Modeling and Simulation Hypotheses Session 2

2/1/2019

Journal: How is NetLogo the same or different from Python? Name specific structures or concepts.

Objectives:

- Explain how models are an abstraction of real environments and will recognize the rationale for and limitations of modeling techniques to analyze problems.
- Identify abstraction in different programming languages.
- Recognize the use of functional and data abstractions in modeling.

Reflect on yesterday...

Notice commonalities in programming languages (sequence, conditionals, iteration, abstraction) and how differences in languages provide specific tools best suited to particular problems.

```
88
89  to reproduce-wolves  ;; wolf procedure
90    if random-float 100 < wolf-reproduce [  ;; throw "dice" to see if you will reproduce
91      set energy (energy / 2)               ;; divide energy between parent and offspring
92      hatch 1 [ rt random-float 360 fd 1 ]  ;; hatch an offspring and move it forward 1 step
93    ]
94  end
95
96  to catch-sheep  ;; wolf procedure
97    let prey one-of sheep-here                    ;; grab a random sheep
98    if prey != nobody                             ;; did we get one?  if so,
99      [ ask prey [ die ]                          ;; kill it
100       set energy energy + wolf-gain-from-food ] ;; get energy from eating
101 end
102
103 to death  ;; turtle procedure
104   ;; when energy dips below zero, die
105   if energy < 0 [ die ]
106 end
```

More Reflection

The domain of modeling and simulation is a huge area in computational thinking,

NetLogo is one of many languages well suited to problem-solving in this domain.

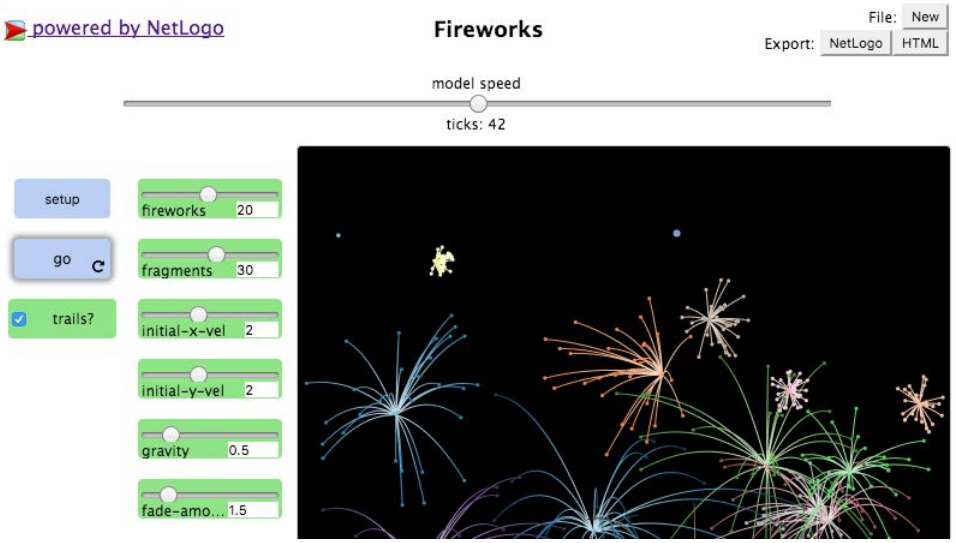
Python is used for modeling and simulation, but to be clear and readable requires the abstraction of libraries to build on that provide the same functionality that comes with a language like NetLogo.

Discuss

The ABSTRACTION available in NetLogo makes it easier to read and write simulation programs
It has features that are readily available to build on.

List abstractions available in Python that are different from NetLogo or PyLogo. What is built into each language that makes it easy to use?

Models and Hypotheses

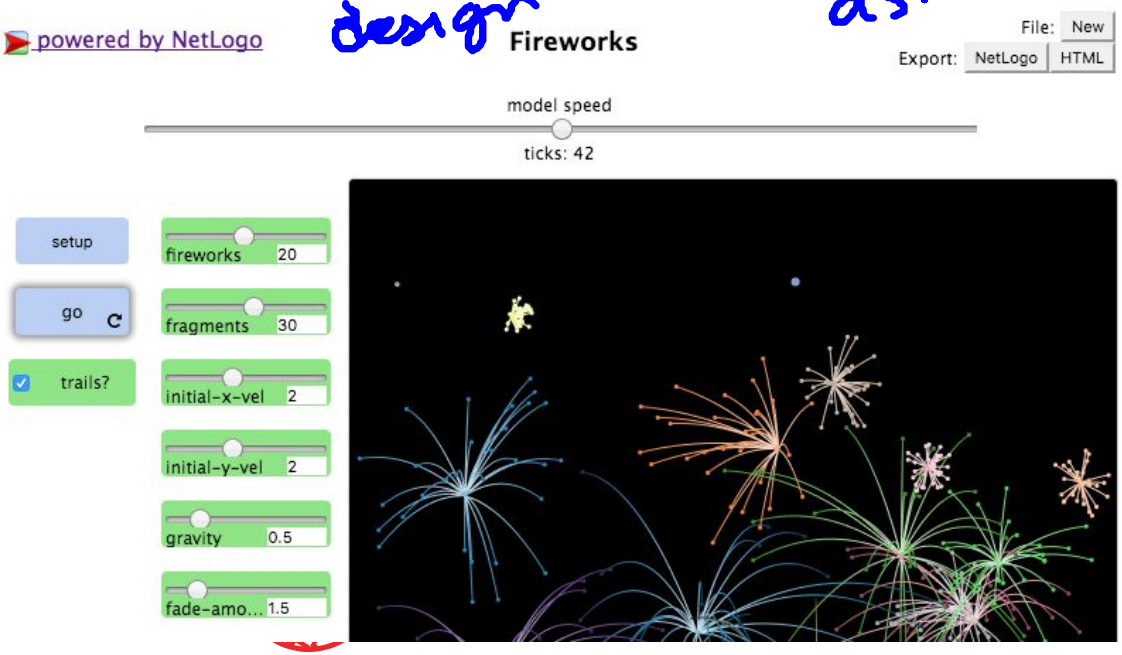


1. Start NetLogo and open the Art>Fireworks model.
2. Use the interface Buttons for Setup and Go to run the simulation.
3. Read the information in the Info tab, and look through the code in the Code tab, to get a sense of what is being simulated and how it works.

Model vs. Simulation

A **model** is the *description* of the **environment,** while the **simulation** is the *specific implementation* of the **model**.

- Identify which aspects of the real-world environment (actual fireworks) ***are*** implemented in the model, and which aspects ***are* not** implemented.



Characteristics

Simpler characteristics of the model or abstraction make the implementation of the model much easier, at the expense of a possible failure to represent key relationships.

a. Find the names of the 5 functions defined in the code.
b. Describe where all 5 are called (3 in the code and 2 in the interface).

Note: all moving objects in the simulation are called “turtles”

```
; This is where the explosion is created.
; EXPLODE calls hatch a number of times indicated by the slider FRAGMENTS.
to explode ; turtle procedure
  hatch-frags fragments [
    set dim 0
    rt random 360
    set size 1
    set x-vel (x-vel * .5 + dx + (random-float 2.0) - 1)
    set y-vel (y-vel * .3 + dy + (random-float 2.0) - 1)
    ifelse trails?
      [ pen-down ]
      [ pen-up ]
  ]
end
```

Hypotheses

A hypothesis is an educated guess about how things work.

- "If _____*[I do]* _____, then _____*[this will result]*_____

Explore hypotheses that could be tested by this model.

Write a hypothesis that can be tested with this simulation, share the hypothesis with elbow partners, and briefly experiment with the parameters to informally test the hypothesis.

interface?

- What do we think will happen we we make those changes?

Work in teams

Use the "4-6-BHypothesis Testing Worksheet"

Work in teams of 2-4