

Your First Model

EES 4760/5760

Agent-Based and Individual-Based Computational Modeling

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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

Enhancing the Butterfly model

- Download butterfly model from https://ees4760.jonathangilligan.org/models/class_05/butterfly_model_class_5.nlogo
- Put a slider for q
- 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
    ...
  ]
  ...
]
```

- 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 5.3.1)"
"jg_butterfly_1.nlogo"
"vary-q"
"01/25/2016 23:08:47:963 -0600"
"min-pxcor", "max-pxcor", "min-pycor", "max-pycor"
"0", "149", "0", "149"
"[run number]", "q", "[step]", "corridor-width"
"4", "0", "999", "424.71585264477375"
"3", "0", "999", "407.8948972331853"
"2", "0", "999", "402.16008464319225"
"1", "0", "999", "413.09183879201066"
"5", "0", "999", "380.4175502215263"
"6", "0", "999", "408.25117143183326"
"7", "0", "999", "431.37461560574894"
"8", "0", "999", "408.38259535508286"
"9", "0", "999", "421.7254402334981"
```

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.jonathangilligan.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.
- Joseph 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*”