COMP4038/G54SOD (Spring 2019)

Workshop 05

Introduction to Focus Groups + Peer's Research

Peer-Olaf Siebers

pos@cs.nott.ac.uk

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

ima Intelligent Modelling & Analysis

Content

- Introduction to focus groups
  - Group activity reminder
  - Focus groups
    - Example: Dental flossing focus group

- Peer's research
  - Co-Creating Artificial Labs for Studying Human-Centric Systems

Group Activity Reminder

Group Activity: Smart Campus

In **Lab 4** your job (as a group) is to identify potential projects. You should look at Google and Google Scholar (http://scholar.google.co.uk/) in order to find out how people have used simulation and optimisation before in the given context. Try to find examples for all the simulation modelling paradigms (also consider hybrids) and the different optimisation approaches and label them accordingly. You should also add your own ideas for novel simulation and optimisation projects that you think would help the UoN Strategy Board in its ongoing quest.

In **Lab 5** your job (as a group) is to organise a **Focus Group** with the relevant stakeholders. Who are they? Once you identified the relevant stakeholders do some role play. Different group members should take on the roles of the different stake holders and then you should conduct some focus group discussions. The output of the focus group discussions should be some clear objectives for the study you want to undertake and what kind of solutions you are having in mind.

In **Lab 6** each group has to attend the UoN Strategy Board Dragons' Den Battle and present their proposals within a 15 minute presentation slot (including 12 minutes presentation time and 3 minutes for questions and constructive feedback from the other groups).

Focus Groups

A Focus Group IS …

- What?
  - A carefully planned discussion
  - To obtain perceptions of a defined interest area
- Where?
  - In a permissive, non-threatening environment
- How?
  - Conducted by a trained interviewer (moderator, facilitator)

A Focus Group IS NOT …

- What?
  - A debate
  - Group therapy
  - A conflict resolution session
  - A problem solving session
  - An opportunity to collaborate
  - A promotional opportunity
  - An educational session

Focus Group Members

- Who?
  - Small group with common characteristics relating to discussion topic
    - Usually 6-10 participants
  - Who are the stakeholders?

Purpose of a Focus Group

- Why?
  - To collect qualitative data
  - To determine feelings, perceptions and manner of thinking of participants regarding products, services, programs or opportunities
    - Attitudes and perceptions are developed in part by interaction with other people
  - To promote self-disclosure among participants
  - It's dangerous to take "people" for granted
    - There is a need to better understand their motivations and behaviour

Limitations

- What are the risks and limitations?
  - Risk of biases introduced by the moderator(s)
  - Domineering and/or passive participants
  - Usually does not provide depth of information compared to other methods, such as key informant interviews

Moderator's Role

- The moderator ...
  - Stays relaxed and sets tone
  - Introduces and guides the discussion
  - Actively and carefully listens
  - Does NOT participate, or share views, or engage in the discussion
  - Does NOT editorialise comments
  - Promotes everyone’s participation
  - Is non-judgmental and respectful

Types of Questions

- Engagement questions
  - Introduce participants to and make them comfortable with the topic of discussion
- Exploration questions
  - Get to the meat of the discussion
- Exit question
  - Check to see if anything was missed in the discussion

An Example: Dental Flossing Focus Group

- Initial consideration:
  - Consider putting flossers and non-flossers in separate groups
- Engagement questions:
  - What is your favourite toothpaste?
  - What do you notice when you look at other people's teeth?
- Exploration questions:
  - Who in particular has influenced your dental habits?
  - What are the pros and cons of flossing your teeth?
  - How do you feel when told about possible damage caused by not flossing?
  - How do you feel about yourself when flossing regularly? When you don't?

An Example: Dental Flossing Focus Group

- Exit question:
  - Is there anything else you would like to say about why you do or do not floss your teeth on a regular basis?

Co-Creating Artificial Labs for Studying Human-Centric Systems

Peer-Olaf Siebers

Nottingham University (Computer Science)

What is this all about?

- 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.

- Agent-Based Social Simulation (ABSS)
  - Example from the Gaming World
    - SIMS4: Promotion Video (https://www.youtube.com/watch?v=dcDy1CCd-F8)
    - SIMS4: Hands-On Gameplay (https://www.youtube.com/watch?v=pXLEAHpzFks)

Engineering ABSS

- Agent-Based Modelling:
  - A complex system is represented by a **collection of agents** that are programmed to **follow some behaviour rules**
  - The **system properties emerge** from its constituent agent interactions

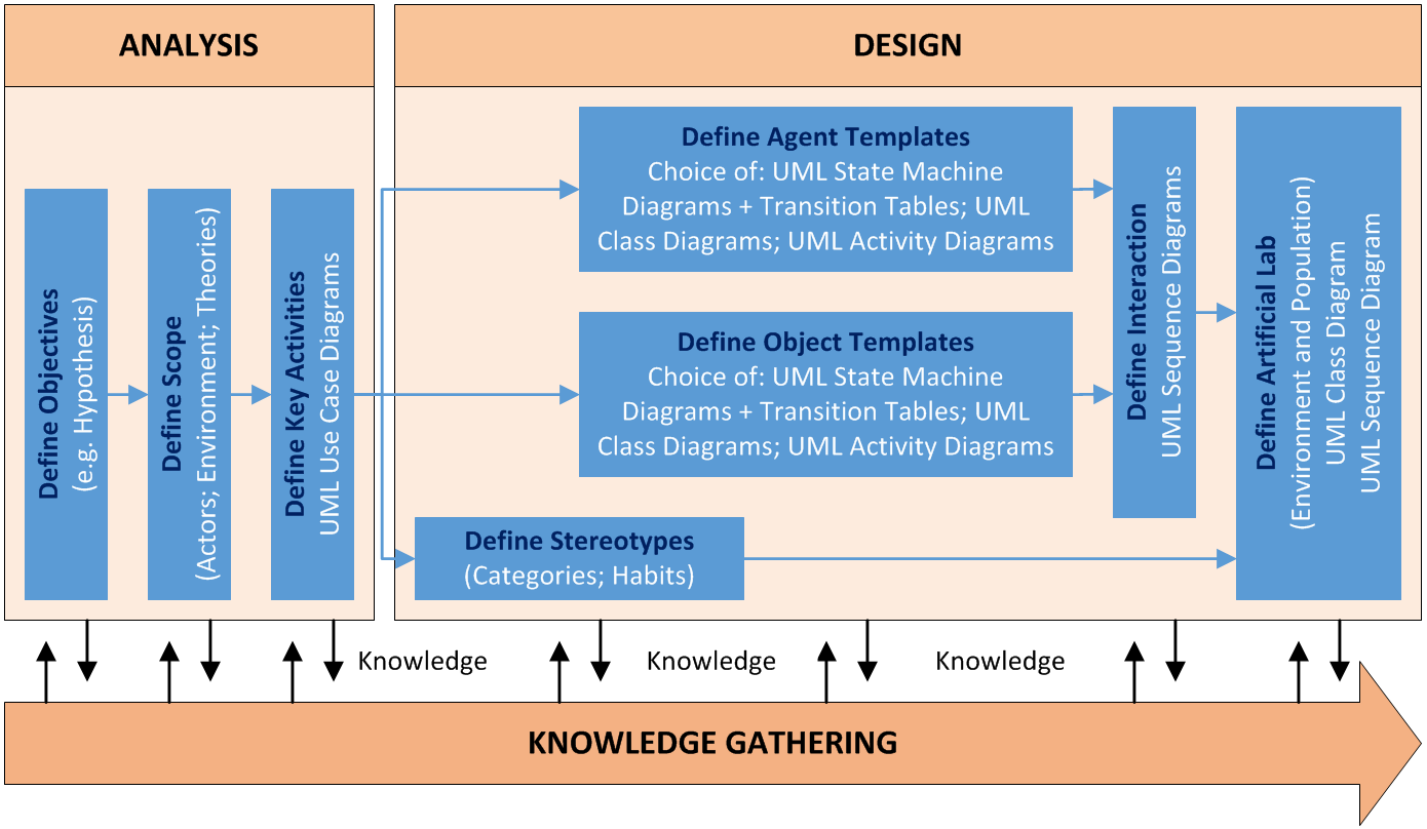
- How do we develop such Agent-Based Models (ABMs)?
  - It would be good to have **a structured approach** ...
    - ... to support multi disciplinary collaboration
    - ... to work with all kinds of stakeholders (academics / non academics)
    - ... for exploratory and explanatory studies
    - ... for communication; conceptual modelling; reverse engineering

Engineering ABSS

- What do we mean by "agents"?
  - 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

Engineering ABSS

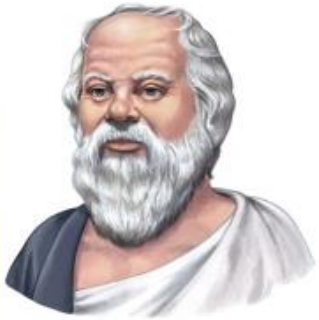
- A structured approach ...



Siebers and Klügl (2017)

Engineering ABSS

- ... using focus groups
  - 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 (small printed remarks in the following are meant to guide the moderator)
    - Important to go forward and backwards



(Potential) Applications

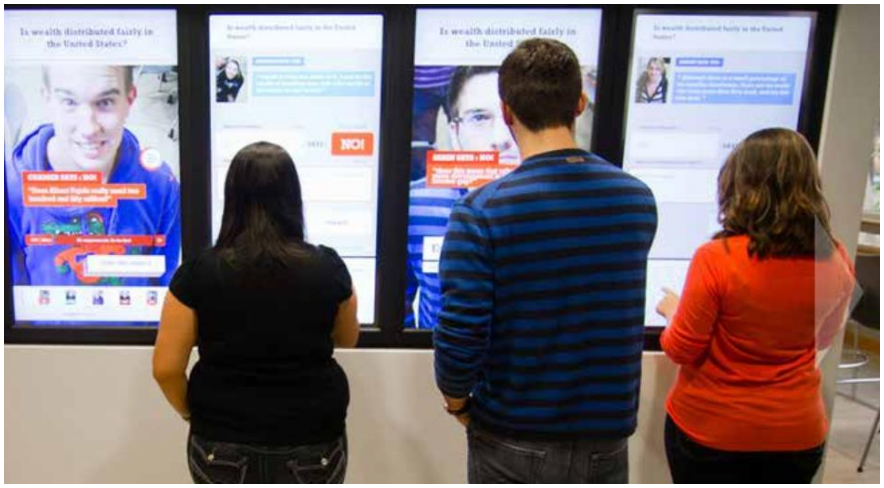
- Business
  - Business Process Modelling for Regenerative Medicine
  - Organisational Plasticity
  - PV Panel Uptake
- Healthcare
  - Epidemiology: Antiviral Treatment Uptake
  - Ethics of Digital Technology for Mental Health
    - Future Healthcare Scenarios
  - Communication Between Healthcare Stakeholders
- Built Environment
  - Energy Use in Buildings
  - Adaptive Architecture
- Peace Keeping Activities in South Sudan

Case Study

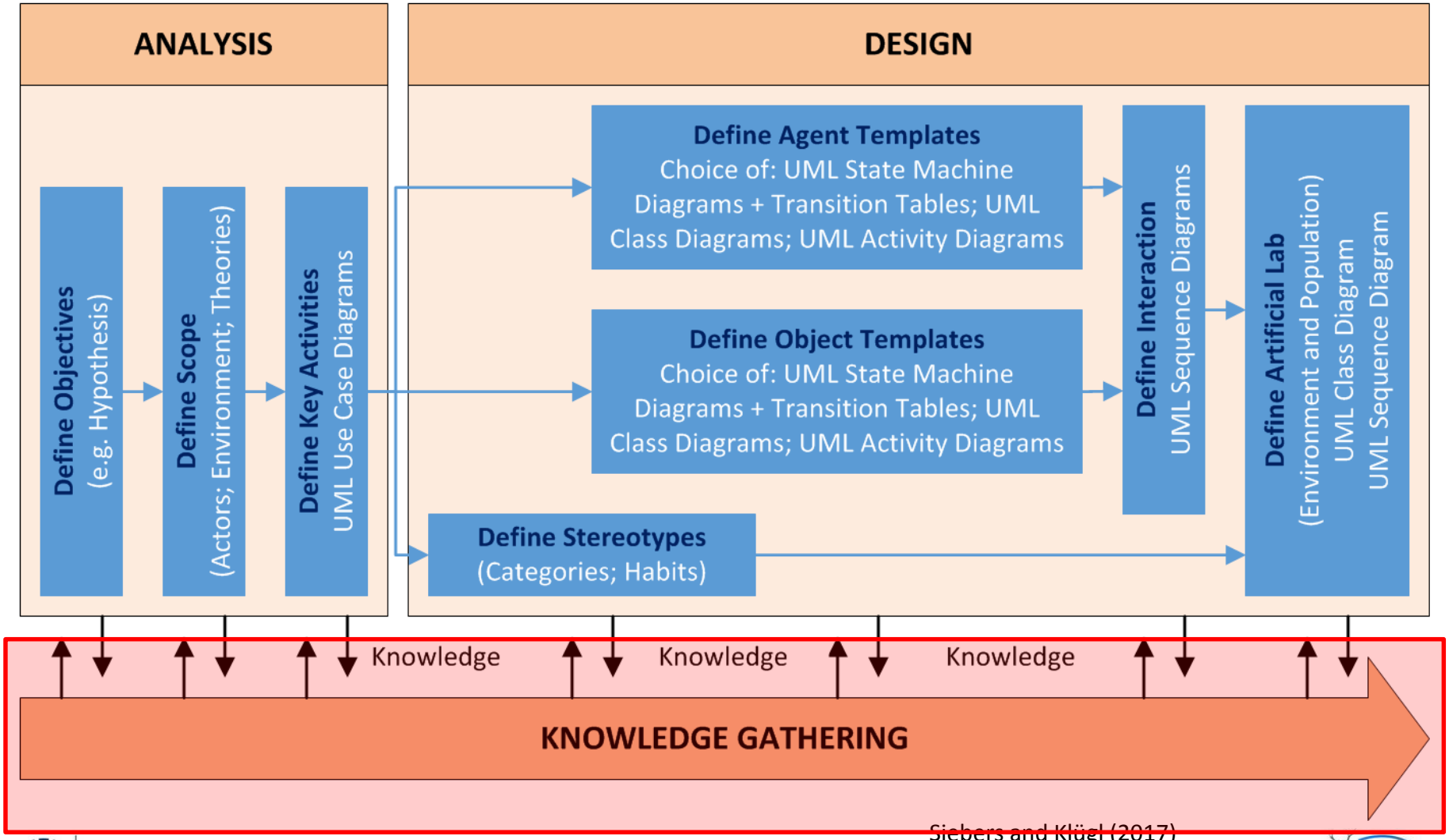
Exploring Adaptive Architecture Design

Case Study: 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.



Engineering ABSS



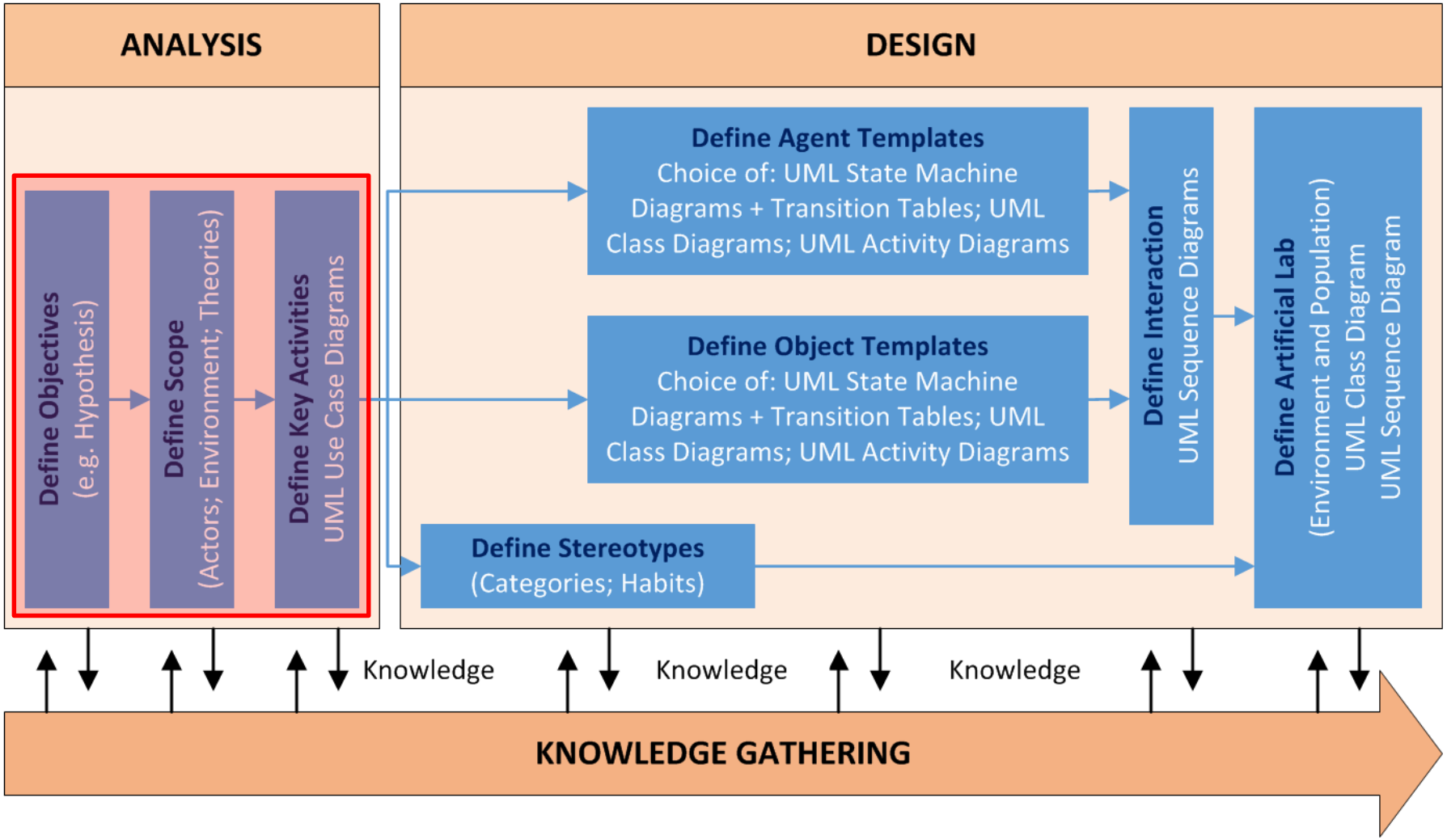
Siebers and Klügl (2017)

Knowledge Gathering

- Knowledge gathering happens throughout the structured modelling approach through
  - Literature review
  - Focus group discussions
  - Observations
  - Surveys

- Either a prerequisite for tasks (e.g. a literature review) or is embedded within the tasks (e.g. focus group discussions)

Engineering ABSS



Siebers and Klügl (2017)

Defining the Objectives

- Define objectives in relation to the aim of the study
  - Literature review or focus group discussions or given by client
  - Alternative: Defining hypotheses

- How can we test these objectives?
  - Consider relevant experimental factors and responses
    - Experimental factors are simulation inputs that need to be set initially to test different scenarios related to the objectives
    - Responses are simulation outputs that provide insight and show to what level the objectives have been achieved
  - Objectives and hypotheses are very helpful for defining an initial set of experimental factors and responses

Case Study: 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 (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

Case Study: 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

Defining the Scope

- We are interested in specifying the model scope
  - Often requires some initial knowledge gathering
    - Literature review and observation of the existing system
  - With the help of the knowledge gathered one can then define the scope of the model by defining a scope table
    - Focus group discussions
  - In order to make decisions about including/excluding elements one needs to answer the following questions:
    - What is the appropriate level of abstraction for the objective(s) stated before?
    - Do the elements have a relevant impact on overall dynamics of the system?
    - Do the elements show similar behaviour to other elements

Case Study: Analysis

- Scope (what elements do we need to fulfil the aim) (look for nouns in previous text to find elements)

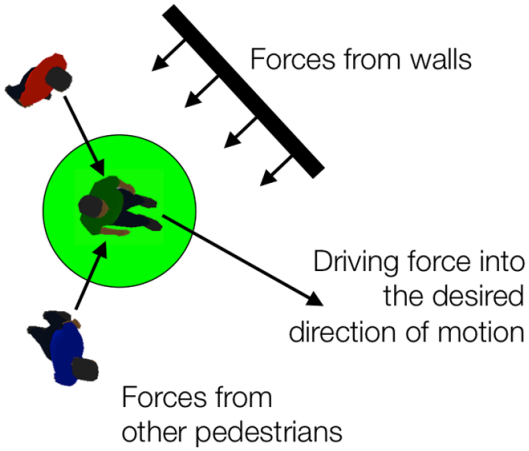
Category		Element	Decision	Justification
Actor	Human	Visitor	Include	Main research subject
		Group	Include	Important for capturing group behaviour
		Staff	Exclude	Have no impact on the dynamics
	Intelligent Object	Window	Include	Intelligent display unit that can make proactive decisions
		Display system	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

Defining Key Activities

- Interaction can take place between actors and between actors and the physical environment they are in
- Capturing these at a high level can be done with the help of UML use case diagrams
  - When using use case diagrams in an ABSS context the actors are inside the system; they represent the humans that interact with each other and the environment; the system boundaries are the boundaries of the relevant locations
- Derived through focus group discussions

Case Study: Analysis

- The "social force model" (Helbing and Molnar 1995) assumes that the acceleration, deceleration and directional changes of pedestrians can be approximated by a sum of different forces, each capturing a different desire or interaction effect.



$$m_i \frac{d\boldsymbol{v}_i}{dt} = m_i \frac{v_i^0(t)\boldsymbol{e}_i^0(t) - \boldsymbol{v}_i(t)}{\tau_i} + \sum_{j(\neq i)} \boldsymbol{f}_{ij} + \sum_W \boldsymbol{f}_{iW}$$

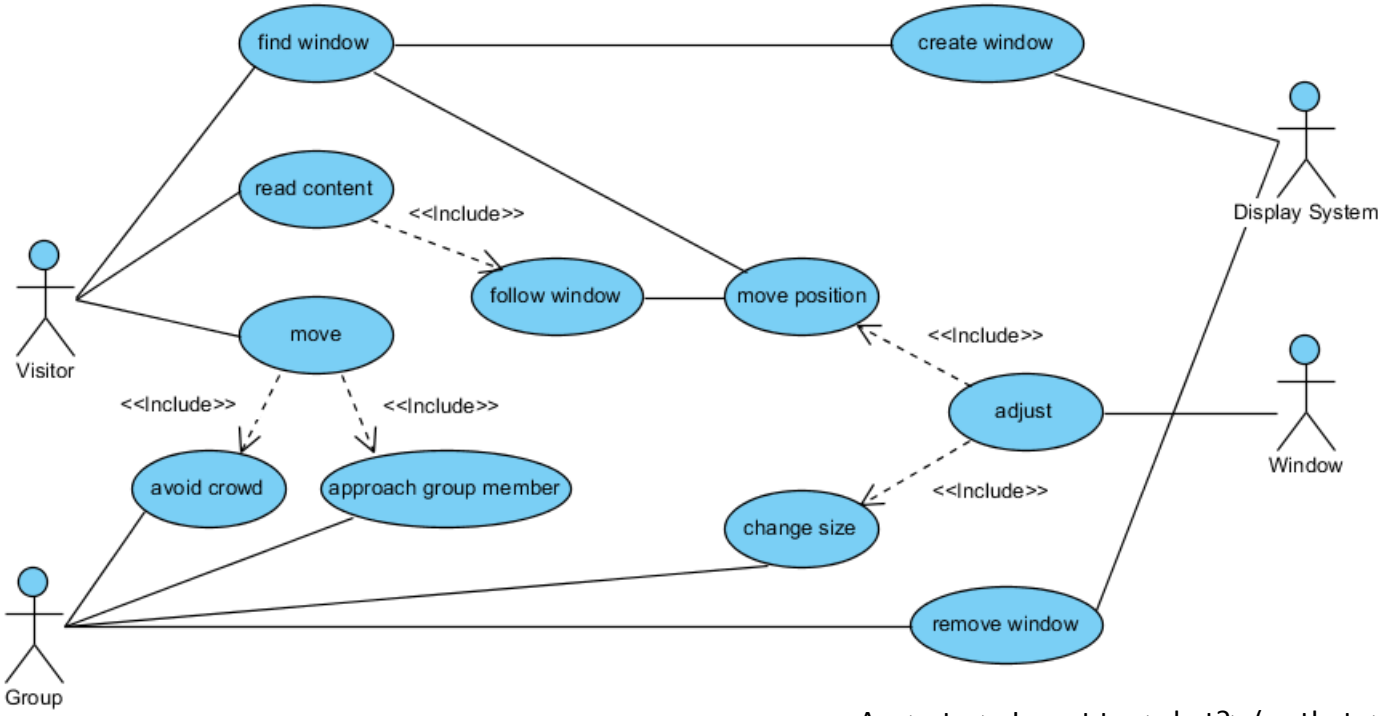
$$\boldsymbol{f}_{ij} = \boldsymbol{f}_{ij}^{psy} + \boldsymbol{f}_{ij}^{phy}, \quad \boldsymbol{f}_{ij}^{psy} = A_i \exp\left(\frac{r_{ij} - d_{ij}}{B_i}\right)\boldsymbol{n}_{ij}$$

$$\boldsymbol{f}_{ij}^{phy} = kg(r_{ij} - d_{ij})\boldsymbol{n}_{ij} + \kappa g(r_{ij} - d_{ij})\Delta v_{ji}^t \boldsymbol{t}_{ij}$$

- The "extended social force model" (Xie et al 2010) adds vision

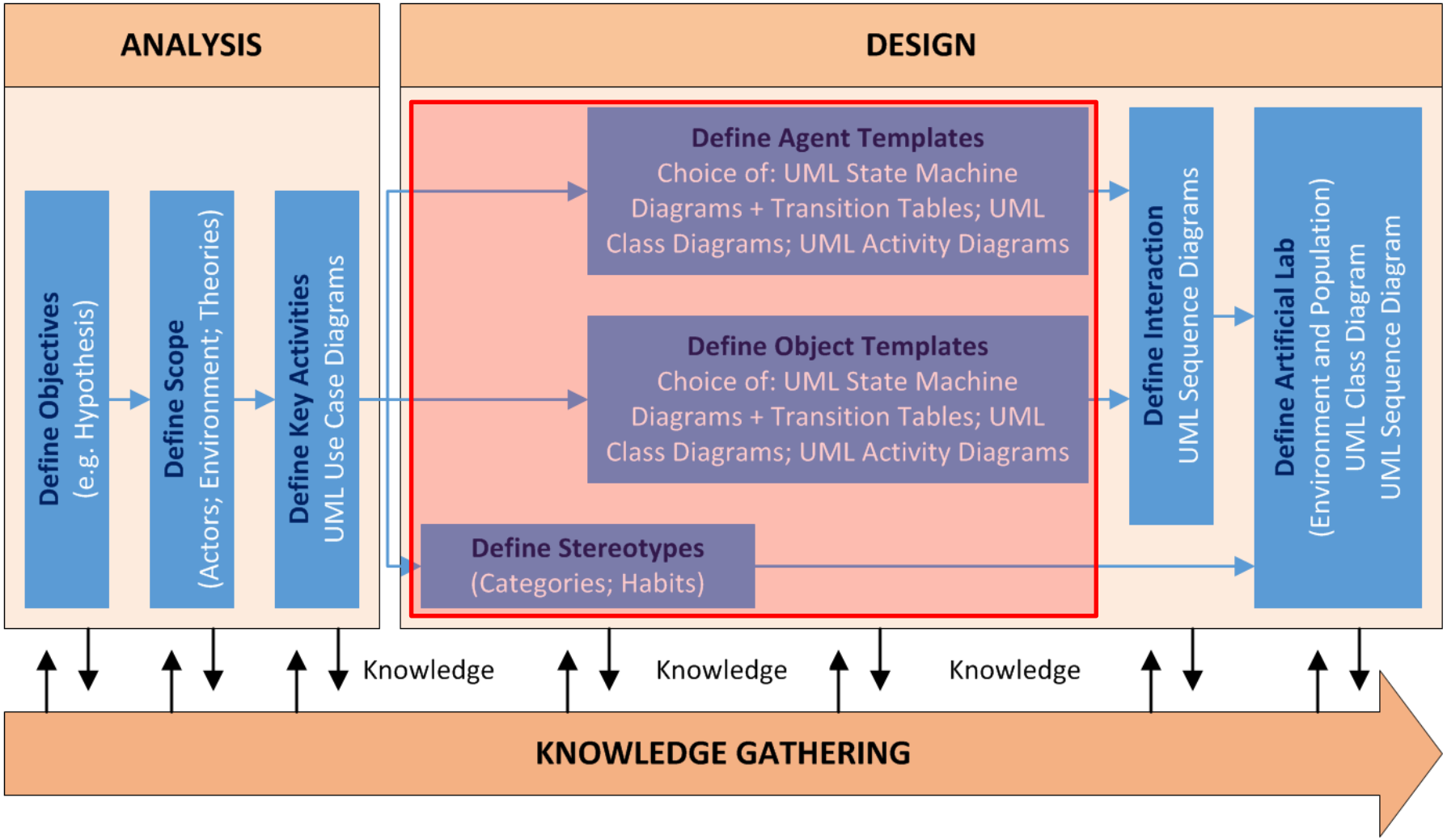
Case Study: Analysis

- 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?>)

Engineering ABSS



Siebers and Klügl (2017)

Defining Stereotypes

- In order to be able to represent a specific population in our simulation models we define stereotypes that allow us to classify the members of this population
  - Habit templates (derived from focus group discussions)
  - Utility function (derived from the literature)
  - Demographics
  - Advanced data analytics.

- Data for classifying the population can be collected through surveys

Case Study: Design

- Stereotypes
  - Allowing to define behaviour of actors

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

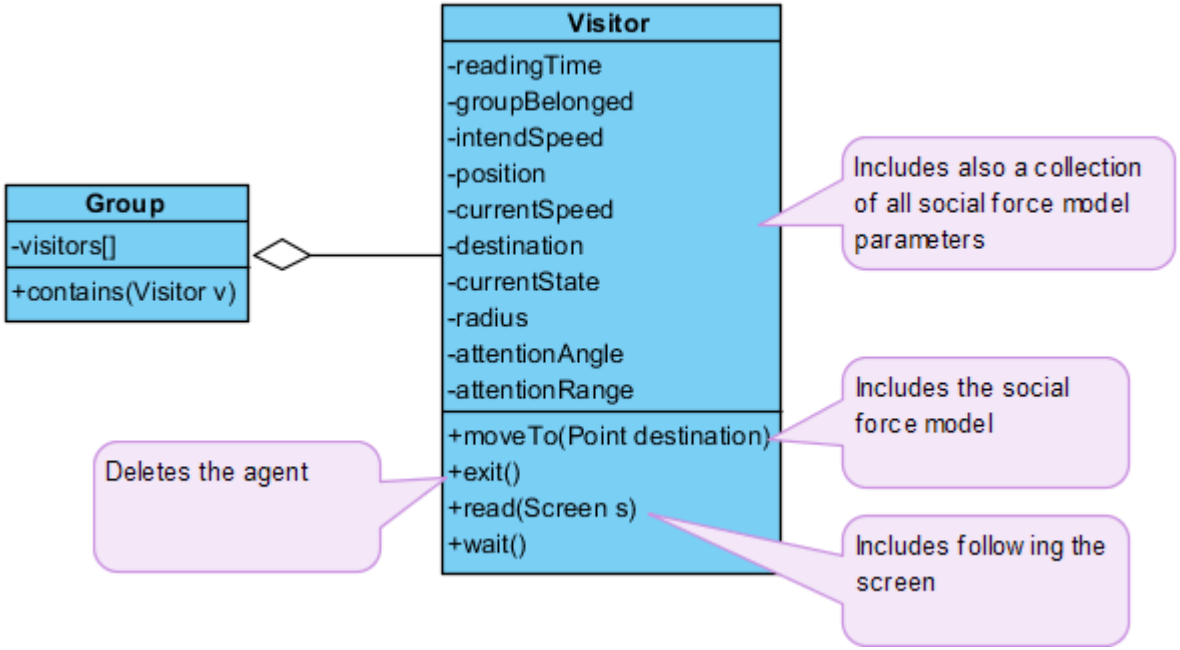
Defining Agent and Object Templates

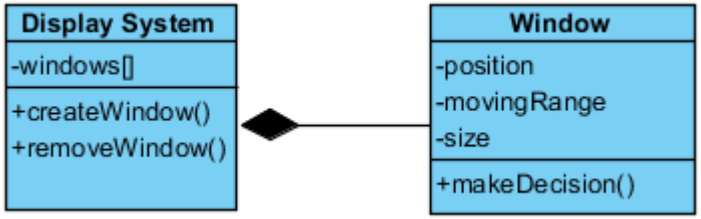
- Actor types identified in scope table
  - We have to develop an agent template
- Physical environment identified in the scope table
  - We have to develop object templates where appropriate
  - For other things we need to consider other modelling methods
- Relevant UML diagram types:
  - UML class diagram (to define structure)
  - UML state machine diagram (to define behaviour)
  - UML activity diagram (to define logic)

- Derived through focus group discussions

Case Study: Design

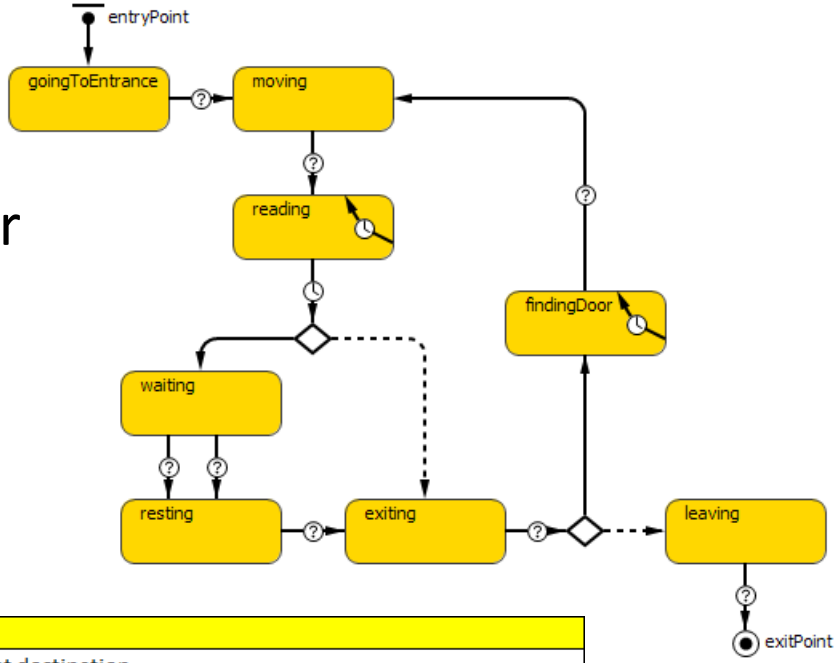
- Agent and object templates (attributes can be derived from stereotype criteria, theory parameters, methods can be derived from the states in the related state charts)





Case Study: Design

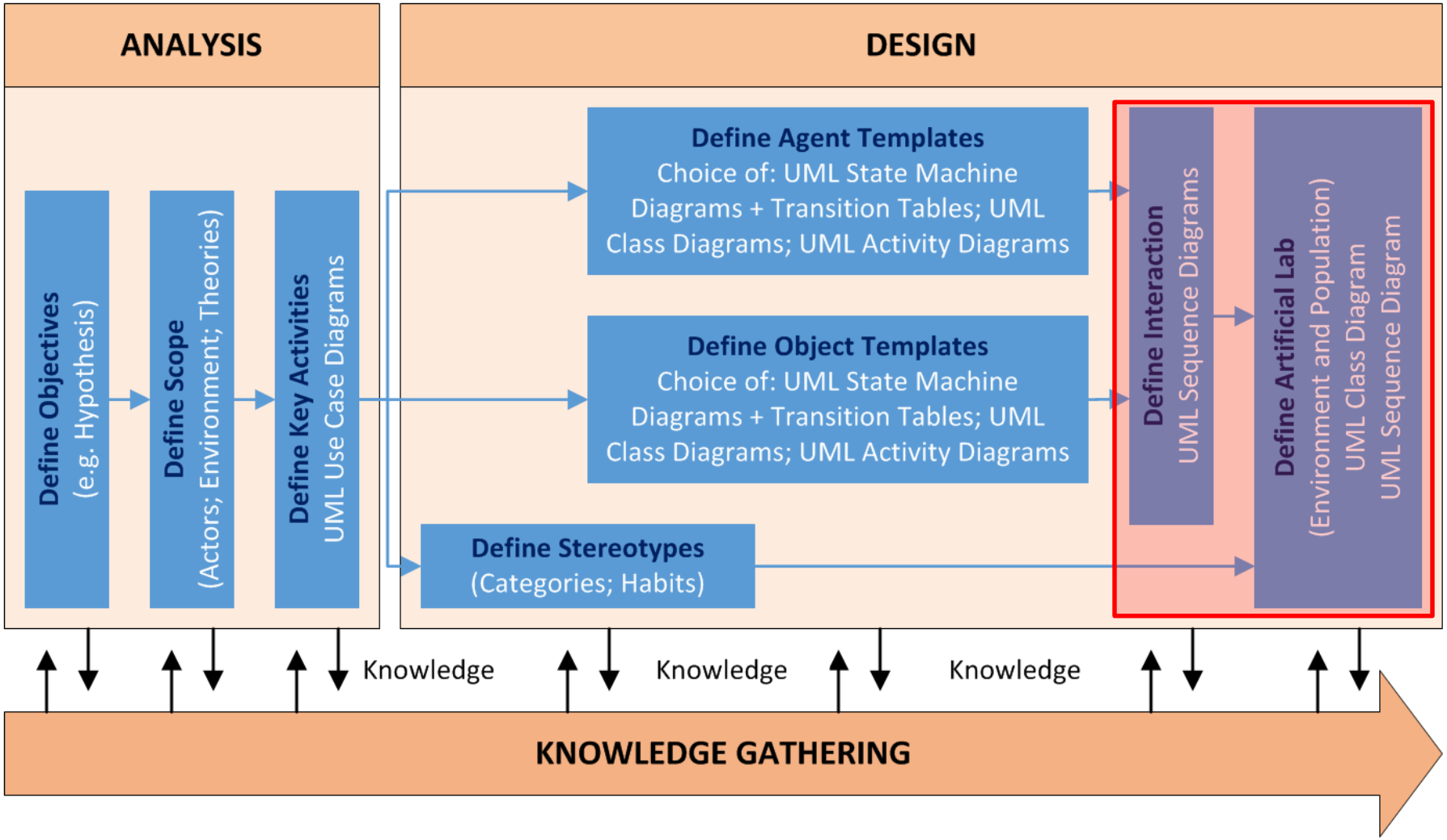
- State machine diagram of visitor agent (states can often be derived from use cases)



- 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

Engineering ABSS



Siebers and Klügl (2017)

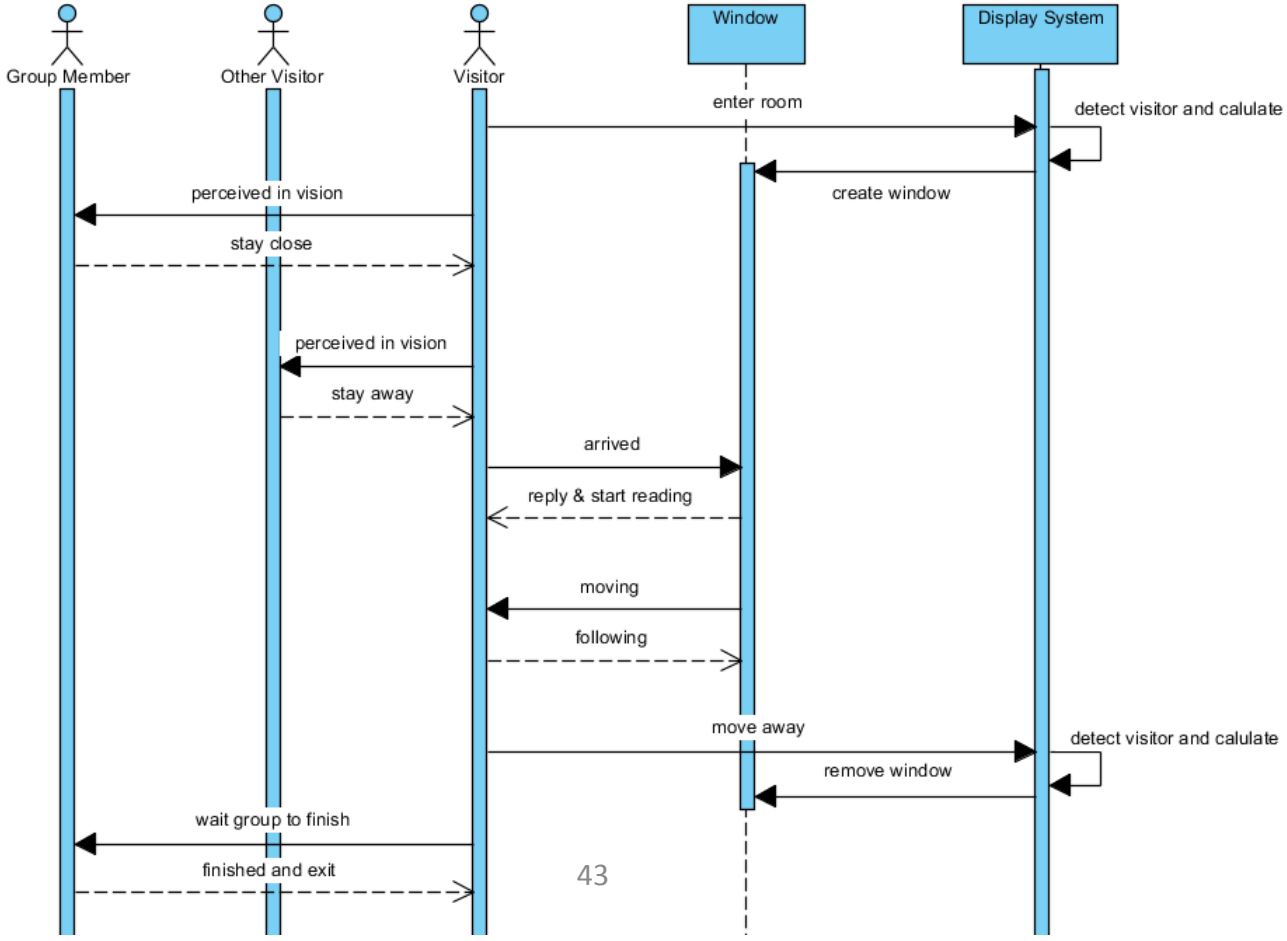
Defining Interactions

- Capturing interactions in more detail can be done by using UML sequence diagrams; this can be used to further specify use cases that involve direct interactions (usually in form of message passing) between entities (agents and objects)

- Derived through focus group discussions

Case Study: Design

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



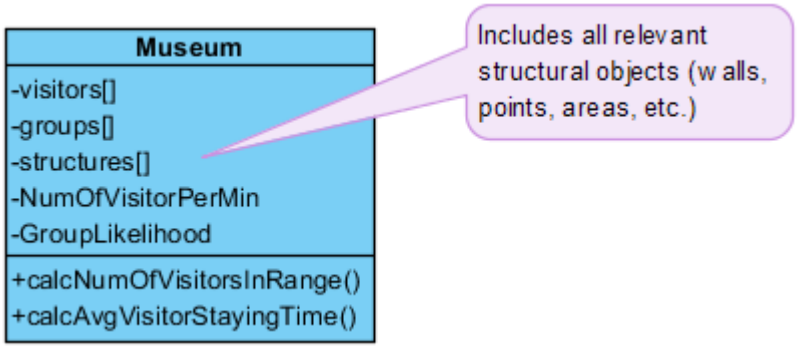
Defining the Artificial Lab

- Finally we need to define an environment in which we can embed all our entities and define some global functionality
  - We need to consider things like:
    - Global variables (e.g. to collect statistics)
    - Compound variables (e.g. to store a collection of agents and objects)
    - Global functions (e.g. to read/write to a file)
  - We also need to make sure that we have all variables in place to set the experimental factors and to collect the responses we require for testing our hypotheses

- Derived through focus group discussions and by looking at the list of objectives and the scope table

Case Study: Design

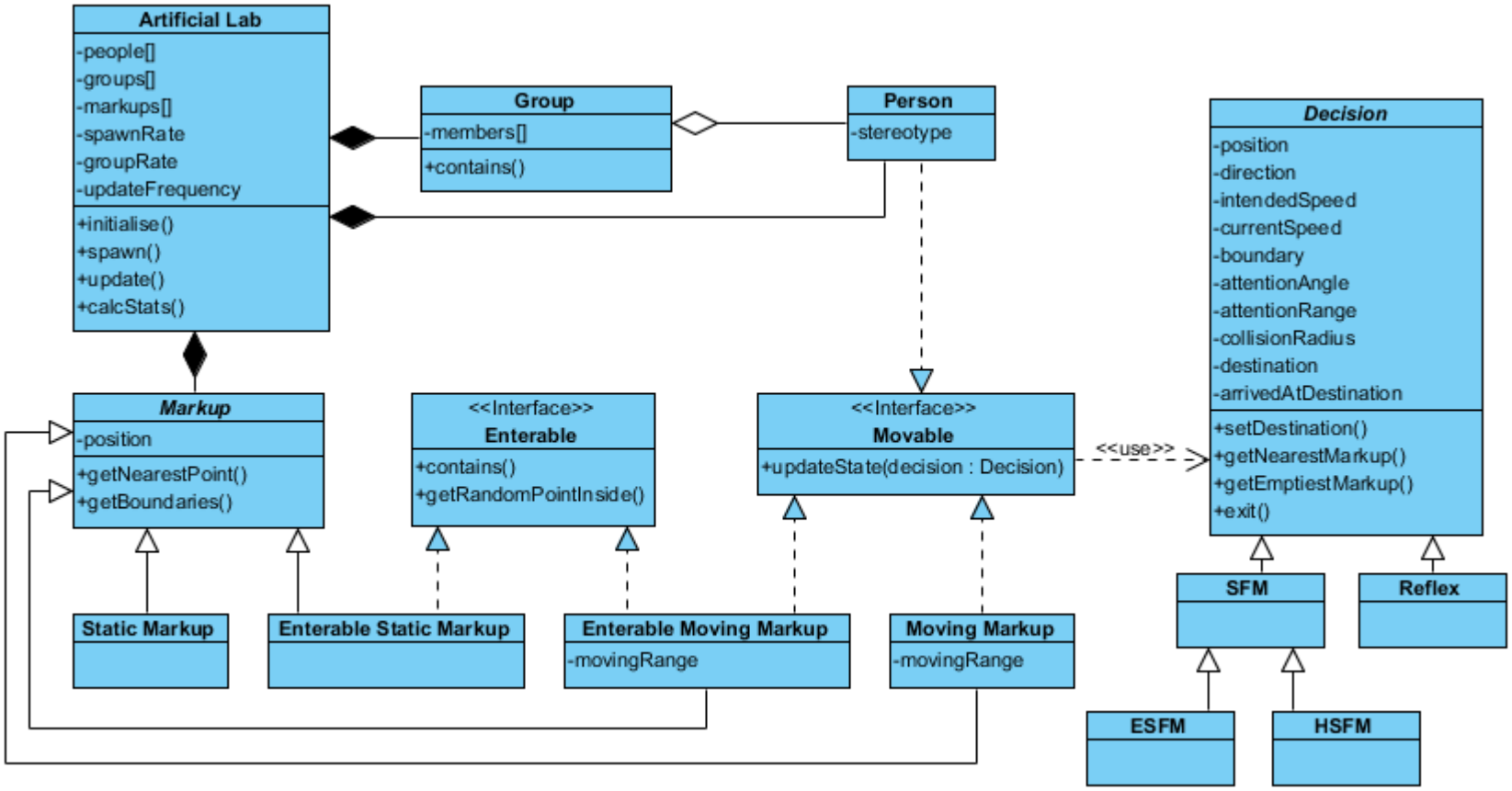
- Artificial Lab (attributes provide storage for all agents/objects and initialisation parameters required for experimental factors; methods related to responses)



Defining the Artificial Lab

- Sometimes it can be helpful to create a sequence diagram to visually show the order of execution describing the actions taken on various elements at each step of the simulation from a high level approach
- The way and order in which all entities are initialised, as well as the way and order how they are updated and how their interactions are handled, is often not trivial and a major source of artefacts

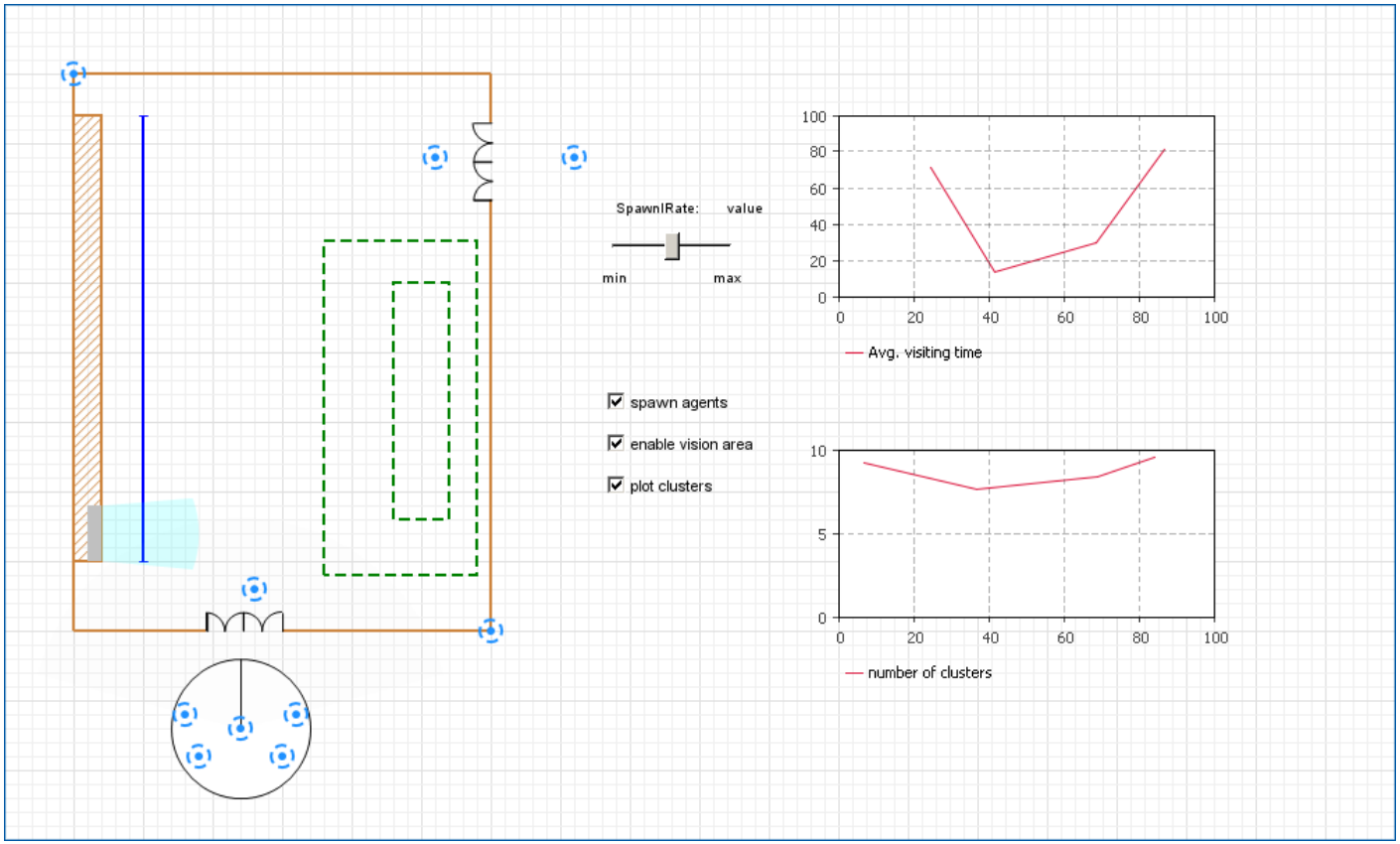
Case Study: Implementation Design Pattern



Siebers et al (2018)

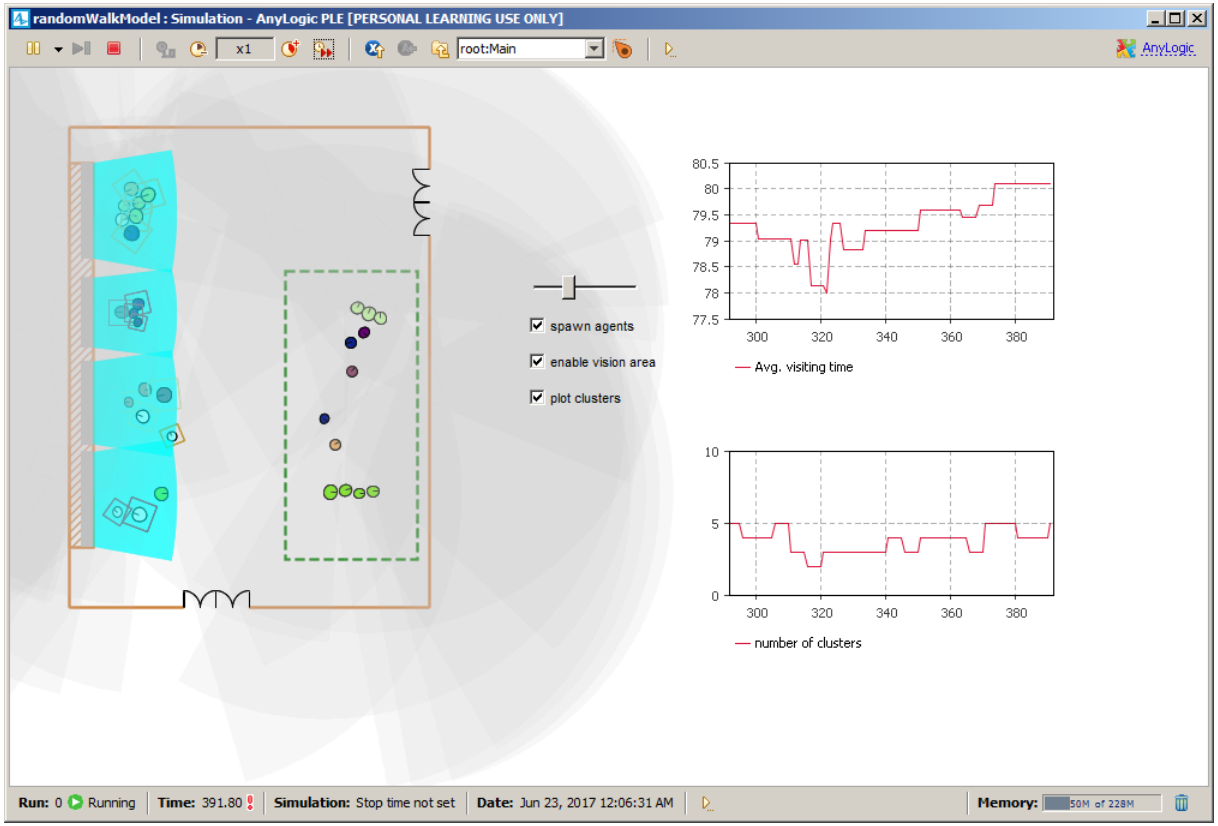
Case Study: Outcome

- The resulting model implemented in AnyLogic



Case Study: Outcome

- The resulting model in action



Conclusions

Conclusions

- What can we use this for?
  - Discussing the next generation of underpinning science and emerging technologies in a structured way through workshops
  - Creating "Would-Be-Worlds" for testing scenarios; we would be able to consider philosophical views about the evolution of our world over the next decades years (e.g. in terms of social aspects)

- What issues can we overcome?
  - Policy guidance is often created to solve short term problems as we look at current problems as a basis for our decision making
  - Transforming research agenda by taking a long term systems level view

Office Worker Challenge (Lecture 05)

Solution

AnyLogic Personal Learning Edition [PERSONAL LEARNING USE ONLY]

File Edit View Draw Model Tools Help

Projects | Palette

- OfficeWorkerChallenge_v01
  - Main
  - OfficeWorker_C
  - OfficeWorker_D
  - Simulation: Main
  - Run Configuration: Main
  - Database

Main

officeWorker_C [..] | officeWorker_D [..] | atOffice | atHome | elseWhere | atOffice_C | atHome_C | elseWhere_C | atOffice_D | atHome_D | elseWhere_D

100% 50% 0%

0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 30

atOffice atHome elseWhere

100% 50% 0%

40 60 80 100 120 140 160 180 200 220 240 260 280 300 320

atOffice_C atHome_C elseWhere_C

100% 50% 0%

20 40 60 80 100 120 140 160 180 200 220 240 260 280 300

atOffice_D atHome_D elseWhere_D

TODO: Add some stats on avereage time spend in states > should be different for C and D

TODO: Add some phone calls (messages) that get people out of doze state early, if they are in that state

TODO: Change from hours to minutes

TODO: Fix agent initialisation error (write to AnyLogic support)

Properties

Main - Agent Type

Name: Main Ignore

Agent actions

On startup:

On destroy:

On arrival to target location:

On before step:

On step:

Agent in flowcharts

Use in flowcharts as: Agent

On enter flowchart block:

On exit flowchart block:

On seize resource:

On release resource:

Movement

Initial speed: 10 meters per second

Rotate animation towards movement

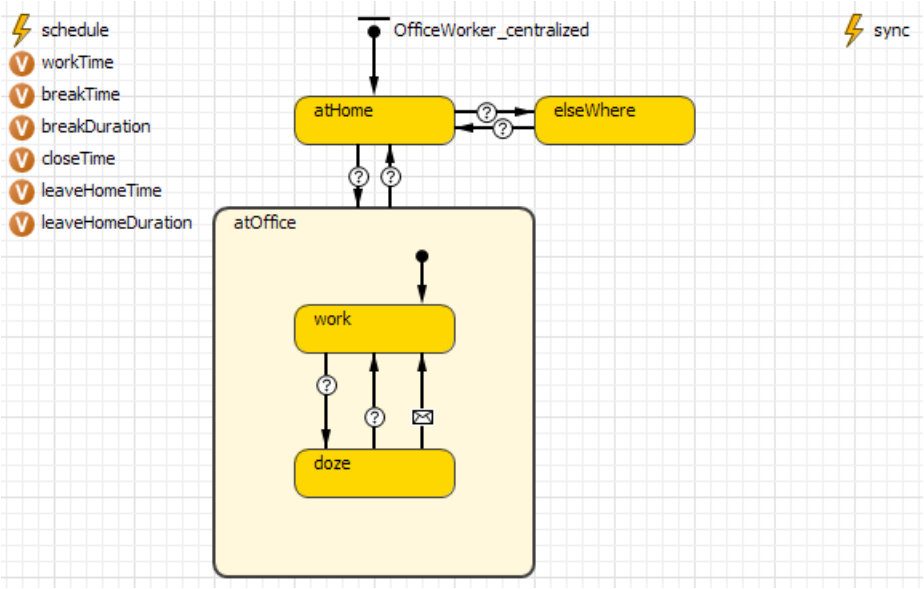
Rotate vertically as well (along Z-axis)

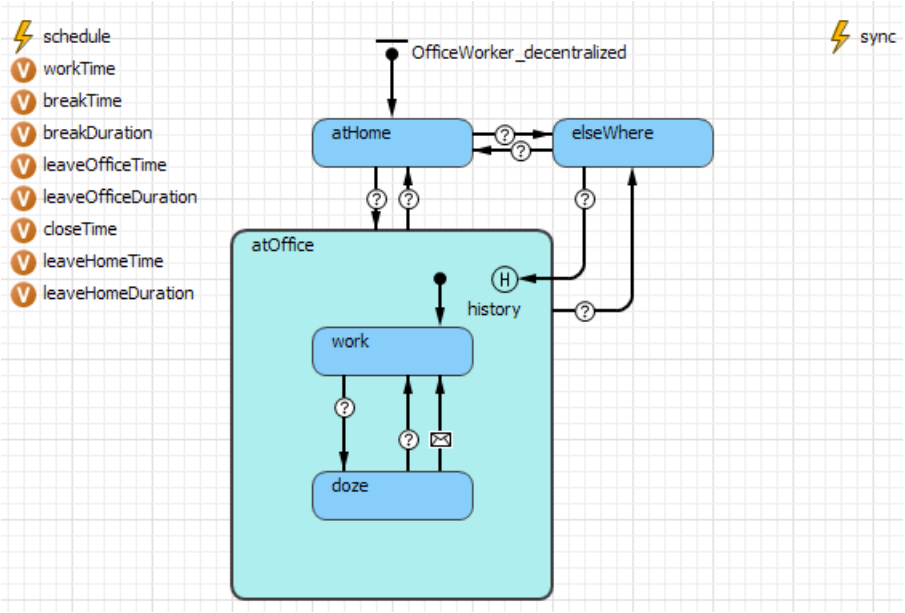
Space and network

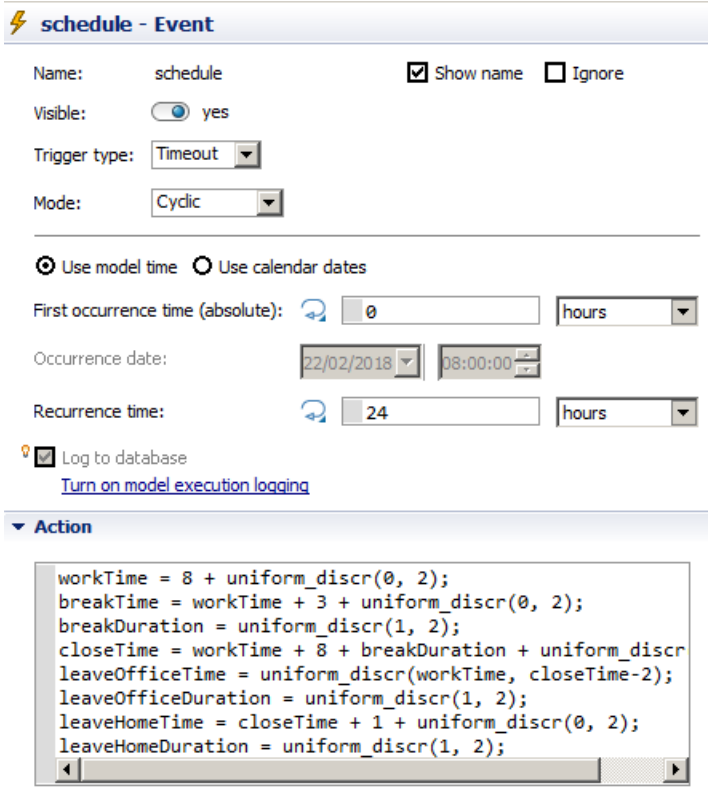
Select the agents you want to place in the environment:

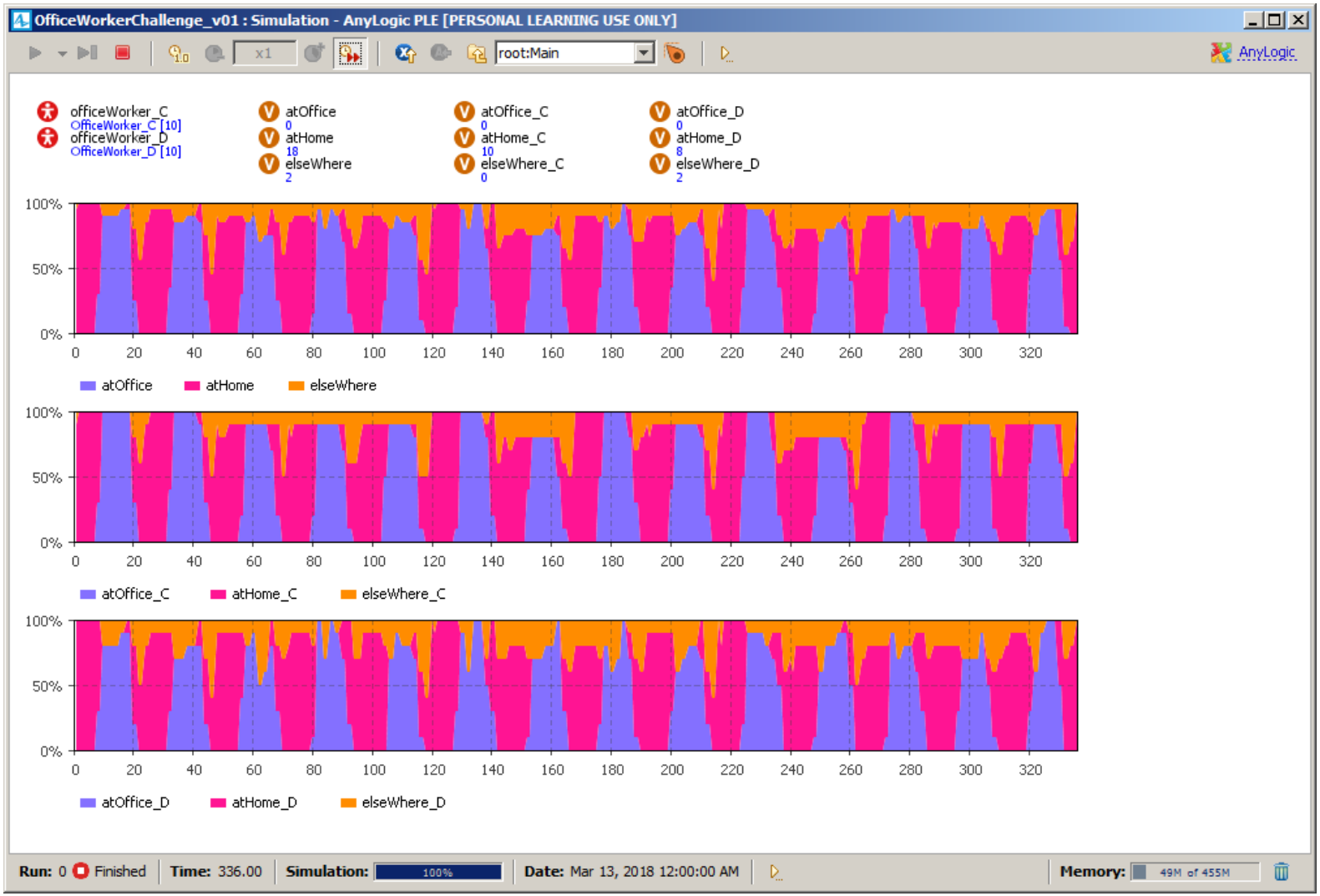
officeWorker_C

OfficeWorkerChallenge_v01 | Time: hours | 1meter = 10px, X=278, Y=699


schedule
workTime
breakTime
breakDuration
closeTime
leaveHomeTime
leaveHomeDuration
OfficeWorker_centralized
sync
atHome
elseWhere
atOffice
work
doze


schedule
workTime
breakTime
breakDuration
leaveOfficeTime
leaveOfficeDuration
closeTime
leaveHomeTime
leaveHomeDuration
OfficeWorker_decentralized
sync
atHome
elseWhere
atOffice
H
history
work
doze


schedule - Event
Name: schedule
Show name
Ignore
Visible: yes
Trigger type: Timeout
Mode: Cyclic
Use model time
Use calendar dates
First occurrence time (absolute): 0 hours
Occurrence date: 22/02/2018 08:00:00
Recurrence time: 24 hours
Log to database
Turn on model execution logging
Action
workTime = 8 + uniform_discr(0, 2);
breakTime = workTime + 3 + uniform_discr(0, 2);
breakDuration = uniform_discr(1, 2);
closeTime = workTime + 8 + breakDuration + uniform_discr
leaveOfficeTime = uniform_discr(workTime, closeTime-2);
leaveOfficeDuration = uniform_discr(1, 2);
leaveHomeTime = closeTime + 1 + uniform_discr(0, 2);
leaveHomeDuration = uniform_discr(1, 2);


OfficeWorkerChallenge_v01 : Simulation - AnyLogic PLE [PERSONAL LEARNING USE ONLY]
x1
root:Main
AnyLogic
officeWorker_C
OfficeWorker_C [10]
officeWorker_D
OfficeWorker_D [10]
atOffice
0
atHome
18
elseWhere
2
atOffice_C
0
atHome_C
10
elseWhere_C
0
atOffice_D
0
atHome_D
8
elseWhere_D
2
100%
50%
0%
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320
atOffice atHome elseWhere
atOffice_C atHome_C elseWhere_C
atOffice_D atHome_D elseWhere_D
Run: 0 Finished
Time: 336.00
Simulation: 100%
Date: Mar 13, 2018 12:00:00 AM
Memory: 49M of 455M

Questions / Comments

References

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- Snape (2015). Incorporating human behaviour in an agent based model of technology adoption in the transition to a smart grid. PhD Thesis, DeMontfort University, UK.

Acknowledgement

- Most "Introduction to Focus Groups" slides based on:
  - https://irep.olemiss.edu/wp-content/uploads/sites/98/2016/05/Trinity_Duke_How_to_Conduct_a_Focus_Group.pdf