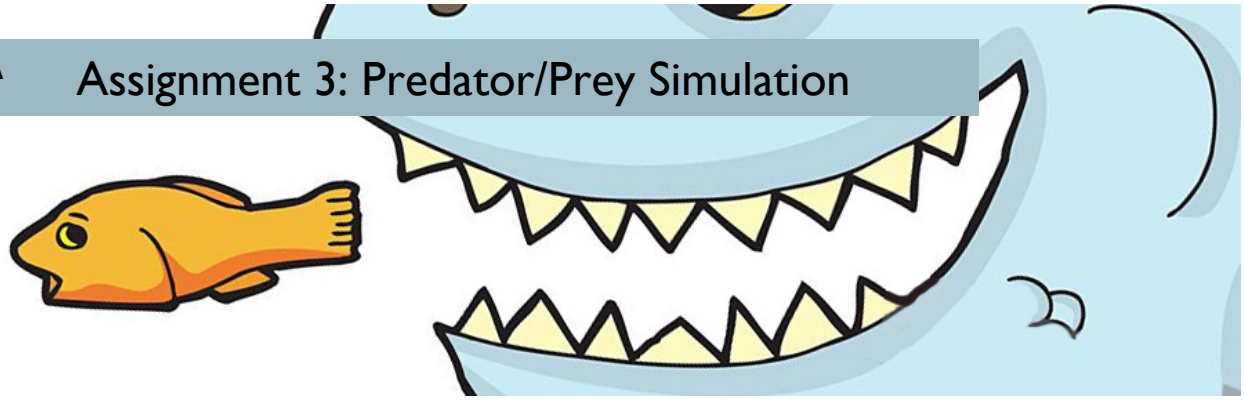
Assignment 3: Predator/Prey Simulation



The Simulation

Your task is to extend a predator/prey simulation. You should use the *foxes-and-rabbits-handout* project (available for download from KEATS) as a basis for your own project, and modify and extend it to make it more interesting. (Note that this is slightly different from the book project, so please use the version from KEATS, not from the book projects).

You MUST replace the Fox and Rabbit classes with different kinds of predator and prey to simulate a different habitat (for example, under water, in a jungle, or in a fantasy world). You may add additional classes to those included in the existing project.

This project is a pair programming task. **You must work in pairs**. Information about pair programming is provided separately. We will not accept submissions by individuals.

1 The core tasks

You should aim at completing all core tasks. They are:

- Your simulation should have at least five different kinds of acting species. At least two of these should be predators (they eat another species), and at least two of them should not be predators (they may eat plants). Plants can either be assumed to always be available (as in the original project), or they can be simulated (see below).
- At least two predators should compete for the same food source.
- Some or all of the species should distinguish male and female individuals. For these, the creatures can only propagate when a male and female individual meet. ("Meet" means they need to be within a specified distance to each other, for example in a neighbouring cell.) You will need to experiment with the parameters for breeding probability to create a stable population.
- You should keep track of the time of day. At least some creatures should exhibit different behaviour at some time of the day (for example: they may sleep at night and not move during that time).

You should implement the core tasks first before you move on to the challenge tasks.

2 Challenge tasks

Once you have finished the core tasks, implement one or more challenge tasks. You can either choose from the following suggestions or invent your own. You will be graded on a maximum of four extensions.

- Add plants. Plants grow at a given rate, but they do not move. Some creatures eat plants. They will die if they do not find their food plant.
- Add weather. Weather can change, and it influences the behaviour of some simulated aspects. For example, grass may not grow without rain, or predators cannot see well in fog.

- Add disease. Some animals are occasionally infected. Infection can spread to other animals when they meet.

If you invent your own extension tasks, check with your class supervisor before implementing them. You must get their comments to ensure they your idea is not too simple or too difficult.

To get full marks on this assignment you must demonstrate exceptional technical aptitude with the challenge tasks you implement.

3 Extra work – just for fun

You can extend the GUI (the graphical user interface) itself if you like, but no marks will be awarded for this work. If you do this – that's good, but it is purely for fun and for your own practice.

4 Submission and Assessment

You must submit a zip file via the link "Assignment 3: Submission Link" in Keats containing the following:

1. A Jar file of your BlueJ project. —You can create a Jar from within BlueJ by going to Project, and then "Create Jar File...". You do not need to change any of the default options, and so you should just click the "Continue" button. The Jar file must contain your source code, i.e., the *.java files, and it must run on BlueJ.
2. A report (PDF)
3. All of your Java files (*.java)

Your assignment will be penalised if you are missing any files. We strongly recommend that you review your submitted files after submission.

Nominate Who Will Submit the Assignment

- **Only one** group member has to submit the group's assessment –you must discuss and decide which group member will be responsible for submitting the assignment.
- **The person submitting the assignment:** this person will take responsibility for uploading the correct files, submitting everything before the deadline, and for adding the other group member to the submissions record during the submission.
- **Other group members:** if you are not submitting the assessment on behalf of the group, keep an eye out for a notification email that will let you know when your partner has submitted the assignment. The group member submitting must add you to the submission record. After they have done this, you will receive an email and you will be properly added to the submission.

For code:

Your code will be assessed for

- Correctness

- Appropriate use of language constructs
- Style (commenting, indentation, etc.)
- Design (code quality, appropriate use of inheritance)
- Difficulty (marks for extension tasks)

For report:

The report should be no more than four pages long, and should include:

- The names of both students who worked on the submission.
- A description of your simulation, including the types of species that you are simulating, their behaviour and interactions.
- A list and description of all extension tasks you have implemented.
- Known bugs or problems (Note: for a bug in your code that you document yourself, you may not lose many marks – maybe none, if it is in a challenge task. For bugs that we find that you did not document you will probably lose marks.)

Deadline

This assignment (code and report) is due on

Thursday, 26 February 2025, 4pm

All coursework must be submitted on time. Do not wait until the last hour to attempt your first submission as there can sometimes be technical issues. If you submit coursework late and have not applied for an extension or have not had a mitigating circumstances claim upheld, you will have an automatic penalty applied. If you submit late, but within 24 hours of the stated deadline, the work will be marked, and 10 raw marks will be deducted. If this deduction brings your mark for the assessment below the usual pass mark (40%), your assessment mark will be capped at the pass mark. All work submitted more than 24 hours late will receive a mark of zero.