Spatial Simulation

Winter Semester 2023 / 24

Getting started with GAMA

What to expect from this course?

1) ABModelling

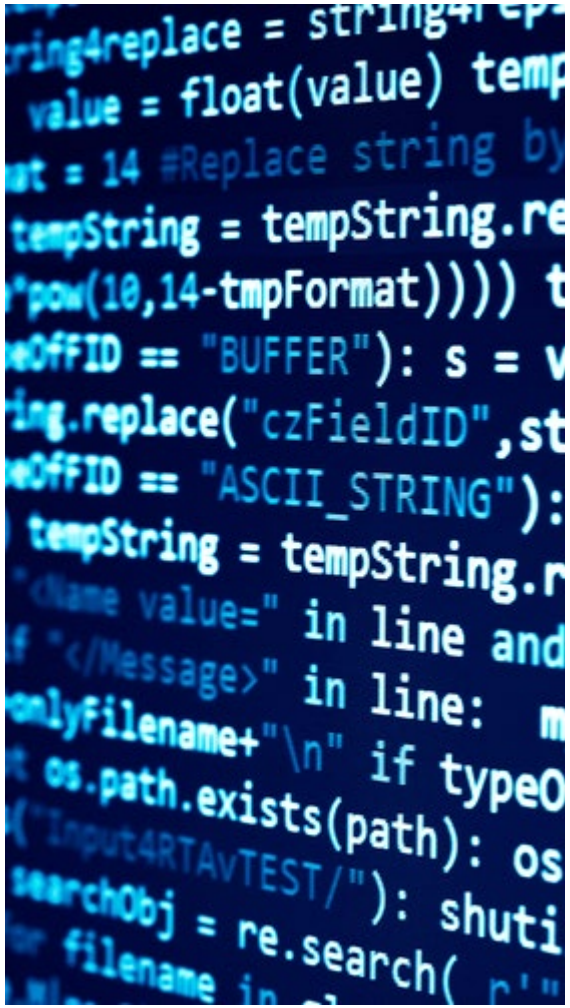
- Model,
- analyse,
- understand,
- predict

Complex, spatial systems

2) OO programming

- Learn and
- practice

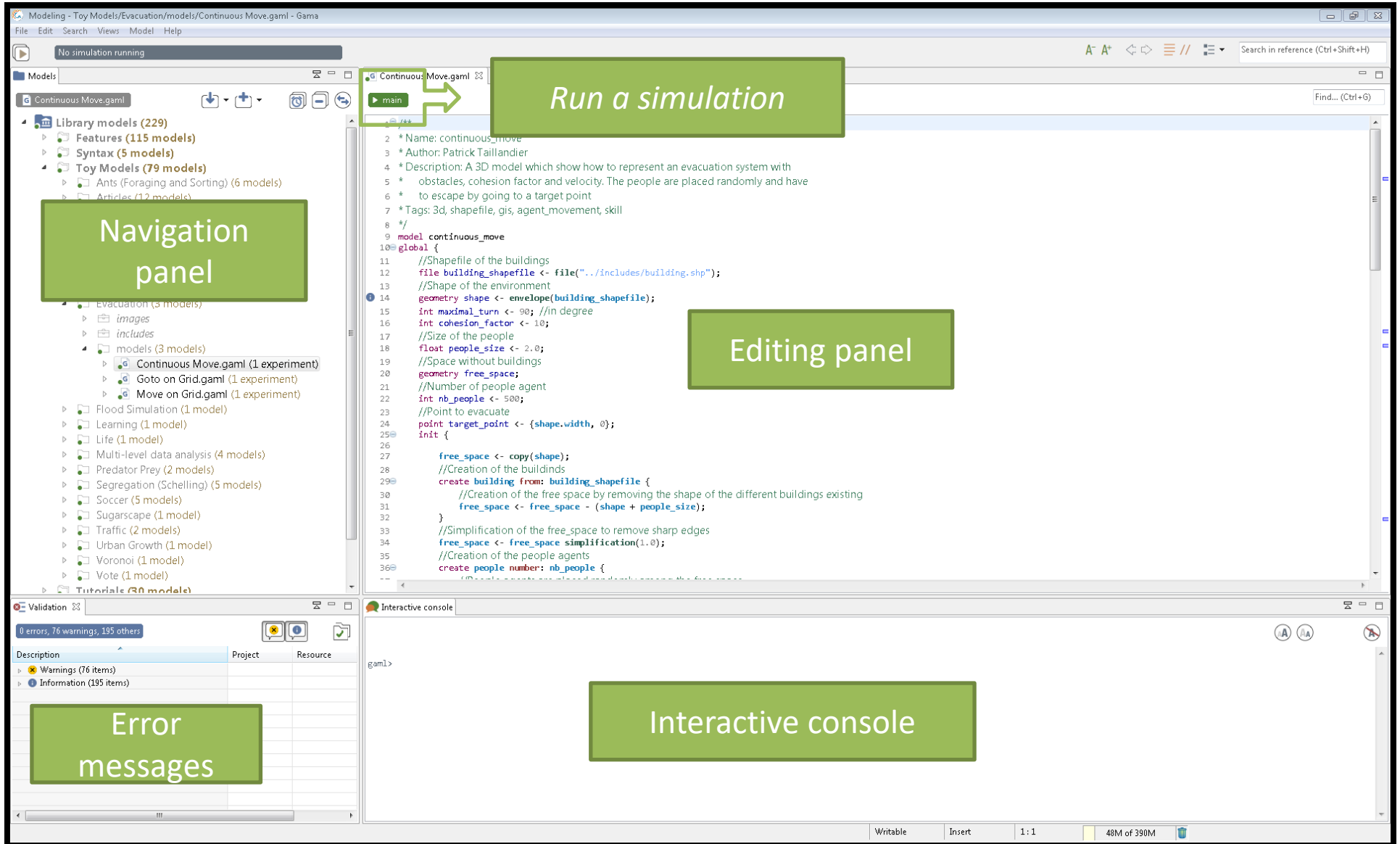
coding of an object-oriented programming language.



Grading and Assignments

See „course set up“ in MS Teams!

Interface: the modelling perspective



Interface: the simulation perspective

Model Library

Put the GAMA folder into your program files.

Open GAMA, define a workspace, and

Open and run the ‘soccer model’:

Library models > Toy Models > Soccer > soccer.gaml

Library models > Toy Models > Segregation > models/Segregation(GIS).gaml

Library models > Toy Models > Epidemiology > models/SIR (ABM vs EBM.gaml

Explore the simulation:

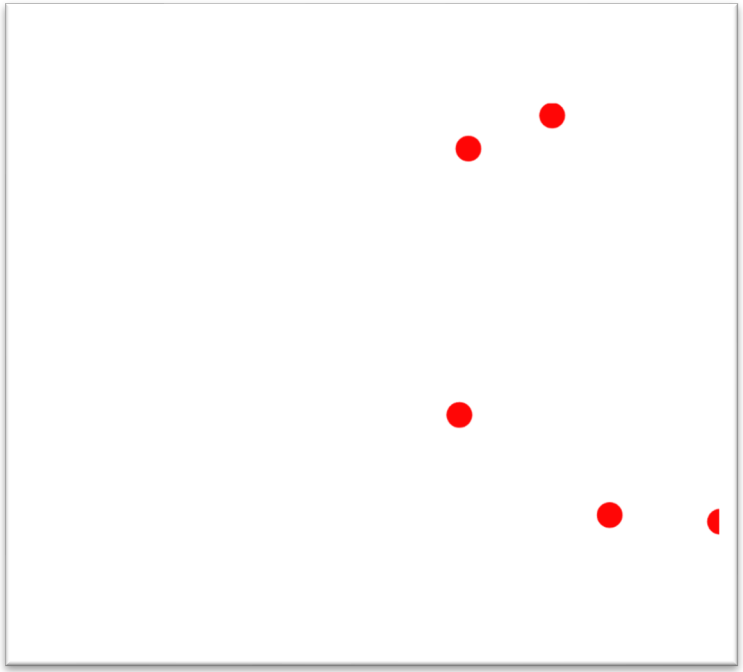
- Adjust the speed slider,
- Inspect an agent,
- Turn on and off layers

GAMA in 30 minutes: my first model

- Open GAMA
- Select Workspace
- Add project

.. and start!

Hello World! example



```
model mymodel
```

```
global{
 int my_variable <- 1;

 init{
  create my_agents number:5 {
   speed <- 5.0 ;
  }
 }
}
```

Global section

```
species my_agents skills:[moving]{
 reflex move{
  do wander;
 }
 aspect default{
  draw circle(2) color: #red ;
 }
}
```

Agents section

```
experiment main_experiment type:gui{
 parameter "my Variable" var: my_variable;
 output {
  display map  {
   species my_agents aspect:default;
  }
 }
}
```

Simulation part

myFirstModel

Implement the “Hello World” model with slight modifications:

- Agents are blue triangles
- Speed has the value of a global variable “my_speed”, which is of type float and has the value 3.0.
- The my_speed variable is a parameter that can be changed by the user (change parameter in the simulation perspective & refresh model).

GAMA in 30 minutes

```
model myFirstModel
global {
// my global parameters
float myParameter <- 1.0;
// initialise the model
init setupModel {
    create lion number: 5 {
}
species myAgent1 skills: [moving]  {
   float age;
   reflex growOlder {
     age <- age + 0.1;
     do move;
   }
   aspect default {
      draw circle(age) color: #orange;
   }
}
grid myCA width:10 height:10 neighbors:8  {
  color <- rgb([50,0,0]);
}
experiment runSimulation type: gui {
output {
   display map {
      grid savannah;
      species lion aspect: default;
      }
   }
}
```

Global variables

Global functions

Global section

Agent variables

Agent functions

Agent visualisation

Species section

Cellular automaton

Grid section

Simulation specifications

Experiment section

GAMA - Help!
..a resource collection

The GAMA website

http://gama-platform.org/

basic skeleton of a GAMA model

https://gama-platform.github.io/wiki/ModelOrganization

Documentation overview of commands

https://gama-platform.org/wiki/Exhaustive-list-of-GAMA-Keywords

GitHub Wiki

https://github.com/gama-platform/gama/wiki

Tutorials

https://www.youtube.com/watch?v=YGHw1LSzd-E ("GAMA in 10 minutes" - Youtube)

Errors in your model? Code Verification helps

https://github.com/gama-platform/gama/wiki/ValidationOfModels