PLTW COMPUTER SCIENCE

Project 4.2.3

Modifying A Simulation's Assumptions

Introduction

The assumptions underlying any model dictate how realistic simulations using that model will be. They also provide insight as to how and when it is appropriate to use the results of that simulation for predictive purposes.

What happens when you change the assumptions?

Materials

- Computer with Internet access and NetLogo installed

Procedure

1. Form pairs as directed by your teacher. Meet or greet each other to practice professional skills.
2. In the previous activities and lesson, you have examined several different NetLogo simulations. In this project you will choose one of those or another simulation of interest and modify the assumptions of that simulation. Consult with your partner and agree upon one of the following simulations to work on during this project. Decide as well if you will alter NetLogo code or limit your changes to those that can be made through the UI.
    - Wolf sheep predation – Create an additional kind of animal in the model. Or, examine the model with the assumption that grass is never consumed and always available to be eaten.
    - Page rank – Examine the model assuming a different network structure.
    - Virus – Examine how the model behaves when assumptions are changed with regards to how disease is spread.
    - Examine another simulation of your choice.
3. Prepare and experiment with your model in order to construct a three- to five-minute presentation on the impact of your assumptions. Include the following:
    - Which model you chose to work with, and why
    - Summary of any parameters you changed using the AI and/or any modifications that you made to your model's code in order to accurately represent the new assumptions
    - Summary of your observation of the results of the simulation as viewed through the viewport
    - Summary of your observation of the results of the simulation as indicated by data produced using Behavior Space as well as any appropriate visual representations
    - Explanation of how the modified assumptions have changed the predictive power of the simulation, including under what circumstances the model could be used to make reliable predictions about real world systems

Conclusion

1. In a model of the impact of rust on an automobile frame, what assumptions are likely to impact the predictive power of a simulation?
2. In a model of the flow of fabric over a surface, what assumptions are likely to impact the predictive power of a simulation?

3. Practice Opportunity for the *Create* Performance Task

   A primary objective of this unit is to build the understanding that very complex behavior emerges from parallel application of simple calculations. NetLogo emerged from work by Mitch Resnick, the lead visionary of MIT Scratch, when he was advised by Hal Abelson, the lead visionary behind MIT App Inventor. In his 1994 book, *Turtle, Termites, and Traffic Jams*, Resnick wrote that he felt it was urgent that we begin raising awareness of a core idea: the appearance that a centralized decision making process is causing a phenomenon or controlling a system is often an illusion. He saw computer science education for younger learners first and foremost about raising this awareness.

   “New computational tools can play an important role in the spread of decentralized ideas. [Children] will become comfortable with decentralized ideas only if [they] get opportunities to design, create, explore, and play with decentralized systems.”

   As strong artificial intelligence stands poised to join us humans on the world stage, it is more urgent than ever to understand that simple algorithms can combine to create new, surprisingly powerful phenomena!

   Consider your agent-based model as an algorithm of algorithms. “Describe how each algorithm within your algorithm functions independently, as well as in combination with others, to form a new algorithm that helps to achieve the intended purpose of the program. (Approximately 200 words)” (adapted from College Board *Create* Performance Task Part 2c.)

Note: This writing prompt is adapted from the official College Board Create Performance Task but does not duplicate the content of College Board Task or Rubric. The task provided here contains elements that are different than the College Board Performance Task and Rubric. Please reference official College Board materials.