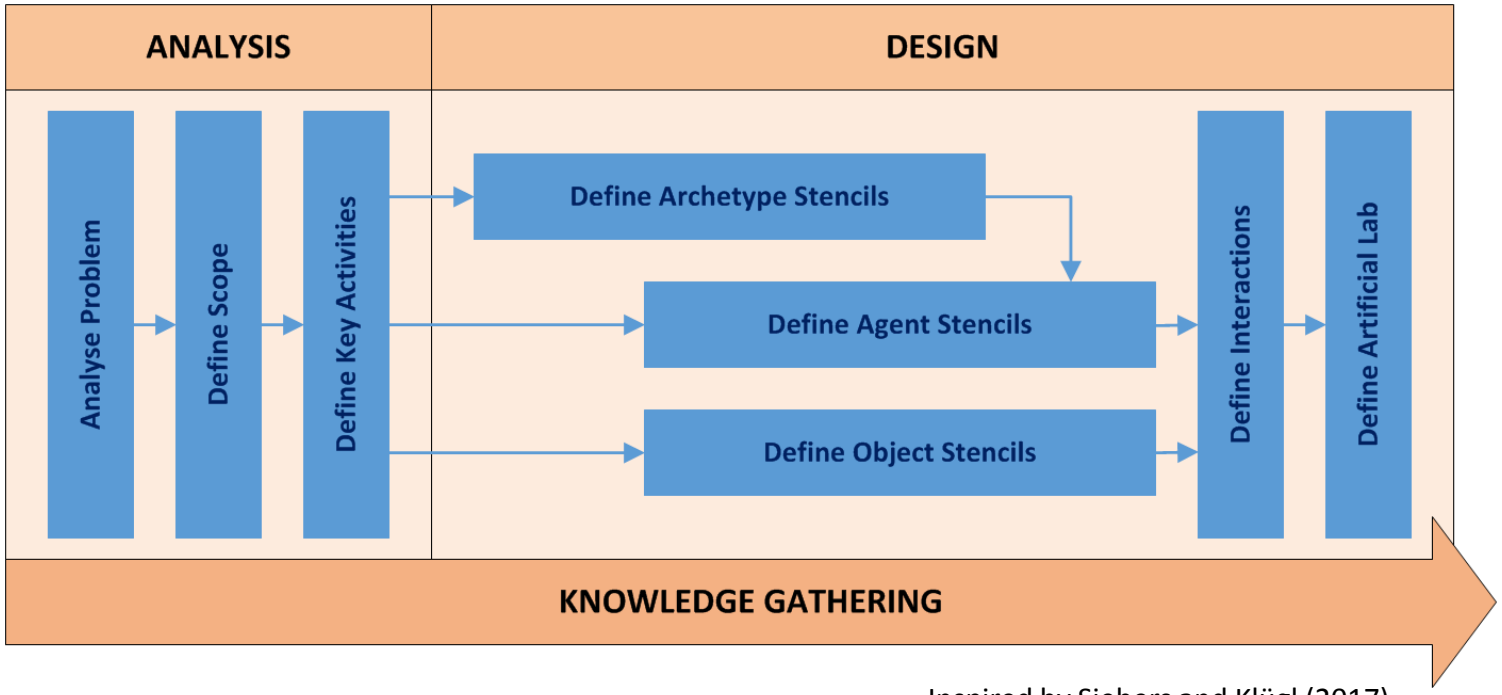
NB: More complex refers to models that go beyond the typical philosophical ABMs, i.e. mid-range+ ABMs

My Definition of Agents

- What do I mean by "agents" in this context?
  - Agents are "**objects with attitude**" (Bradshaw 1997)
  - Similar to non-player characters in computer games
- Properties (borrowing from AI):
  - Discrete entities
    - Have a memory
    - Have their own goals (missions)
    - Have their own thread of control
  - Autonomous decisions
    - Capable to adapt and to modify their behaviour
  - Proactive behaviour
    - Actions depending on motivations generated from their internal state

EABSS & PhiloLab

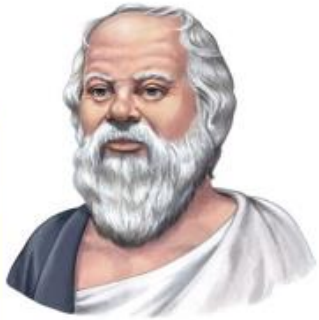
- Model development process (base path)
  - In reality it is an **agile** and **iterative** framework



Inspired by Siebers and Klügl (2017)

EABSS & PhiloLab

- Using a focus group approach
  - Group sizes of **4-5 participants** (including moderator) work best
  - Estimated time to get through the whole process: **8 hours**
  - Socrates vs Confucius
    - Collaborative brainstorming
    - Information capturing
    - Debates only when needed
  - Moderators
    - Will guide
    - Will act as stakeholder (modeller)
  - Iterative process
    - Reuse of information + some implicit validation
    - Important to go forward and backward



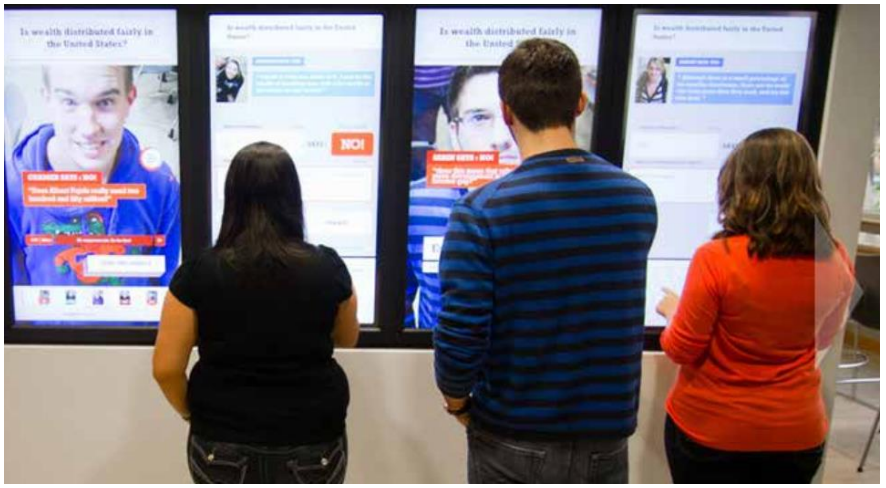
An Off-Topic Illustrative Example

Studying New Concepts in Adaptive Architecture

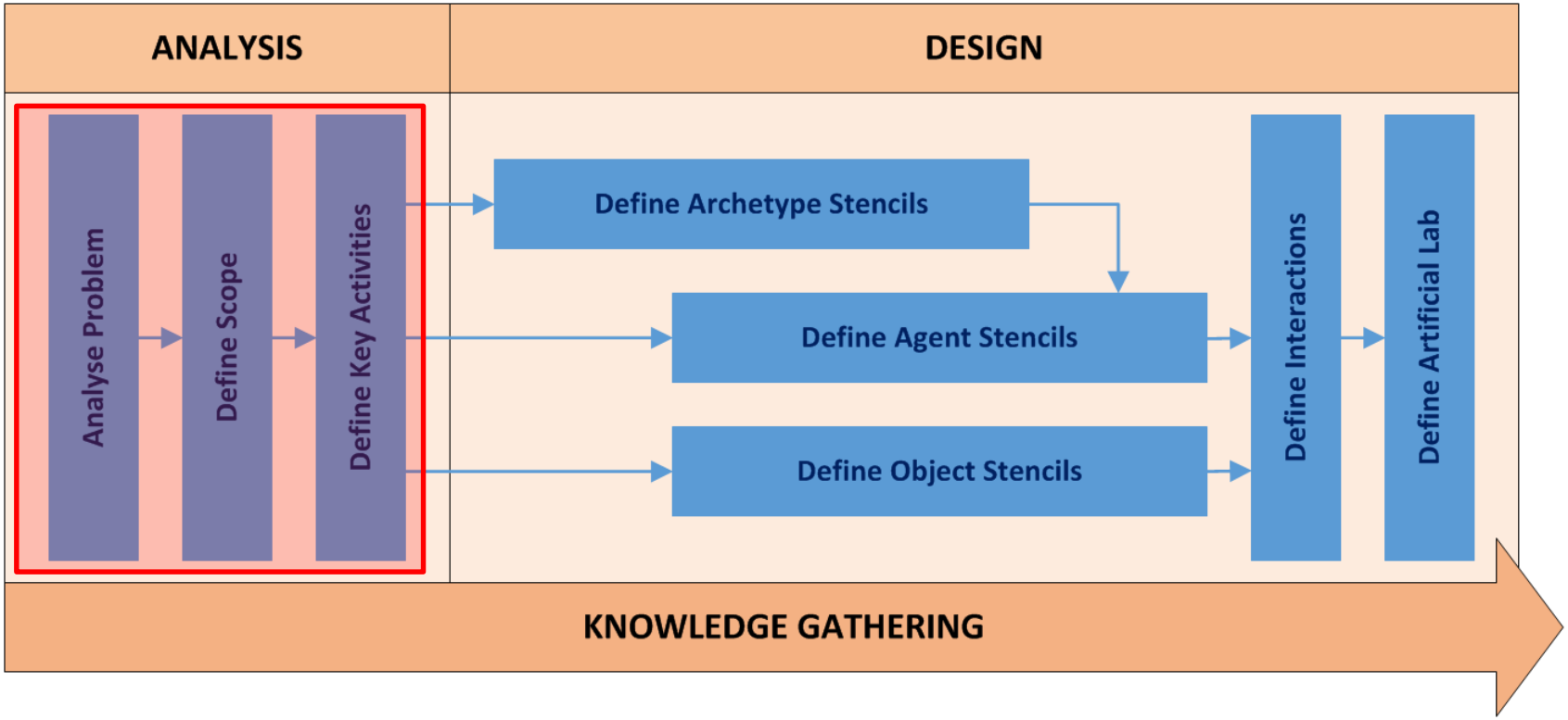
This started as an information gathering exercise for a prototype to be developed for a funding proposal; we then found a student to implement it

Illustrative Example: Context

- Context
  - The purpose of the study is to explore Adaptive Architecture design in the context of a **novel museum visit experience**, in particular the idea of having a large screen with a set of **intelligently adaptive moving content windows** that adapt position and size in response to movement and grouping of people in front of them.



Model Development Process



Inspired by Siebers and Klügl (2017)

Illustrative Example: Analysis

- Aim
  - Study the **impact of an adaptive screen** (including several display windows) in a museum exhibition room
- Objectives
  - Study the interaction of "artificial intelligent" windows and visitors' movement; use the model to demonstrate to architects the idea of adaptive **screens** (with artificial intelligent **windows**)
- Hypotheses
  - A larger window size has a positive effect on visitor engagement
  - Space availability has a positive effect on visitor engagement
  - Screens with artificial intelligent windows attract viewers for longer

Illustrative Example: Analysis

- Experimental factors (look at objectives/hypotheses to work these out)
  - A subset of parameters of the underlying theoretical movement model
  - Visitors arrival rate
  - Initial number of windows

- Responses (look at objectives/hypotheses to work these out)
  - Number of groups of visitors
  - Average time spend in the museum
  - Visual representation of the system and its dynamics

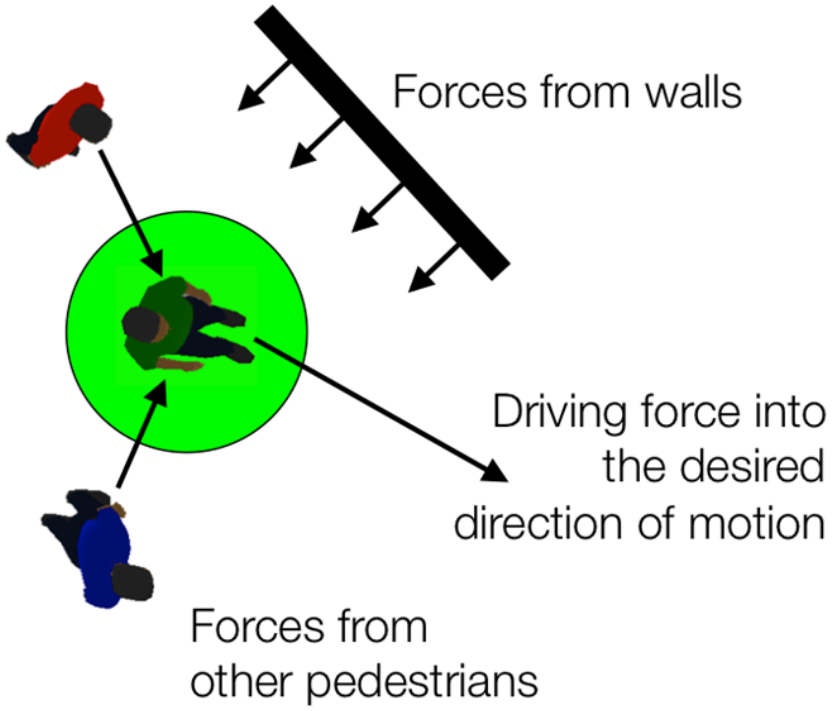
Illustrative Example: Analysis

- Scope (what elements do we need to fulfil the aim) (look for nouns in previous text to find elements)
  - Exploratory study; focus on transparency; hypothetical museum

Category		Element	Decision	Justification
Actor	Human	Visitor	Include	Main research subject
		Group	Include	Important for capturing group behaviour
		Staff	Exclude	Have no impact on the dynamics
	Intelligent Object	Window	Include	Intelligent display unit that can make proactive decisions
		Display system	Include	Controls the life cycle of each window
Physical Environment	Service	Projector	Exclude	Considered by the windows
		Screen	Include	Home of the windows
	Structure	Wall	Include	Used by social force model
		Door	Include	Used by social force model
		Lighting	Exclude	Not necessary for testing hypotheses
		Furniture	Exclude	Not necessary for testing hypotheses
	Weather	Temperature	Exclude	Not necessary for testing hypotheses
		Natural light	Exclude	Indoor environment
	Building	Exhibition room	Include	Location where visitors move around
		Corridor	Exclude	Not necessary for testing hypotheses
		Toilet	Exclude	Not necessary for testing hypotheses
Social and Psychological Aspects	Visitor behaviour	Social force model	Include	Modelling visitor movement
		Vision area	Include	Will affect visitor movement behaviour
	Window behaviour	Social force model	Include	Part of the AI to be tested
		Vision area	Include	Area that visitors are able to read clearly
		Hammer algorithm	Exclude	Alternative to SFM but to be ignored due to time constraints
Other		N/A	N/A	N/A

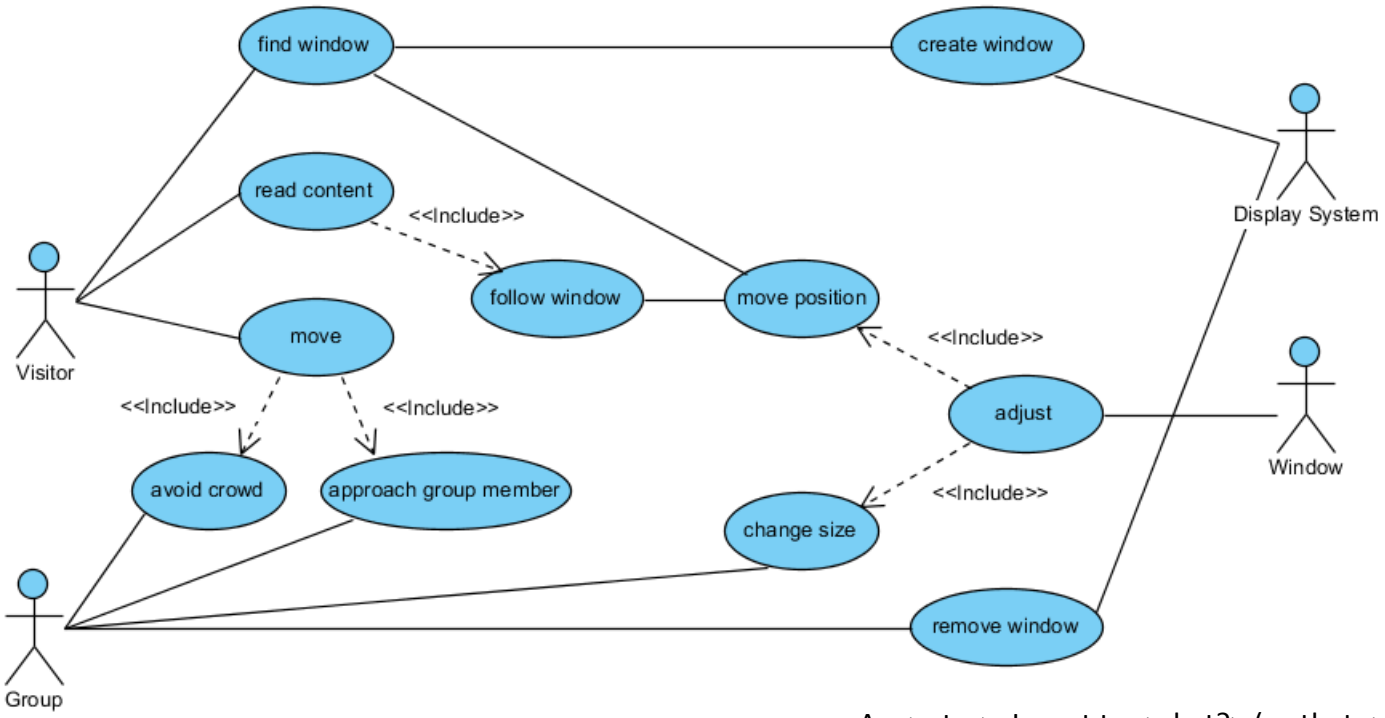
Illustrative Example: Analysis

- Social force model (Helbing and Molnar 1995)



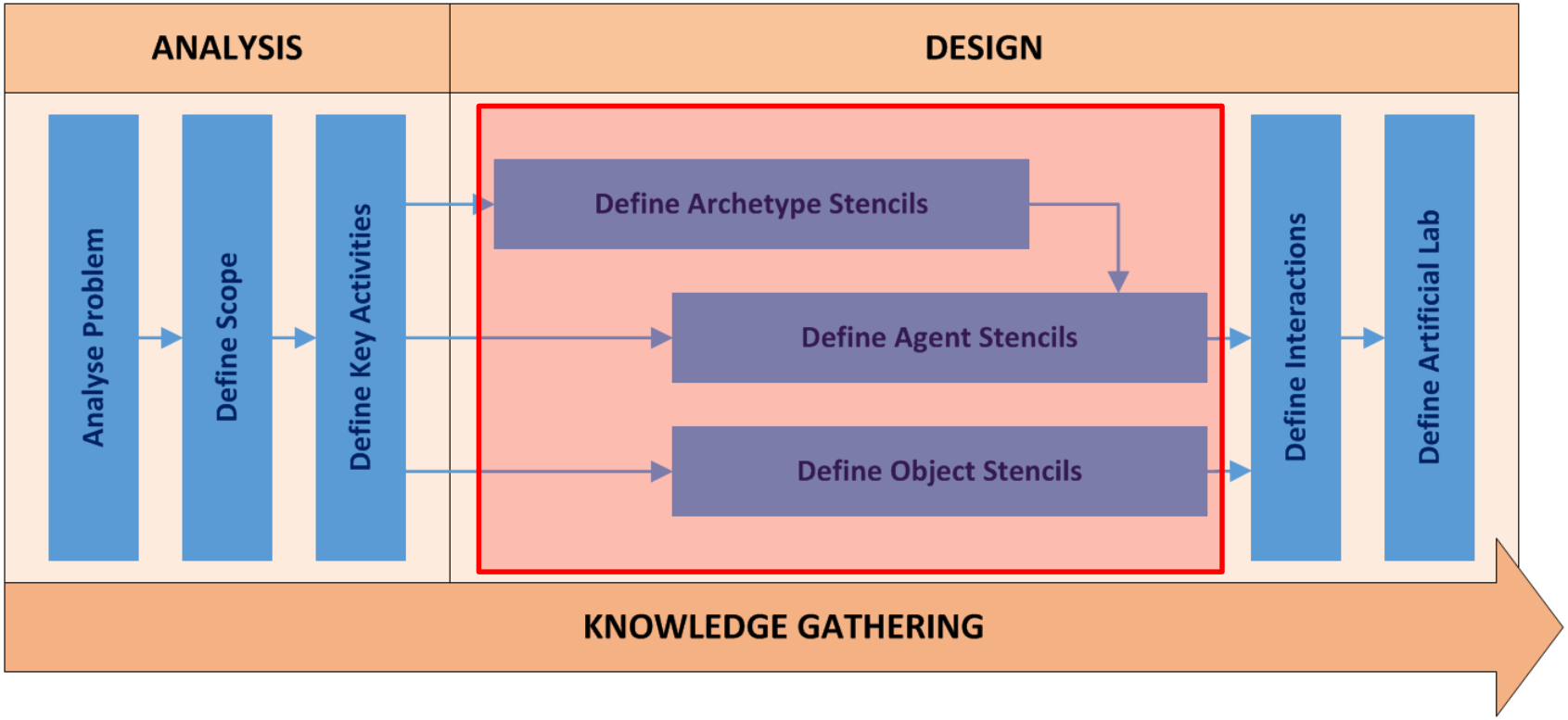
Illustrative Example: Analysis

- Key activities (actors come from scope table; use cases come from hypotheses and by creating user stories)



As <actor>, I want to <what?> (so that <why?>)

Model Development Process



Inspired by Siebers and Klügl (2017)

Illustrative Example: Design

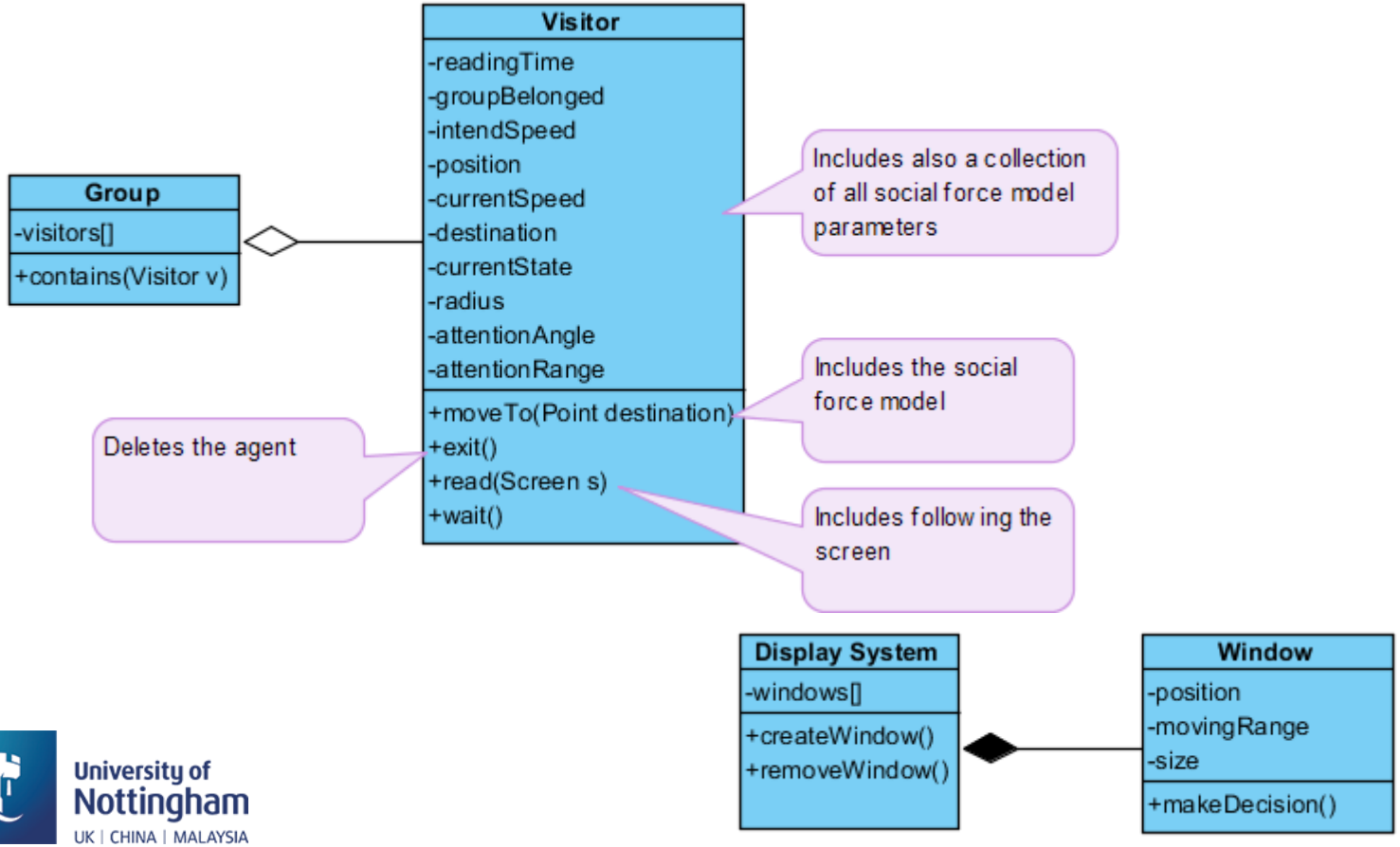
- Archetype stencils
  - Allowing to define behaviour of actors
    - Habit templates
    - Utility function
    - Demographics
    - Advanced data analytics

Stereotype	Reading time(second)
Not-interested	3-10
General-visitor	10-40
Researcher	40-90

Stereotype	Speed(meter per second)	Collision radius(meter)
Child	1.4-1.8	0.11-0.15
Adult	1.2-1.4	0.20-0.25

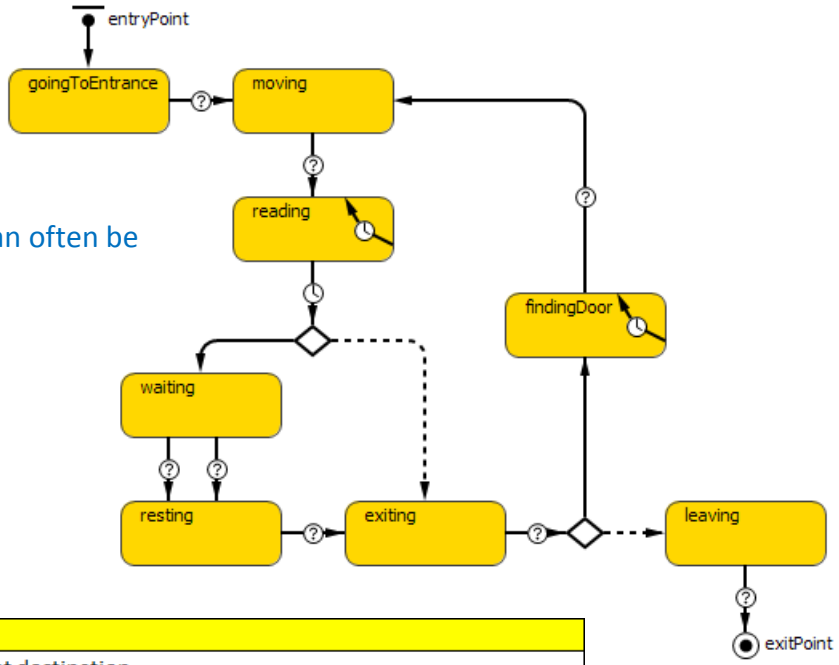
Illustrative Example: Design

- Agent and object stencils (attributes can be derived from archetype criteria, theory parameters, methods can be derived from the states in the related state charts)



Illustrative Example: Design

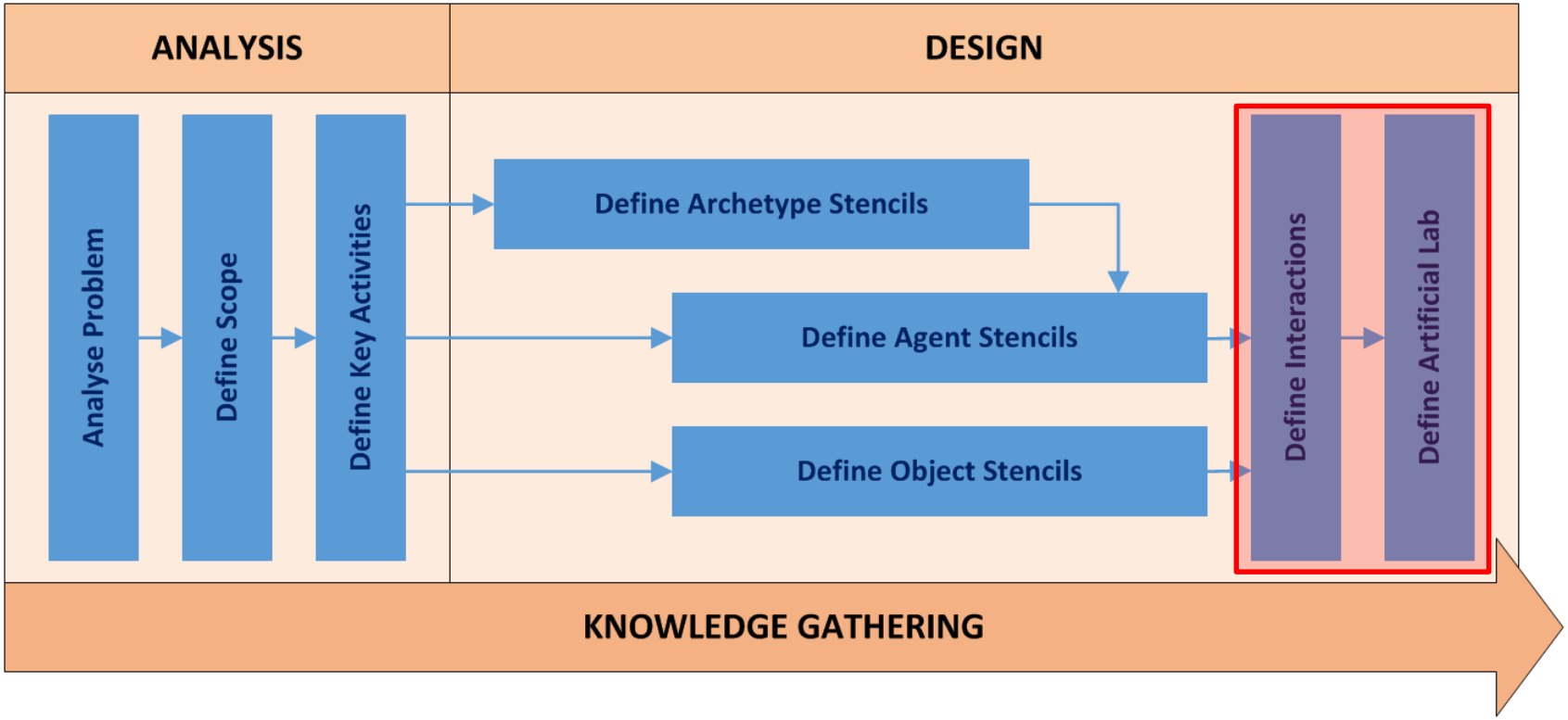
- State chart of visitor agent (states can often be derived from use cases)



- Transition table of visitor agent

From state	To state	Triggered by	When?
goingToEntrance	moving	Condition	Agent arrived at destination
moving	reading	Condition	Agent arrived at destination
reading	reading	Timeout (Internal)	Agent follows the nearest window
reading	waiting	Timeout+Condition	After reading time elapsed and agent needs to wait for group members
waiting	resting	Condition	Agent arrived at destination
waiting	resting	Condition	Agent is close to destination and is part of a group
resting	exiting	Condition	All group members have finished reading
reading	exiting	Timeout+Condition	After reading time elapsed and agent is individual
exiting	findingDoor	Condition+Condition	There are other rooms available
findingDoor	findingDoor	Timeout (Internal)	Agent looks for nearest door
findingDoor	moving	Condition	Agent arrived at destination
exiting	leaving	Condition+Condition	This was the last room to go

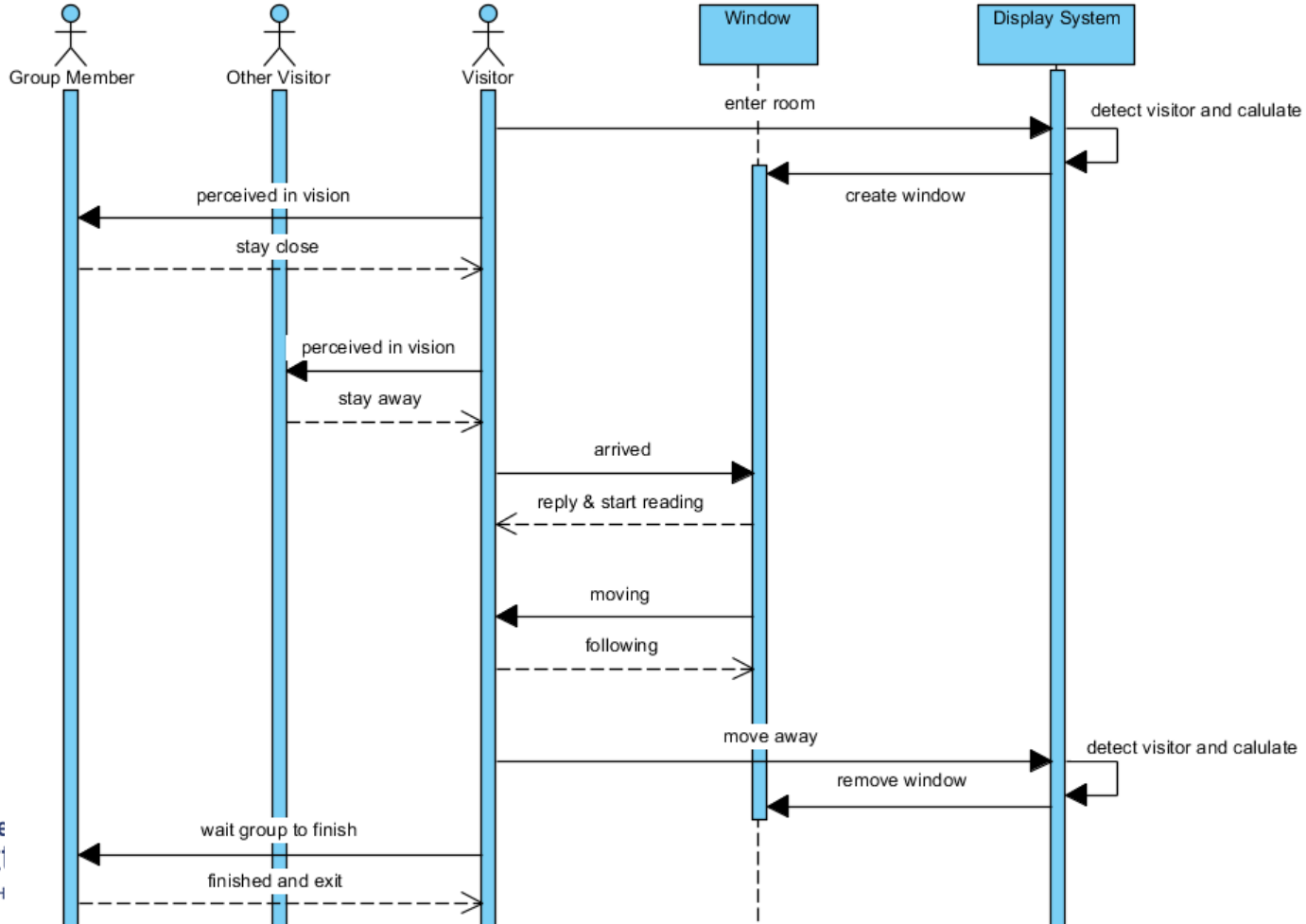
Model Development Process



Inspired by Siebers and Klügl (2017)

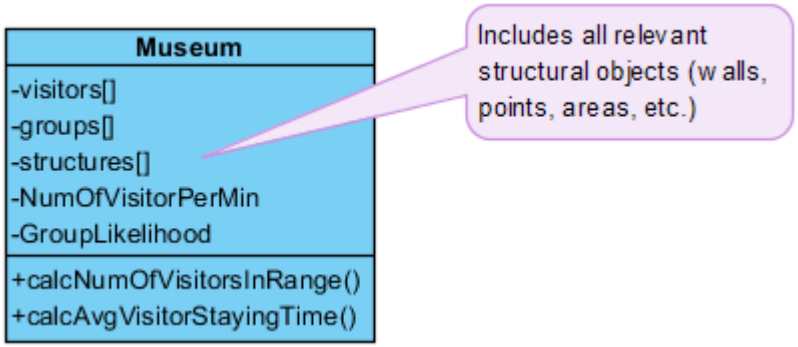
Illustrative Example: Design

- Interaction (all elements defined in the agent/object stencil step need to be listed on the horizontal axis) (use cases could be listed on the vertical axis)

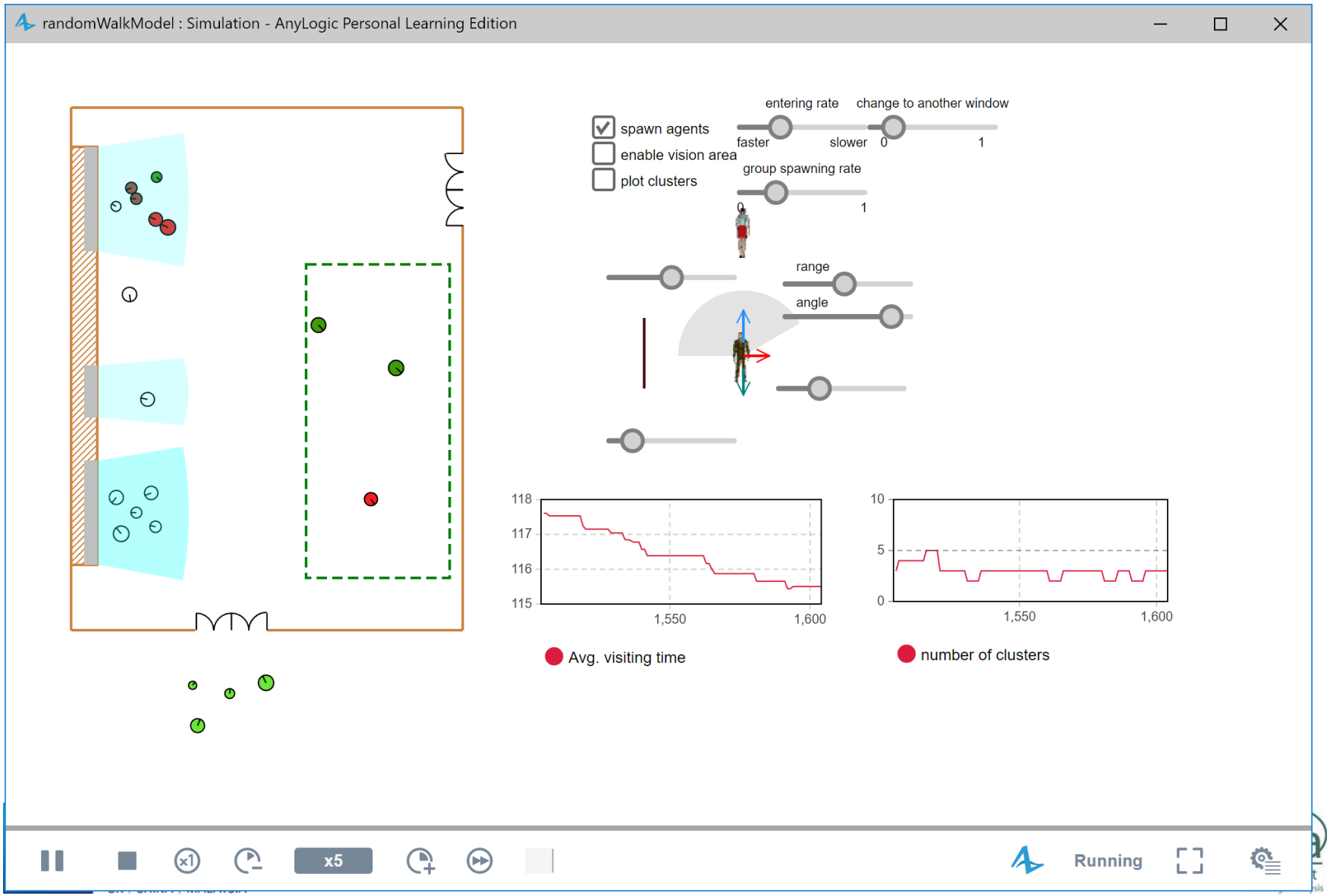


Illustrative Example: Design

- Artificial Lab (attributes provide storage for all agents/objects and initialisation parameters required for experimental factors; methods related to responses)



Illustrative Example: Implementation



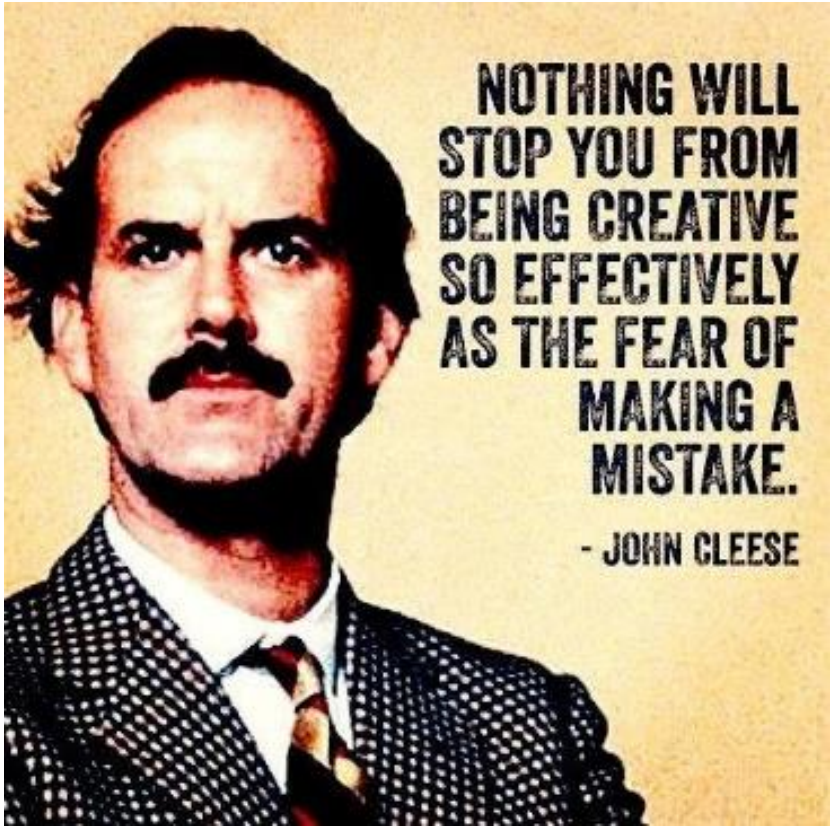
Conclusions

- The structured process of conceptual model development itself gave us lots of innovative ideas and a clearer picture of how a potential system might look like

- The EABSS was driving the model development and guided us in the right direction; implicitly we checked the validity of our conceptualisations

- The big question remains: Can something like this work to investigate some more philosophical questions about societal changes

Questions / Comments



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- Siebers and Klügl (2017). What Software Engineering has to offer to Agent-Based Social Simulation. In: Edmonds and Meyer (eds). Simulating social complexity: A handbook - 2e, Springer.