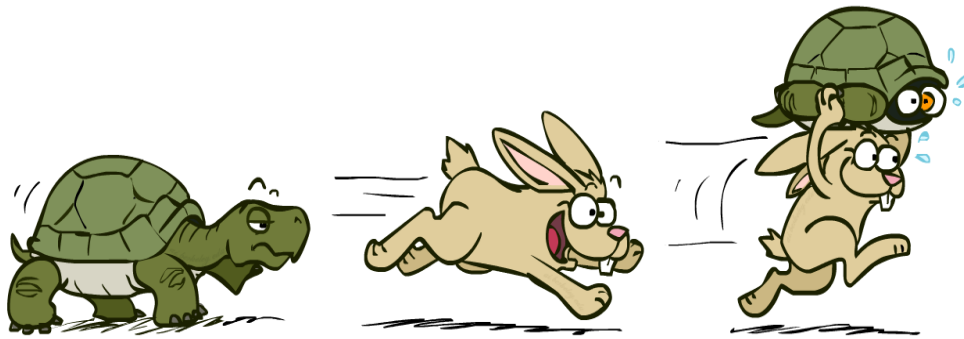# Project 01 (APCS)

Searching Solver with NetLogo

1. Description

Searching often appears in many real-world problems. The implementation of different algorithms makes it possible for the researcher to develop a realistic simulation system. In this project, we will experience emulation using the NetLogo tool.

According to the developer, NetLogo is a multi-agent programmable modeling environment. It helps us to visually represent the strategy execution of the agents as well as view important communications. You can watch a basic introduction to programming on NetLogo through the following YouTube video.
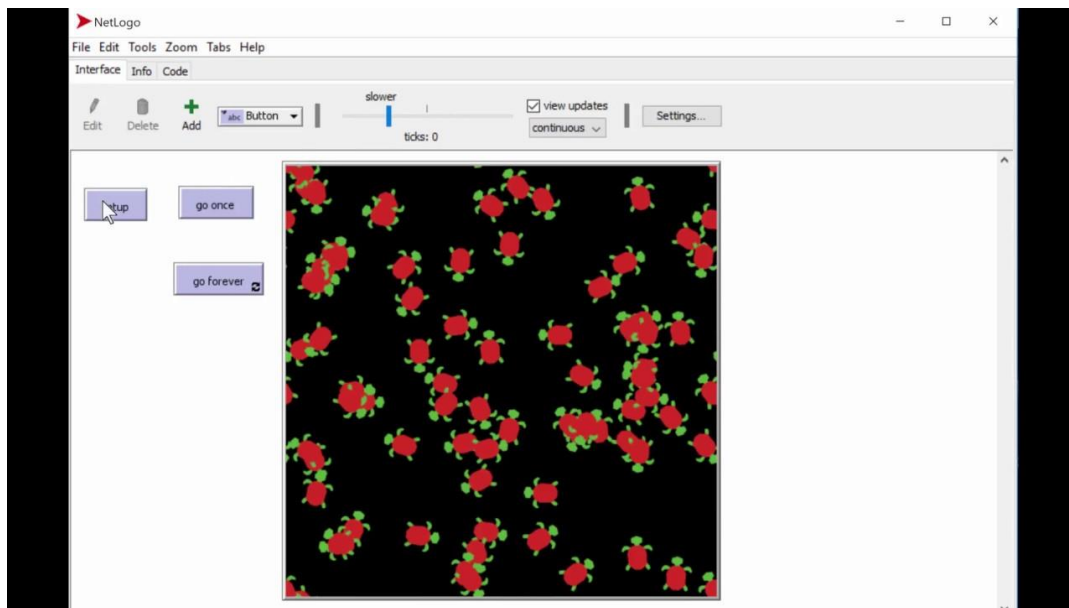
https://www.youtube.com/watch?v=3CIokwPBDFE&ab_channel=MartinHilbert

2. Requirements

2.1. Requirement 1

Investigate and document NetLogo's features to create an application that simulates the execution of the search algorithms.

The work needs at least the following items:

- Show agents with shapes like turtles, rabbits, humans, etc.
- Show buttons to manipulate the simulator environment
- Showing running parameters of agents through plots
- Create utilities to change the parameters of the search model, such as heuristic strategies, number of agents, etc.
- Color agents and the environment

Submit a written report and (several) screen-recorded videos to show you have programmed in the NetLogo for the search problem. Videos are pretty heavy, and thus please upload them to Google Drive (share mode enabled) or YouTube.

2.2. Requirement 2

Implement the uninformed and informed search algorithms on the NetLogo and then give comments and comparisons.

For your ease of implementation, the above requirement is divided into levels as follows.

- **Level 1 (easiest): one algorithm, one agent, one start, one goal.**
    - Design several world maps, each of which has one start point and one endpoint. The first map does not include walls and obstacles, while the other maps must have these items. Moreover, the complexity of landscapes must gradually increase.
    - Create an agent to move from the start point to the endpoint with uninformed search (BFS, DFS, and UCS) and informed search (A*)
    - The direction (angle) and the way of going depend on your design
    - Draw the agents' route
    - Take screenshots and describe the results. Video recording is recommended for further description.
    - Supply comparative comments in your report

- **Level 2: two algorithms, one agent, one start, two goals**
    - The set of algorithms is the same as listed in Level 1. However, the agent now reaches the endpoint with one algorithm and returns to the starting point with another algorithm.
    - Draw the routes with different colors
    - Take screenshots and describe the results. Video recording is recommended for further description.
    - Supply comments through test cases with different situations (maps, algorithms, etc.)
- **Level 3: multiple agents, one goal, different starting points, and different algorithms**
    - Each agent will be assigned a random algorithm. Agents are marked with a different color to identify the set algorithm.
    - The number of agents must be twice the number of installed algorithms
    - The start points are different, but the endpoint is the same
    - No need to draw a route
    - Run and give comments

3. Assessment

No.	Criteria	Scores
1	Requirement 1	20%
2	Requirement 2: Level 1	15%
3	Requirement 2: Level 2	15%
4	Requirement 2: Level 3	15%
5	Generate at least 5 test cases for each level with different attributes. Describe them in the experiment section of your report. Videos to demonstrate.	15%
6	Report your algorithms, experiments with some reflection or comments.	20%
Total		100%

4. Notices

- This is a **GROUP** assignment.
- Beside the above requirements, the report must also give the following information:
  - Your detailed information (Student Id, Full Name)
  - Assignment Plan
  - Self-assessment for completion level for each requirement.
  - References (if any)
- Any plagiarism, any tricks, or any lie will have a 0 point for the COURSE grade.
- Videos that are not made by your own group are signs of plagiarism.

5. References

[1] https://ccl.northwestern.edu/netlogo/.

[2] http://www.cs.us.es/~fsancho/?e=131