# Testing and Validating Models

EES 4760/5760

Agent-Based & Individual-Based Computational Modeling

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Class #7: Tuesday January 30 2018

# Organization

- Download marriage model from Brighspace or class web page:
  - Marriage Model is at https://ees4760.jgilligan.org/models/class_07/marriage_model.nlogo
  - ODD is at https://ees4760.jgilligan.org/models/class_07/MarriageAgeModel-ODD.pdf

- Team Projects:
  - Class Presentations Feb. 27
  - Choice of two projects:
    - Adaptive behavior (Business investor model, Ch. 10)
    - Agent interactions (Telemarketer model, Ch. 13)
  - Decide which one you want to do and choose a partner (undergrads with undergrads, grads with grads)

# Finding and Fixing Errors

# Classes of Errors

- Typographical (typing `pxcor` when you mean `pycor`)
- Syntax
- Misunderstanding NetLogo language:

```
ask turtle 5 [
  let neighbor-turtles turtles in-radius 2
  ask neighbor-turtles [set color green]
]
```

  versus

```
ask turtle 5 [
  let neighbor-turtles turtles-on patches in-radius 2
  ask neighbor-turtles [set color green]
]
```

- Wrong display settings (wrapping)
- Run-time errors (e.g., division by zero, moving turtle out of world forgetting to initialize globals, turtles-own, or patches-own)
- Logic errors **(hard to find)**
- Formulation errors **(hard to find)**

# Finding Errors

- Syntax checks
- Visual tests
- Print statements (highly recommended)
  - `print`, `show`, `type`, `write`, ...
  - `output-print`, `output-show`, ... outputs to model output area instead of Command Center
  - `file-print`, `file-show`, ... outputs to a file.
    - Must call `file-open` first
- Spot tests with monitors on interface
- Unit tests with `jg-tif.nls`

# Chasing Down Errors

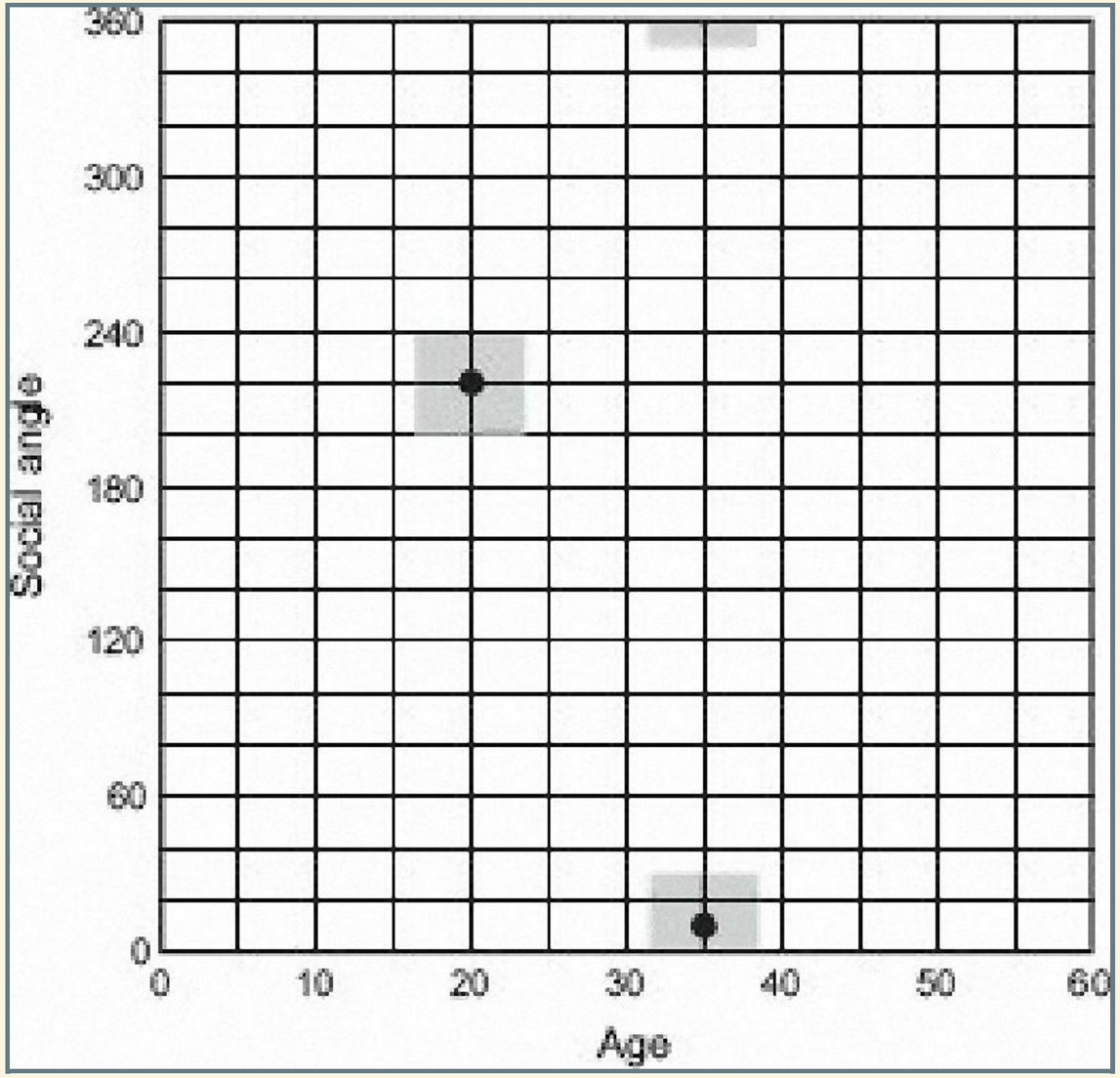
- Stress tests
  - Run with many different extreme values using unit tests
- Code reviews (teamwork)
- Statistical analysis of output
  - BehaviorSpace
  - `file-open`, `file-print`, …
  - `export-plot`

# Independent Re-Implementation of Submodels

- If your model needs a tricky calculation:
  - Try it in another format: spreadsheet, scripting language (Python, R, Matlab, etc.)
  - Compare to NetLogo results

# Marriage Model ODD

- **Purpose:** Describes social norms of age at which people marry
- **Entities, State-Variables, Scales:** Agents are individual people.
  - Age (0–60), sex, marital status
  - Social angle: describes location in social network
    - Social network like cylinder: coordinates are age and social angle


360
300
240
180
120
60
0
Social angle
0
10
20
30
40
50
60
Age