

From Animations To Science

EES 4760/5760

Agent-Based & Individual-Based Computational Modeling

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Class #6: Thurs. January 26 2017

Planning

- Semester Project:
 - Two weeks (Feb. 9): Pick a model from one of the open-source repositories, or NetLogo “model library” that you want to work with.
 - One-page description of model and thoughts for extending it
 - Feb. 23: Examine ODD and code.
 - Short write-up of how model works and output from running it
 - Mar. 16: ODD for extending model
 - Apr. 18-20: Presentations on experiments with extended models
 - Apr. 25: Write-up of research project (around 10 pages)
- Team Project:
 - Each team (2–3 students) will code a model from an ODD in the textbook (Ch. 10 or Ch. 13)
 - Use model to do exercises from book
 - Make presentation about what you learned (Tues. Feb. 28)
- Detailed Assignments on Blackboard

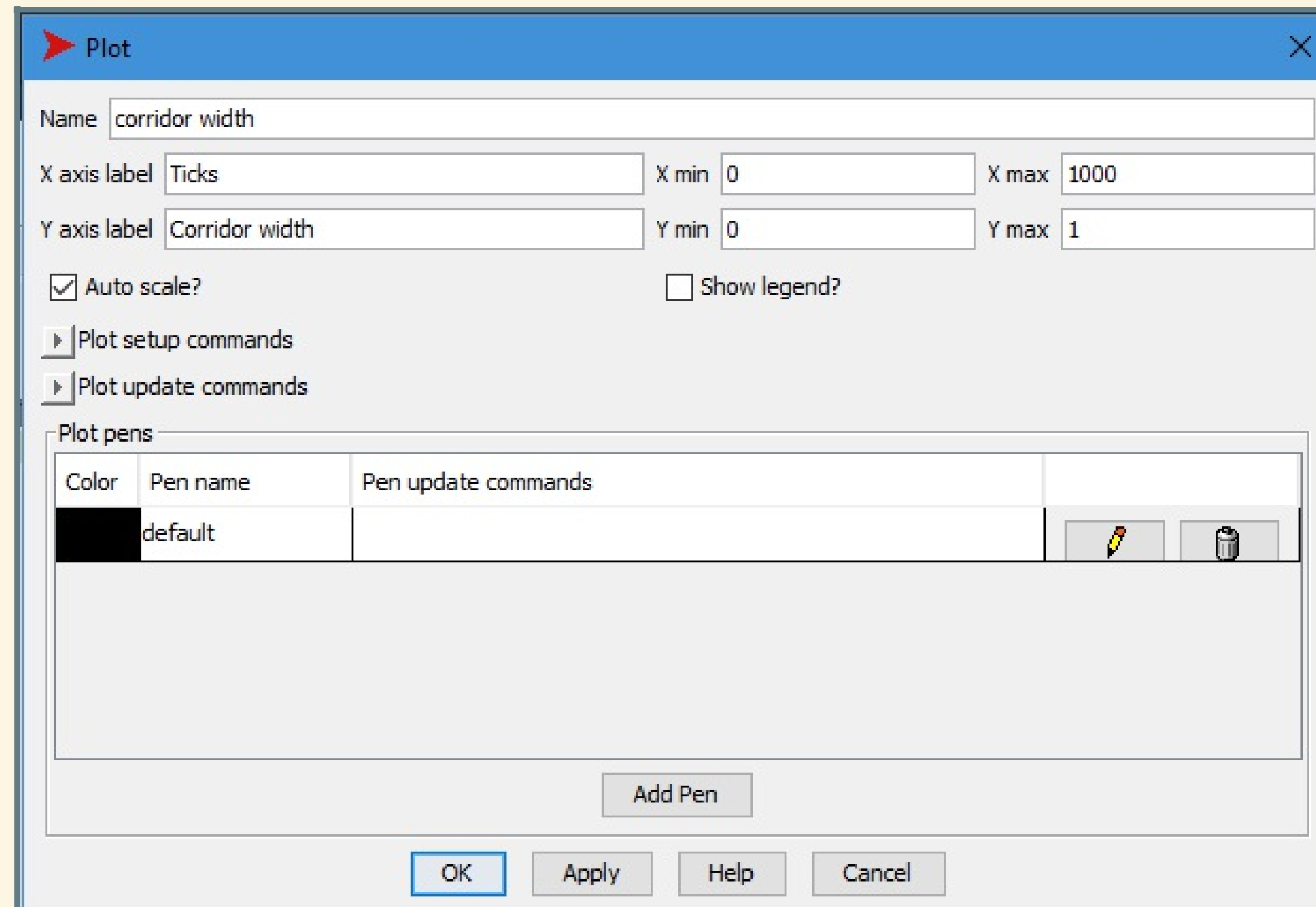
Experiments with the Butterfly Mode

Download the following files:

- A butterfly model from Chapter 5:
https://ees4760.jonathangilligan.org/models/class_06/butterfly_class_06a.nlogo
- A version of the butterfly model with modifications:
https://ees4760.jonathangilligan.org/models/class_06/butterfly_class_06b.nlogo
- Versions of the butterfly model with code for testing:
https://ees4760.jonathangilligan.org/models/class_06/butterfly_class_06c.nlogo and
https://ees4760.jonathangilligan.org/models/class_06/butterfly_class_06c_testing.nlogo
- The NetLogo “Testing Is Fun” library
https://ees4760.jonathangilligan.org/models/class_06/jg-tif.nls
- A digital elevation map of real hills
https://ees4760.jonathangilligan.org/models/class_06/ElevationData.txt
- Start NetLogo and load `butterfly_class_06a.nlogo`

Plot Corridor Width

- On the interface tab, add a plot



The screenshot shows a 'Plot' dialog box with the following fields and options:

- Name:** corridor width
- X axis label:** Ticks
- X min:** 0
- X max:** 1000
- Y axis label:** Corridor width
- Y min:** 0
- Y max:** 1
- ☒ Auto scale?
- ☐ Show legend?
-
-
- Plot pens:**

Color	Pen name	Pen update commands
Black	default	
-
-

- On the code tab, add a line to go to plot the corridor width

```
plot corridor-width
```

Enhance Interface

- Add a button to export the plot to a file:

```
export-plot "Corridor-width" (word "corridor-output-for-q-" (precision q 2) ".csv")
```

- Add a button to increment q by 0.1

BehaviorSpace

- If your model is having problems, compare it to `butterfly_class_06b.nlogo`
- Open BehaviorSpace and create an experiment
 - Call it `experiment`
 - Vary `real-terrain` between `false` and `true`
 - Vary `q` from 0 to 1 in steps of 0.2
 - Run 20 repetitions for each value of q .
 - Measure `corridor-width` at the last tick only
 - Set time limit to 0 to let model run until it stops
- Run BehaviorSpace experiment
 - Save “table” output
 - Speed things up by unchecking “Update view” and “Update plots and monitors”
- Open the `analyzeBehaviorspace` app at https://ees4760.jonathangilligan.org/analyze_behaviorspace and use it to compare the relationship between corridor width and q for each terrain

Practice

- Work together with a partner
- Add a button to erase the tracks of the turtles (Exercise 5.2)
- Using the realistic terrain, play with q and see what values do best at helping butterflies find mates near hilltops.

Testing Models

- Using monitors
- Unit testing resource “Testing Is Fun”
- Open “butterfly_class_06a_testing.nlogo”
- At beginning of code:

```
__includes ["jg-tif.nls"]
```

- In to_setup add:

```
initialize-tests
```

- In to_go add:

```
set-context "Reporting corridor-width"
test-that "# visited patches should equal # yellow patches"
expect-that (count patches with [visited?]) equals (count patches with [pcolor = yellow])
...
if ticks >= 1000 or all? turtles [finished?]
[
  resume-all-tests
  stop
]
```


Emergence

- A tricky concept
- Early definition: *“stable macroscopic patterns arising from the local interaction of agents”* — Joshua Epstein, 1996
- 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”**
- Other scientists (especially in natural sciences: biology, physics, etc.) are more comfortable talking about *emergence*.