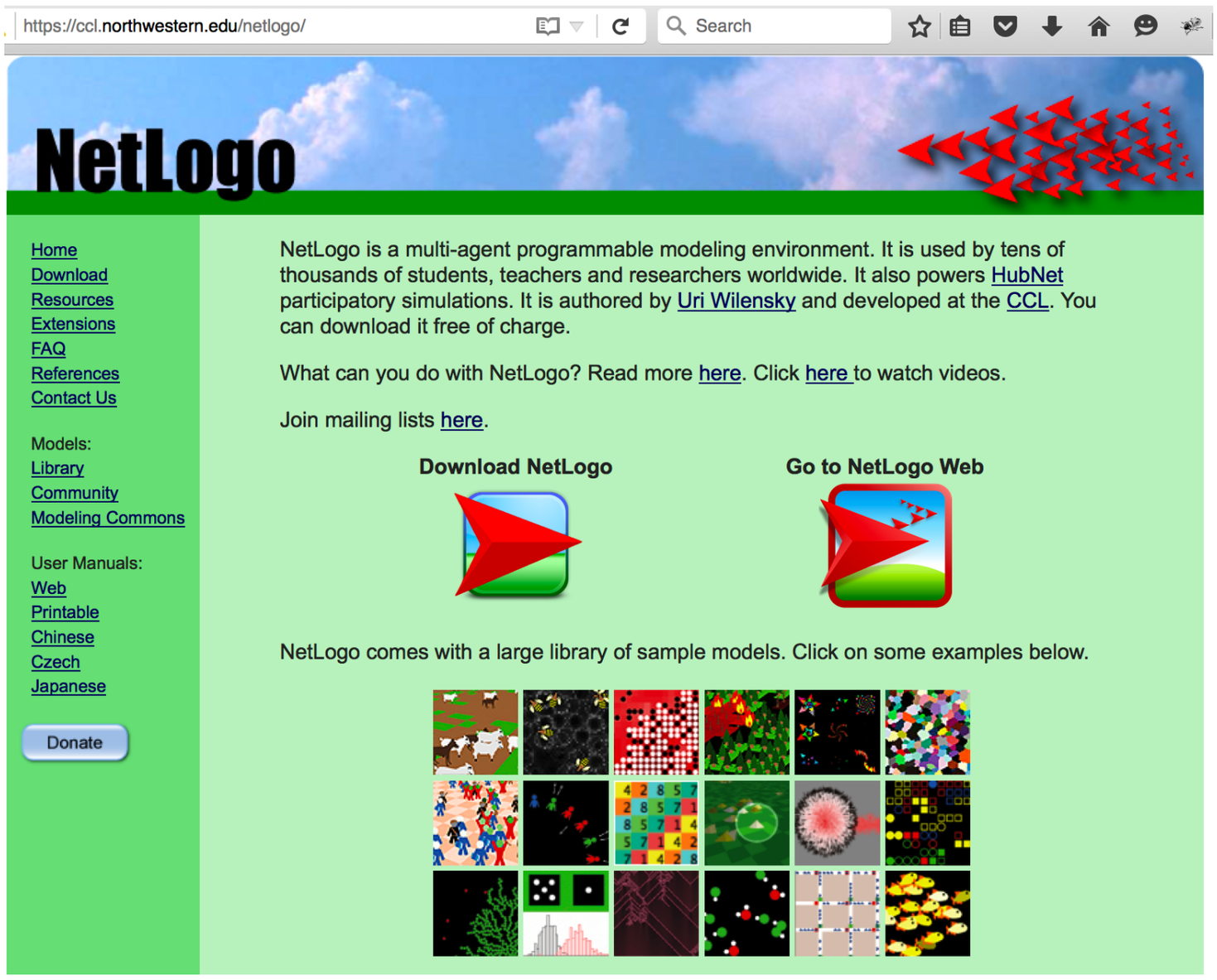
Intro to NetLogo Syntax: Coding Basics



Module Objectives

Create a Basic Model

- Learn NetLogo syntax
- Code, Buttons, Parameters
- Observer control

Explore agent movement and interaction

Review Netlogo help and resources

Coding with a purpose

Creating a model and coding is an iterative process so break it down into mini-tasks. For each model task: 1) identify your specific coding **goal**, 2) **vision**/describe how what you want to see, 3) what are your **objectives** and steps to accomplish the goal, 4) what is code structure or **syntax** (pseudo-code).

Coding with a purpose

Coding goal: What you want to accomplish.

Vision: What are you hoping to see on the display or outputs

Coding objectives: Specific and detailed things you want to see happen on the NetLogo display and specific steps that support your coding goal.

Code structure and syntax: Write the steps of model as detailed step by step instructions as sentences and use specific code function names or libraries if you know them

Let’s make a model

Coding goal: Create two sets of agents on the screen in specific places and have them interact with the environment and each other

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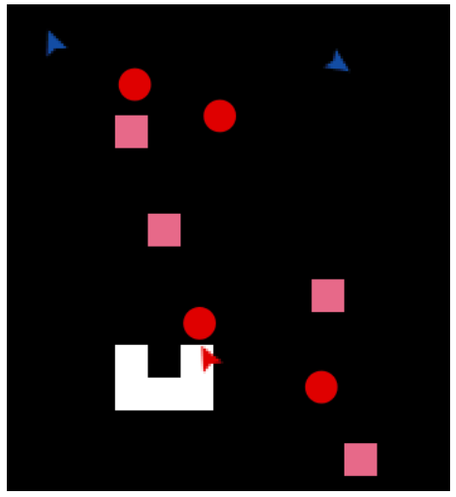
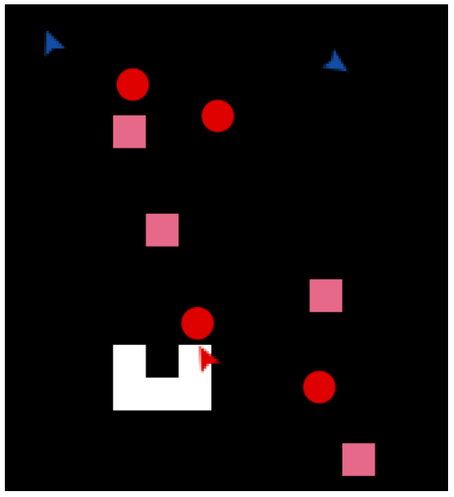
Vision:



Let’s make a model

Coding goal: Create two sets of agents on the screen in specific places and have them interact with the environment and each other

Vision:

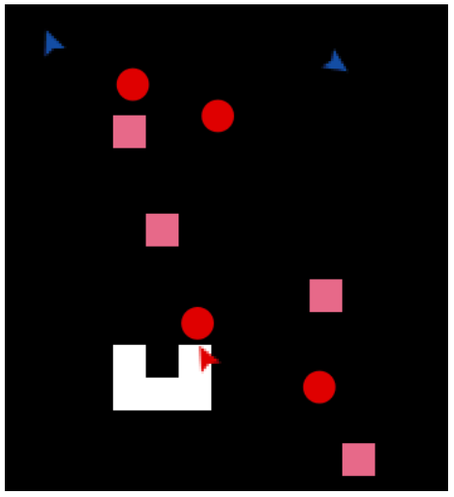


Coding objective: Red agents live on pink squares. Both agents move around the screen. Blue agents interact with the environment to show where they went. If a blue one lands on a pink square it dies. Red agents interact with blue agents when nearby and turn blue to red when together.

Let's make a model

Coding goal: Create two sets of agents on the screen in specific places and have them interact with the environment and each other

Vision:



Coding objective: Red agents live on pink squares. Both agents move around the screen. Blue agents interact with the environment to show where they went. If a blue one lands on a pink square it dies. Red agents interact with blue agents when nearby and turn blue to red when together.

Pseudo-code:

[starting conditions] Create 20 turtles, 10 blue and 10 red. Red turtles are circles and start on pink patches. Blue turtles start anywhere on the display.
[movement] Red and blue turtles move around in random directions but not pass edge
[interactions] Where blue turtles go, patches turn white. If a blue turtle touches a pink patch it dies. If a red turtle is near a blue turtle it increases in size. If red and blue together on same patch then the blue turtle changes to red.
[stopping conditions] When no more blue turtles.

Let’s make some agents

Coding goal: Create some agents on the screen

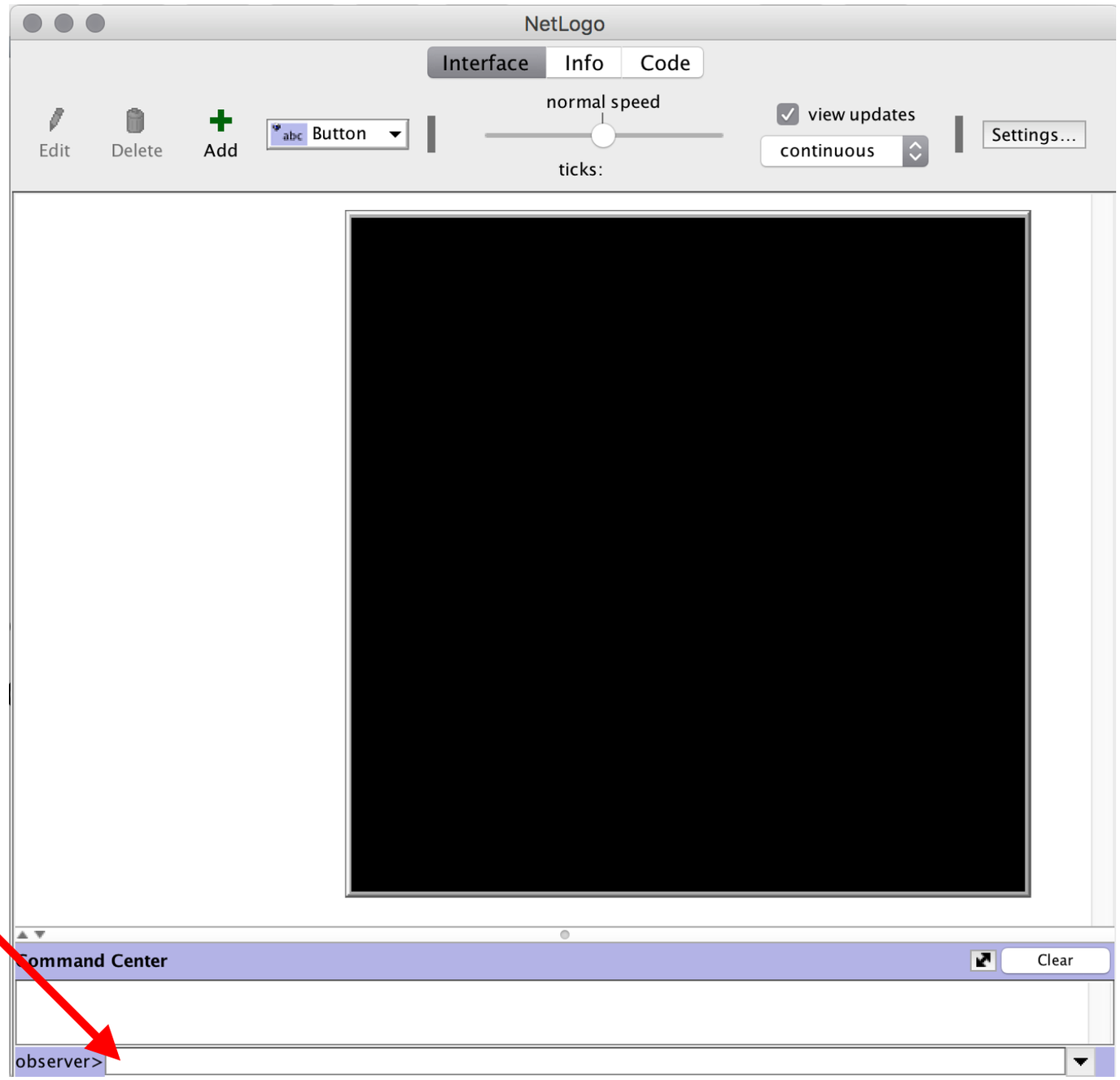
Coding objectives: *Create 20 agents, 10 blue and 10 red. Red agents are circles and start on pink spaces.* Put blue agents anywhere on the display.

In Observer command line on the NetLogo Interface type the following:

Let’s make some agents

- File>New
- Get familiar with NetLogo syntax
- Use observer Command line to prototype

Our Goal: We will add agents to display, have them move around and interact with their environment and each other.



Let’s make some agents

Coding goal: Create some agents on the screen

Coding objectives: Create 20 agents, 10 blue and 10 red. Red agents are circles and start on pink spaces. Put blue agents anywhere on the display.

In Observer command line on the NetLogo Interface
type the following:

create-turtles 20

ask turtles [move-to one-of patches]

ask n-of 10 turtles [set color blue]

ask n-of 10 turtles [set color red set shape "circle"]

count turtles with [color = blue]

How many blue agents?

Let’s make some agents

Coding goal: Create some agents on the screen

Coding objectives: Create 20 agents, 10 blue and 10 red. Red agents are circles and start on pink spaces. Put blue agents anywhere on the display.

In Observer command line on the NetLogo Interface
type the following:

```
clear-all
ask n-of 20 patches [set pcolor pink]
ask patches with [pcolor = pink] [sprout 1 [set color red set shape "circle"]]
```

What did the pink patches do?

Let’s make some agents

Coding goal: Create some agents on the screen

Coding objectives: Create 20 agents, 10 blue and 10 red. Red agents are circles and start on pink spaces. Put blue agents anywhere on the display.

In Observer command line on the NetLogo Interface
type the following:

ask turtles [die]

Note: Use the up arrow to get to previous commands you typed

ask n-of 10 patches with [pcolor = pink] [sprout 1 [set color red set shape “circle”]]

create-turtles 10 [set color blue]

ask turtles with [color = blue] [move-to one-of patches]

Have we achieved our objective yet?

Let’s make agents move

Coding goal: Allow agents to move on the screen

Coding objectives: Have agents turn to the right a random amount between 0-360 and then go forward 2 cells

In Observer command line on the NetLogo Interface type the following:

Let’s make agents move

Coding goal: Allow agents to move on the screen

Coding objectives: Have agents turn to the right a random amount between 0-360 and then go forward 2 cells

In Observer command line on the NetLogo Interface
type the following:

ask turtles [move to patch ahead]

Note: Use the up arrow to get to previous command you typed, and hit enter to make the agents move around a bit

Troubleshooting

The Netlogo dictionary can help: Menu>Help
Netlogo Dictionary
Search for turtle commands
We just need to add a dash in between move and to

NetLogo User Manual
version 6.0.4
June 4, 2018

Release Notes
System Requirements
Contacting Us
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Introduction
- What is NetLogo?
- Sample Model: Party

Learning NetLogo
- Tutorial #1: Models
- Tutorial #2: Commands
- Tutorial #3: Procedures

Reference
- Interface Guide
  - Interface Tab Guide
  - Info Tab Guide
  - Code Tab Guide

```
if mouse-down?
  [ ask patch mouse-xcor mouse-ycor [ set pcolor red ] ]
```

move-to

move-to *agent*

The turtle sets its x and y coordinates to be the same as the given agent's.

(If that agent is a patch, the effect is to move the turtle to the center of that patch.)

```
move-to turtle 5
;; turtle moves to same point as turtle 5
move-to one-of patches
;; turtle moves to the center of a random patch
move-to max-one-of turtles [size]
;; turtle moves to same point as biggest turtle
```

Note that the turtle's heading is unaltered. You may want to use the face command first t

See also setxy.

Let’s make agents move

Coding goal: Allow agents to move on the screen

Coding objectives: Have agents turn to the right a random amount between 0-360 and then go forward 2 cells

In Observer command line on the NetLogo Interface
type the following:

ask turtles [move-to patch-ahead 1]

Note: Use the up arrow to get to previous command you typed, and hit enter to make the agents move around a bit

Let’s make agents move

Coding goal: Allow agents to move on the screen

Coding objectives: Have agents turn to the right a random amount between 0-360 and then go forward 2 cells

In Observer command line on the NetLogo Interface
type the following:

ask turtles [rt random 360 fd 1]

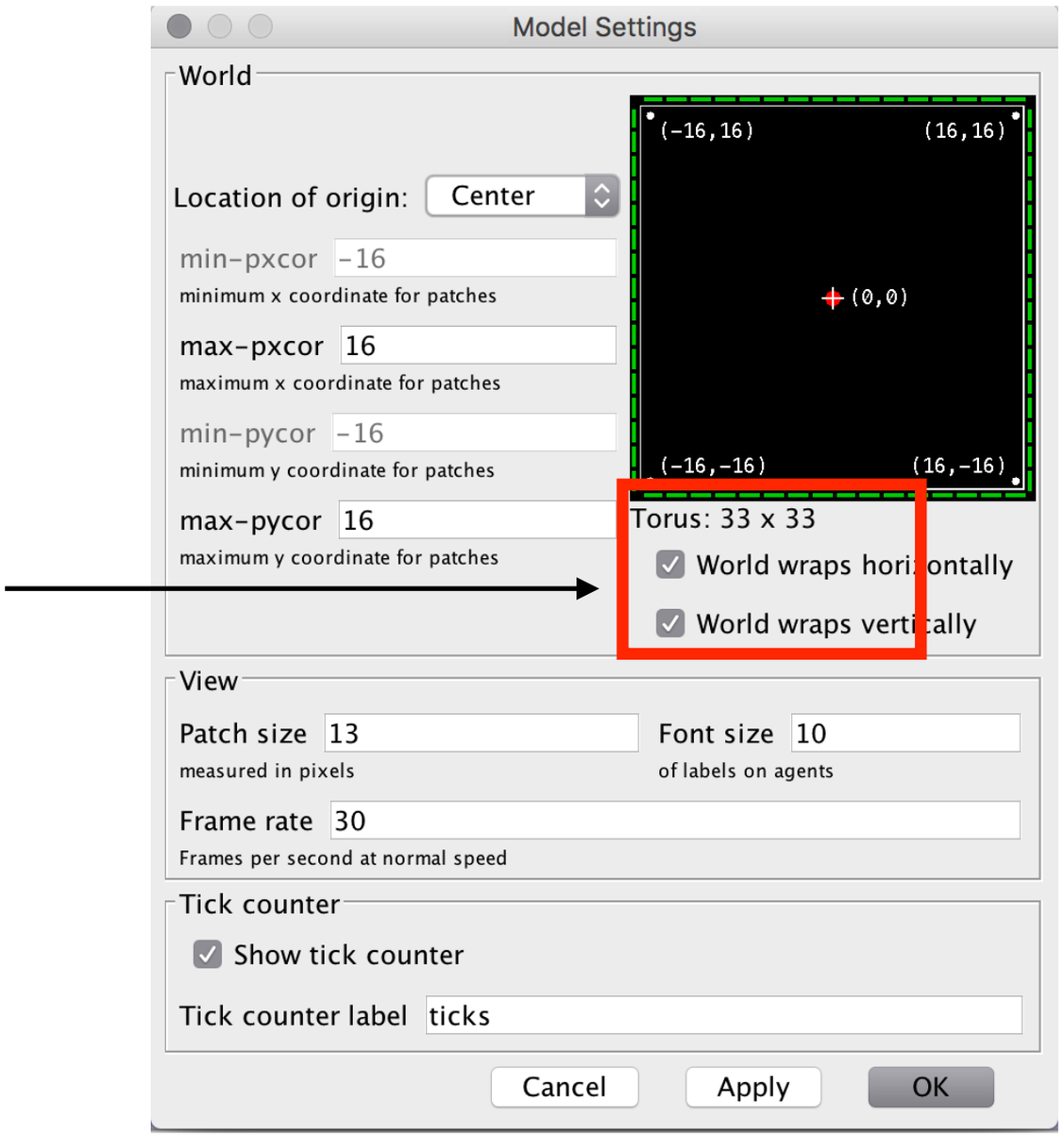
Note: Use the up arrow to get to previous command you typed, and hit enter to make the agents move around a bit

How to keep agents from moving off the screen…

The model world default is a torus.

This allows agents to move off the top of the screen and then suddenly appear on the bottom of the screen. To change this, uncheck the two check boxes about the world wraps.

Note: Also with the model settings, you can increase the world display by increasing the max-pxcor and max-pycor, and by adjusting the patch size.



Have agents interact with environment

Coding goal: Where blue agents go, turn the space white

Coding objectives: Have the patch check to see if any blue agents are there, if so change the patch color to white, if the blue lands on a pink patch they die.

In Observer command line on the NetLogo Interface
type the following:

Have agents interact with environment

Coding goal: Where blue agents go, turn space white.

Coding objectives: Have pink patches check to see if any blue agents are there, if so they die. Have the patch check to see if any blue agents are there, if yes change patch to white.

In Observer command line on the NetLogo Interface
type the following:

ask patches [if any? turtles-here with [color = blue] [set pcolor white]]

Use the up arrow to get to previous commands you typed to move agents and then to turn patches white. Do this a few times.

Have agents interact with environment

Coding goal: If blue agent lands on pink, it dies.

Coding objectives: Have pink patches check to see if any blue agents are there, if so they die.

In Observer command line on the NetLogo Interface
type the following:

ask patches with [pcolor = pink] [ask turtles-here with [color = blue] [die]]

or can do it this way

ask turtles with [color = blue] [if [pcolor] of patch-here = pink [die]]

Use the up arrow to get to previous commands you typed to move agents and then to turn patches white. Do this a few times.

Have agents interact with each other

Coding goal: Red and blue interact by red gets bigger if blue nearby. Blue turns red if together with a red.

Coding objectives: Ask red agents to check if any blue agents on patches around them, if so makes red agents bigger. Red agents ask blue agents on the same patch to turn red.

In Observer command line on the NetLogo Interface
type the following:

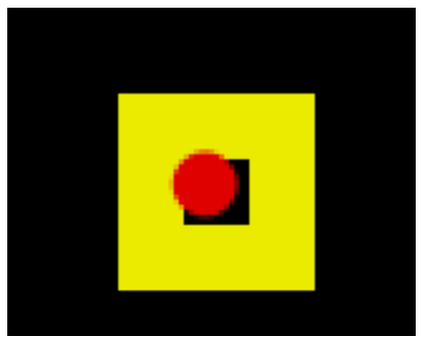
Have agents interact with each other

Coding goal: Red and blue interact by red gets bigger if blue nearby. Blue turns red if together with a red.

Coding objectives: Ask red agents to check if any blue agents on patches around them, if so makes red agents bigger. Red agents ask blue agents on the same patch to turn red.

In Observer command line on the NetLogo Interface
type the following:

ask turtles with [color = red] [ask neighbors [set pcolor yellow]]



Moore neighborhood = 8 surrounding patches

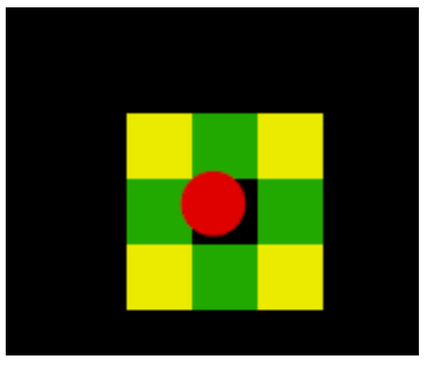
Have agents interact with each other

Coding goal: Red and blue interact by red gets bigger if blue nearby. Blue turns red if together with a red.

Coding objectives: Ask red agents to check if any blue agents on patches around them, if so makes red agents bigger. Red agents ask blue agents on the same patch to turn red.

In Observer command line on the NetLogo Interface
type the following:

ask turtles with [color = red] [ask neighbors4 [set pcolor green]]



Von Neumann = 4 adjacent patches

ask turtles with [color = red] [ask neighbors [set pcolor black]]

Have agents interact with each other

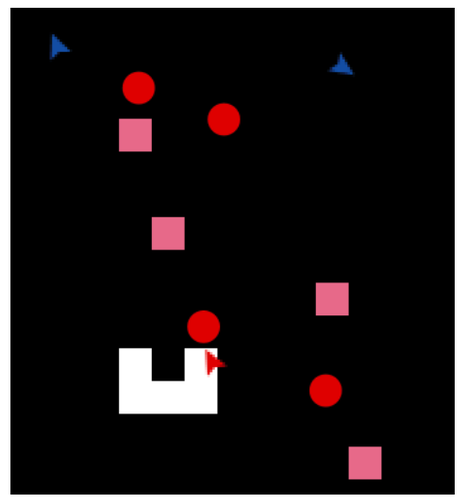
Coding goal: Red and blue interact by red gets bigger if blue nearby. Blue turns red if together with a red.

Coding objectives: Ask red agents to check if any blue agents on patches around them, if so makes red agents bigger. Red agents ask blue agents on the same patch to turn red.

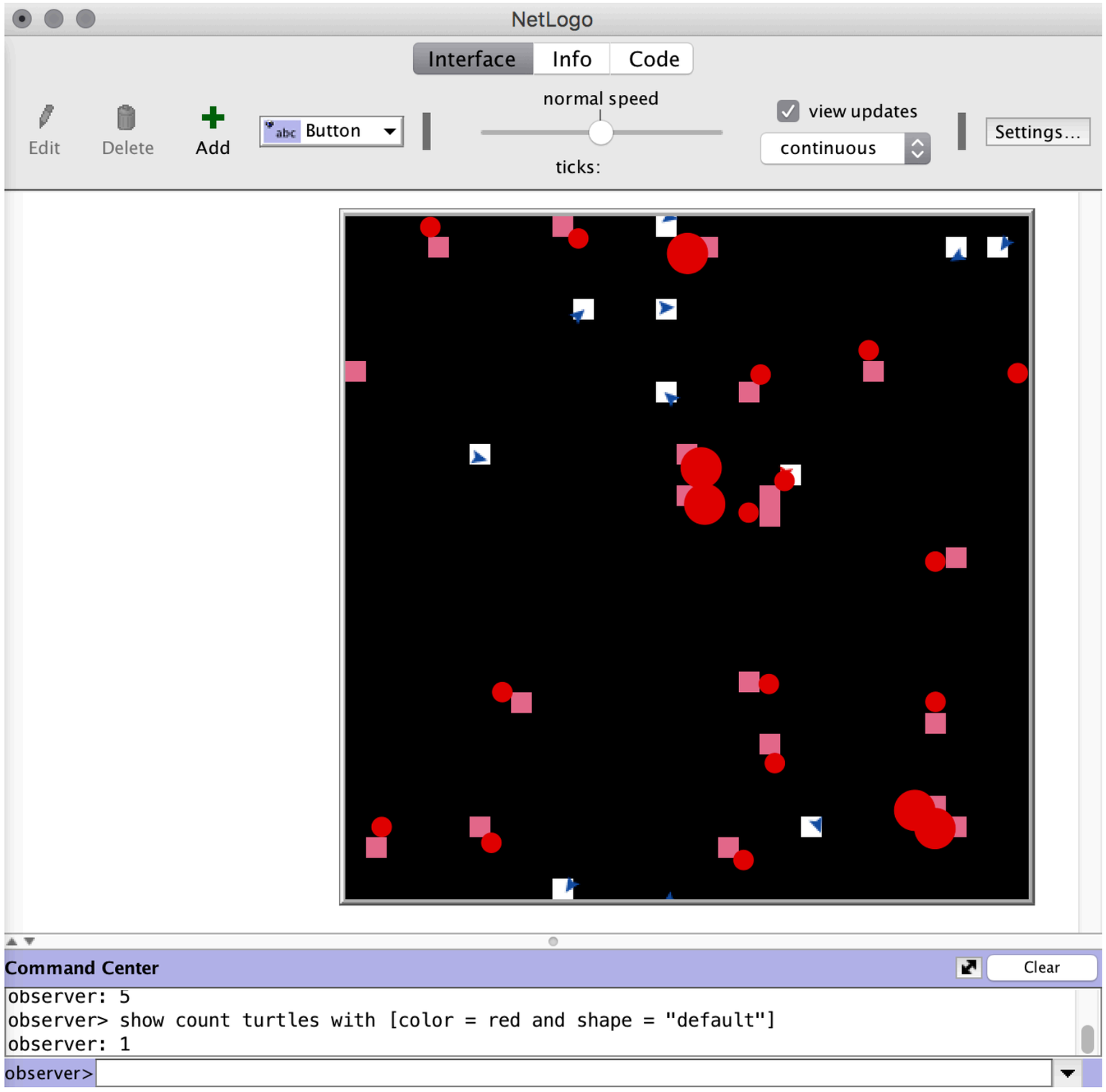
In Observer command line on the NetLogo Interface
type the following:

ask turtles with [color = red] [if any? turtles-on neighbors [set size size + 1]]

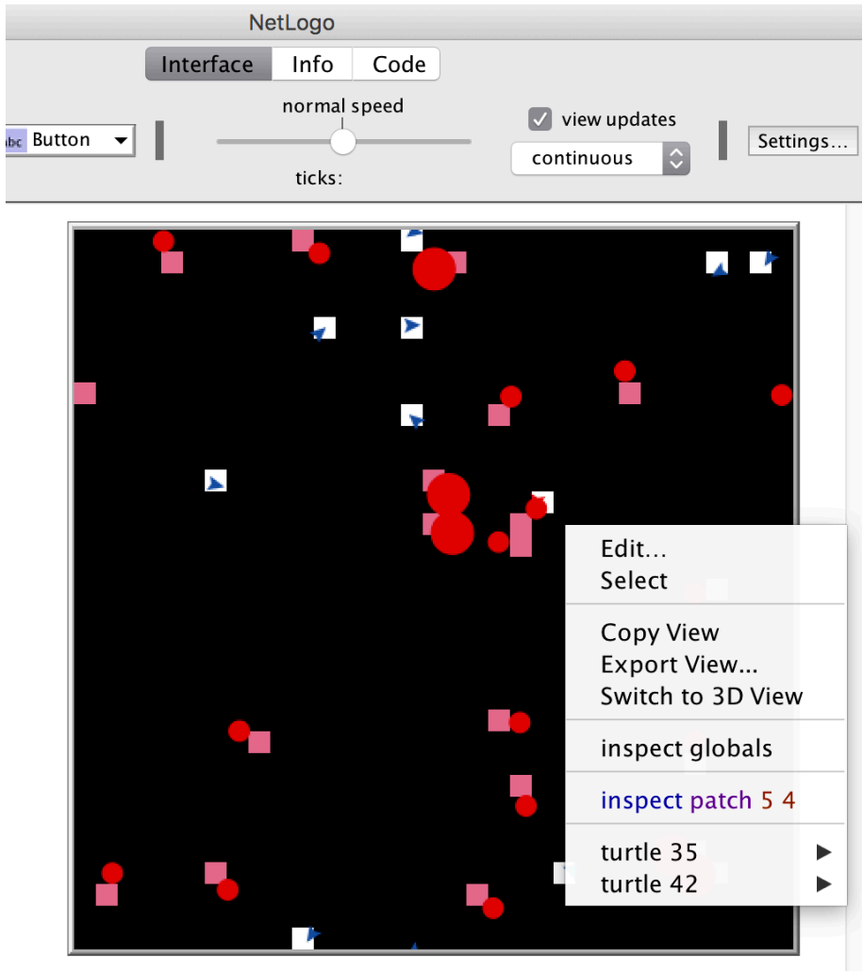
ask turtles with [color = red] [ask turtles-here with [color = blue] [set color red]]

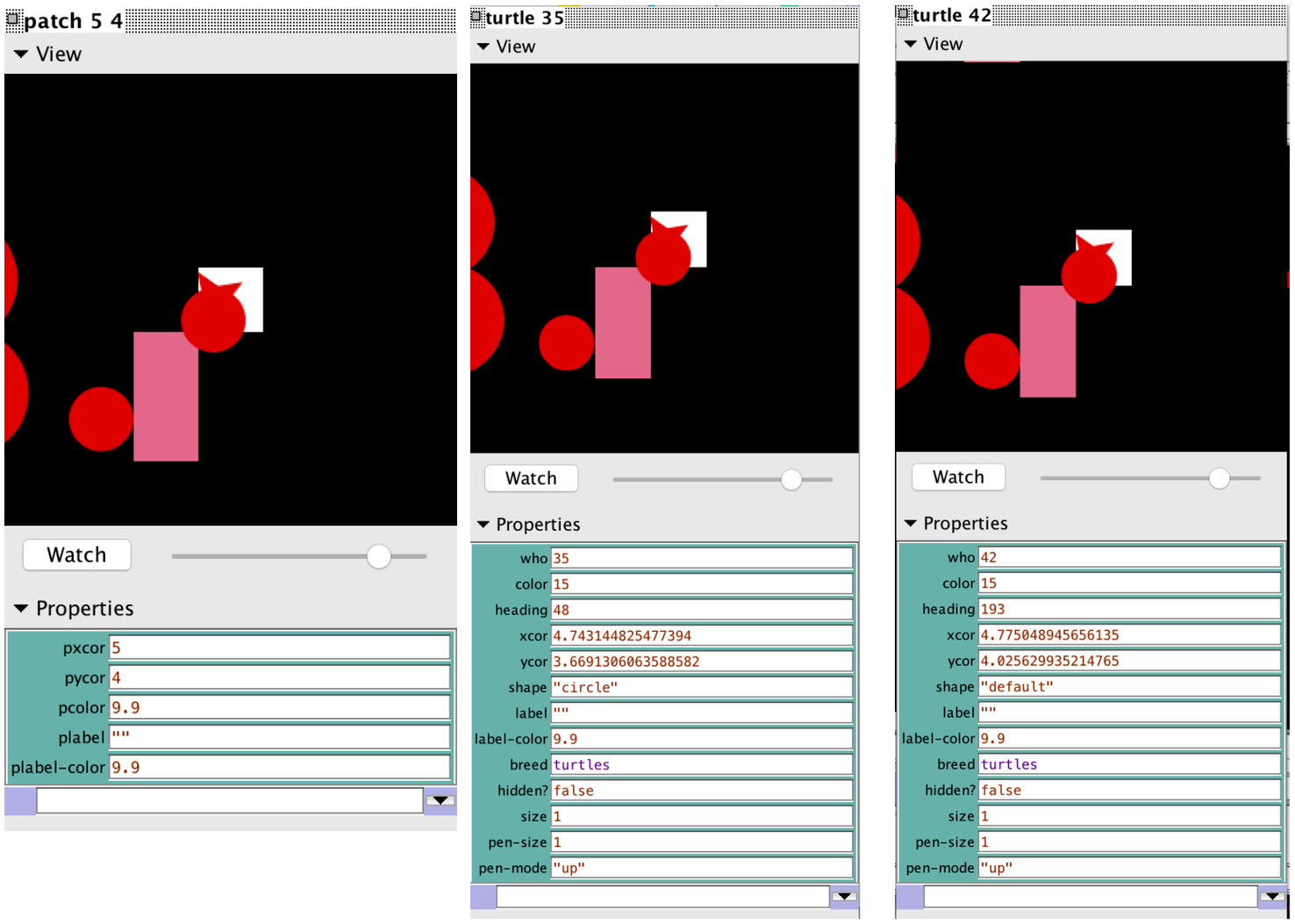


A simple model of movement and interaction



Inspect the model





Measure results

How many blue turtles are left? **show count turtles with [color = blue]**

What percent of patches were turned white?

show ((count patches with [pcolor = white]) / count patches) * 100

How percent of red turtles changed size

show ((count turtles with [color = red and size > 1]) / count turtles with [color = red])) * 100

How many blue turtles turned red

show count turtles with [color = red and shape = "default"]

NetLogo easy to use

- Net logo is easy to use but you need to get used to they syntax.
- When coding, if you get stuck check out the dictionary.
- The models library is a great resource for code examples and ideas.