Worksheet 03

This exercise's main objective is to extend the evacuation model with a basic feature, namely facilitator agents (task 3), and to analyse different modes of scheduling and spatial resolution (task 4). In order to get there, a suitable python development environment is needed (task 1) and basic knowledge of mesa is required (task 2).

1 Setting up the development environment (<2h)

1. Setup git
    - Follow the instructions depending on your OS: https://github.com/git-guides/install-git
2. Setup a python development environment
    1. Install python if you haven't (>= 3.9)
        - Mac & linux
            - https://docs.python-guide.org/starting/installation/
        - Windows
            1. https://www.python.org/downloads
            2. check „Add python 3.10 to PATH"
            3. Install
    2. In case you want to keep the lecture software apart from your existing system, use a virtual environment. We support poetry: https://python-poetry.org/docs/master/#installing-with-the-official-installer (Windows: no need to add poetry to PATH)
3. Retrieve required lecture software
    1. Open terminal
    2. Clone git repository

        ```
        git clone
        https://github.com/UniK-INES/edu_introabm_exercise.git
        ```

    3. Install required python packages

1. with poetry

   ```
   cd path-to-git-repository/edu_introabm_exercise/abmodel
   peoetry install
   poetry shell
   spyder
   ```

   After installing all required python packages, the virtual environment may grow up to ca. 1 GB. In case you want to change the virtual environtment's location, execute:

   ```
   poetry config virtualenvs.path <path>
   ```

2. w/o poetry

   ```
   cd path-to-git-repository/edu_introabm_exercise/abmodel
   pip install -r requirements.txt
   ```

4. Get familiar with **Spyder** in case you haven't used a python IDE yet

   1. Open Spyder

      ```
      cd path-to-git-repository/edu_introabm_exercise/abmodel
      spyder
      ```

   2. Go through introducery tour (worth it)

   3. Make yourself familiar with the spyder cheatsheet

   4. Edit template to correctly show your name on new python modules:
      Preferences > Editor > Advanced settings > Edit template for new modules

5. Get familiar with **jupyter**

   1. Start jupyter

      ```
      cd path-to-git-repository/edu_introabm_exercise/abmodel
      jupyter-lab
      ```

   2. Make yourself familiar with the **jupyter** cheatsheet

→ Open jupyter and execute task 1 in the jupyter notebook `path-to-git-repository/edu_introabm_exercise/exercises/lecture03/lecture03_tasks.ipynb`, store the output to `IntroABM_E03-T2_<Lastname<>Firstname>_<YYYY-MM-DD>.txt` and upload the file to moodle.

2 Introduction to Mesa (<1.5h)

As introduced in the lecture, Mesa is a python package that implements a framework for agent-based modelling. Based on the lecture slides, this task shall help to familiarise you with Mesa.

1. Follow the tutorial at https://mesa.readthedocs.io/en/latest/tutorials/intro_tutorial.html

   When you either used poetry and are in the poetry shell (`poetry shell`) or installed the requirements as above, you don't need to follow instructions in section „Installation" of the tutorial.

   Use `jupyter-lab` to add a file for the model code and add model execution commands in a documented jupyter notebook.

→ Zip the model folder, name it `IntroABM_E03-T2_<Lastname<>Firstname>_<YYYY-MM-DD>.zip` and upload the file to moodle.

3 Extending the Evacuation Model: Introducing Facilitators (<2h)

1. Add the new Facilitator class to *abmodel/agent.py*

   1. *class Facilitator(Human):*

   2. Add a new model parameter `facilitators_percentage` as slider to `model_params` in `server.py` with `value=10`, `step=1` and obvious values for `min_value` and `max_value`.

   3. Add a new facilitator icon to `abmodel/fire_evacuation/resources` (e.g. other colour) and extend `fire_evacuation_portrayal(agent)` in `server.py`. Add the parameter to FireEvacuation.__init__()

      If your lost at finding an image manipulation tool and/or fancy doing the subtask in python, consider Pillow (installation – install version Pillow==9.0.0 as 9.1.0 seems to have a bug; example). Of course, there are numerous python alternatives.

   4. Initialise Facilitators in model.py (around line 200) depending on `facilitators_percentage` with a vision twice as wide as for normal Humans.

2. Update the UML class diagram

1. Open gaphor

```
cd path-to-git-repository/edu_introabm_exercise/abmodel
[poetry shell]
gaphor ../exercises/03/task03/fire-evacuation_classes.gaphor
```

2. Add the new Facilitator class to the diagram including properties.

3. Style the new class to highlight it

4. Save the new gaphor file to `fire-evacuation-facilitors_classes.gaphor`

5. Export the diagram as SVG (Scalable Vector Graphics) to `IntroABM_E03-T3_<Lastname<>Firstname>_<YYYY-MM-DD>.svg` in the folder `../exercises/03/task03`

3. Vary the model parameter `facilitators_percentage` and describe your observations (< 500 words)

4. Discuss the pros and cons of introducing a new agent class for facilitaotrs and its alternative (< 500 words).

→ Zip the folder `../exercises/03/task03` to `IntroABM_E03-T3_<Lastname<>Firstname>_<YYYY-MM-DD>.zip` and upload it to moddle.

4 Analysing the Evacuation Model: Spatial Resolution (<2.5h)

The representation of space seems crucial for an evacuation model. This task investigates the impact of spatial resolution (the space a single patch in the discrete modelling of space represents), and room size.

Start jupyter and open

1. Explore space and resolution parameters

2. Open jupyter and follow the instruction under task 3 in the jupyter notebook `path-to-git-repository/edu_introabm_exercise/exercises/lecture03/lecture03_tasks.ipynb`, store the output to `IntroABM_E03-T4_<Lastname<>Firstname>_<YYYY-MM-DD>.txt` and upload the file to moodle.

1. Describe your observations in about 500 words (+/-200).