Your First Model

EES 4760/5760

Agent-Based and Individual-Based Computational Modeling

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Class #5: Thursday, September 9 2021

Homework

Homework:

- In the mushroom hunt, were there always 80 red patches?
- Any questions about modified mushroom hunt model?
- Let’s talk about ODD exercise.

Writing a model from an ODD

- Questions about writing a model from Butterfly ODD?
- Were there things the ODD was unclear about?

Butterfly Model

Download the model

- Download butterfly model from ees4760.jgilligan.org/models/class_05/butterfly_model_class_5.nlogo
  - Or go to the “Downloads” page on the class web site ees4760.jgilligan.org, click on “5. Butterfly Models” and download the “Basic Butterfly Model”

Enhancing the Butterfly model

- Put a slider for *q*
  - In the “Code” page:
    - Remove *q* from the global variables
    - Remove the initialization of *q* from `to setup`
- Add patches-own variable to indicate whether it was visited.

```
patches-own
[
  elevation
  visited? ; question mark means it's a true/false variable
]

to setup
  ...
  ask patches [
  set visited? false
  ...
  ]
  ...
end
```

- Add turtles-own variable to remember the patch where it started.

Enhancing the Butterfly model

- Put a slider for *q*
- Add patches-own variable to indicate whether it was visited.
- Add turtles-own variable to remember the patch where it started.
- Set the number of butterflies to 50.
- Stop butterfly from moving if it’s at the top of a hill.
  - How can you tell whether it’s on the top?

Enhancing the Butterfly model

- Write a reporter for corridor width

$$\text{Corridor width} = \frac{\#\ \text{patches visited}}{\text{distance from start}}$$

  - Put an **observer** on the interface
  - Define a reporter:

```
to-report corridor-width
  let wid ... ; calculate corridor
width
  report wid
end
```

Behaviorspace

Running Experiments: BehaviorSpace

- Vary any parameter that has a control on the model's interface
- Writes output to `.csv` spreadsheet file (table output is the most useful).
- Note: Data written in spreadsheet might be out of order.

```
"BehaviorSpace results (NetLogo 6.2.0)"
"enhanced_butterfly_model_class_5.nlogo"
"vary-q-final-only"
"09/08/2021 23:22:51:278 -0500"
"min-pxcor","max-pxcor","min-pycor","max-pycor"
"0","149","0","149"
"[run number]","q","[step]","corridor-width"
"7","0","999","430.473699756153 85"
"18","0","999","435.056612743918 44"
"20","0","999","414.941275015214 7"
"6","0","999","438.385016832529 1"
"3","0","999","445.711146751024 2"
"1","0","999","429.070105050936"
"19","0","999","420.950098310879 5"
"5","0","999","433.528031865475 2"
```

Analyzing Behaviorspace Output

- Behaviorspace output format is annoying
  - Each line is some tick of some run
  - How to organize, and average over runs?
- analyzeBehaviorspace app
  - https://ees4760.jgilligan.org/analyze_behaviorspace
  - Or install on your own computer using R
    - Instructions at https://github.com/jonathan-g/analyzeBehaviorspace
    - After installing:

```
library(analyzeBehaviorspace)
launch_abs()
```

Emergence

Emergence

- A tricky concept.
- Joshua Epstein in *Growing Artificial Societies:* “stable macroscopic patterns arising from the local interaction of agents.”
- Epstein ten years later: “I have always been uncomfortable with the vagueness and occasional mysticism surrounding this word.”
- Epstein now prefers to talk about “*Generative* Social Science”