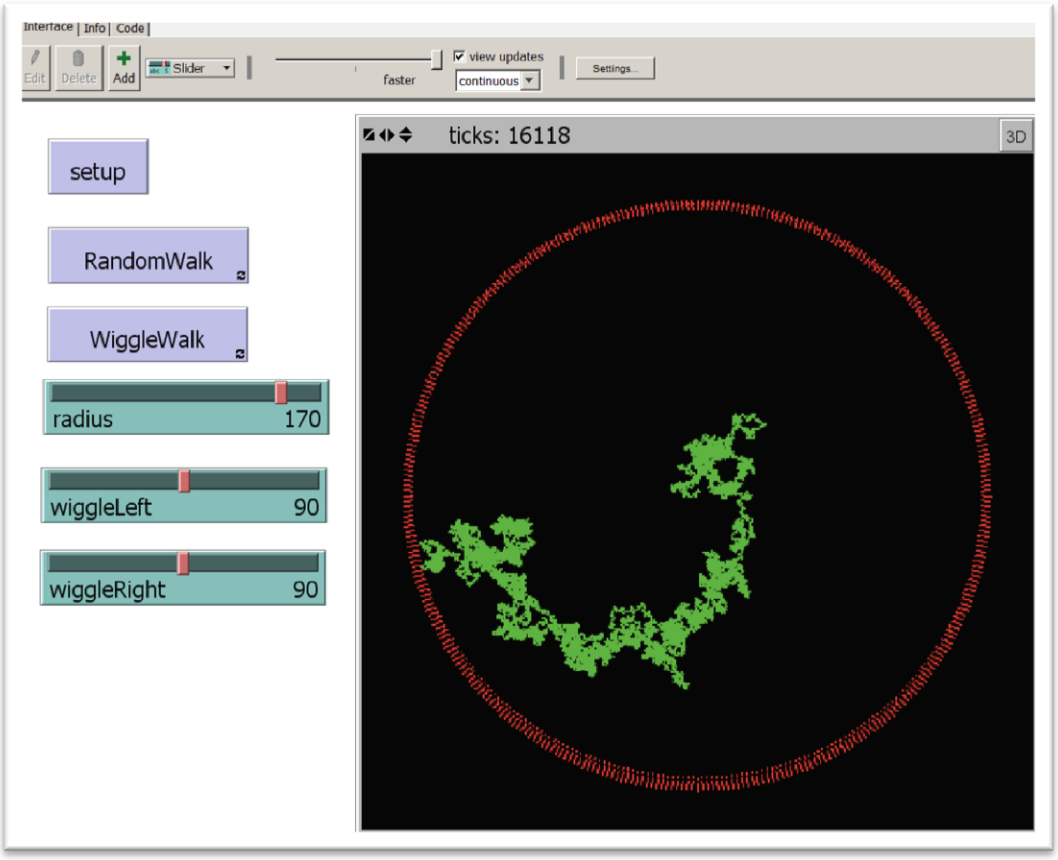
Lab 4: NetLogo Experiments in the Random Walk and Wiggle Walk



In this lab, you will be writing program that lets you experiment with two different types of turtle movement: the "***random walk***" and the "***wiggle walk***". These simple movements have useful behaviors and we will use them in more advanced models later in the semester.

There are two NetLogo video lectures this week:

1) NetLogo and the Random Walk
2) NetLogo and Wiggle Walk

These videos explain the two types of walks and show how to create and use the ***slider*** Graphical User Interface to control the value of ***variables***.

The screen capture above shows the required layout of your program's interface tab.

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The red circle is the boundary circle and must be drawn by code in the "**setup**" button. It must be centered at the origin and have a radius specified by the "**radius**" slider. You may do this any way you like. Below is an ***algorithm*** that you may choose to use (An algorithm is a set of step-by-step instructions for solving a problem).

Algorithm for Drawing a Circle with a Specified Radius and Centered at the Origin
1) Create one turtle and set its color to red.
2) Create a local variable, **`angle`**, and set its value to zero.
3) Loop for 360 times. In each iteration of the loop, do the following:
3a) Lift the turtle's pen
3b) Move the turtle to the origin.
3c) Set the turtle's heading to the value of **`angle`**.
3d) Move the turtle forward a distance equal to the radius slider setting.
3e) lower the turtle's pen and move forward 4 or 5 steps.

How many licks does it take to get to the center of a Tootsie Pop?

In this lab, you will be trying to establish some general principles about the average number of steps in each of two types of walks needed for the turtle to travel a specified distance.

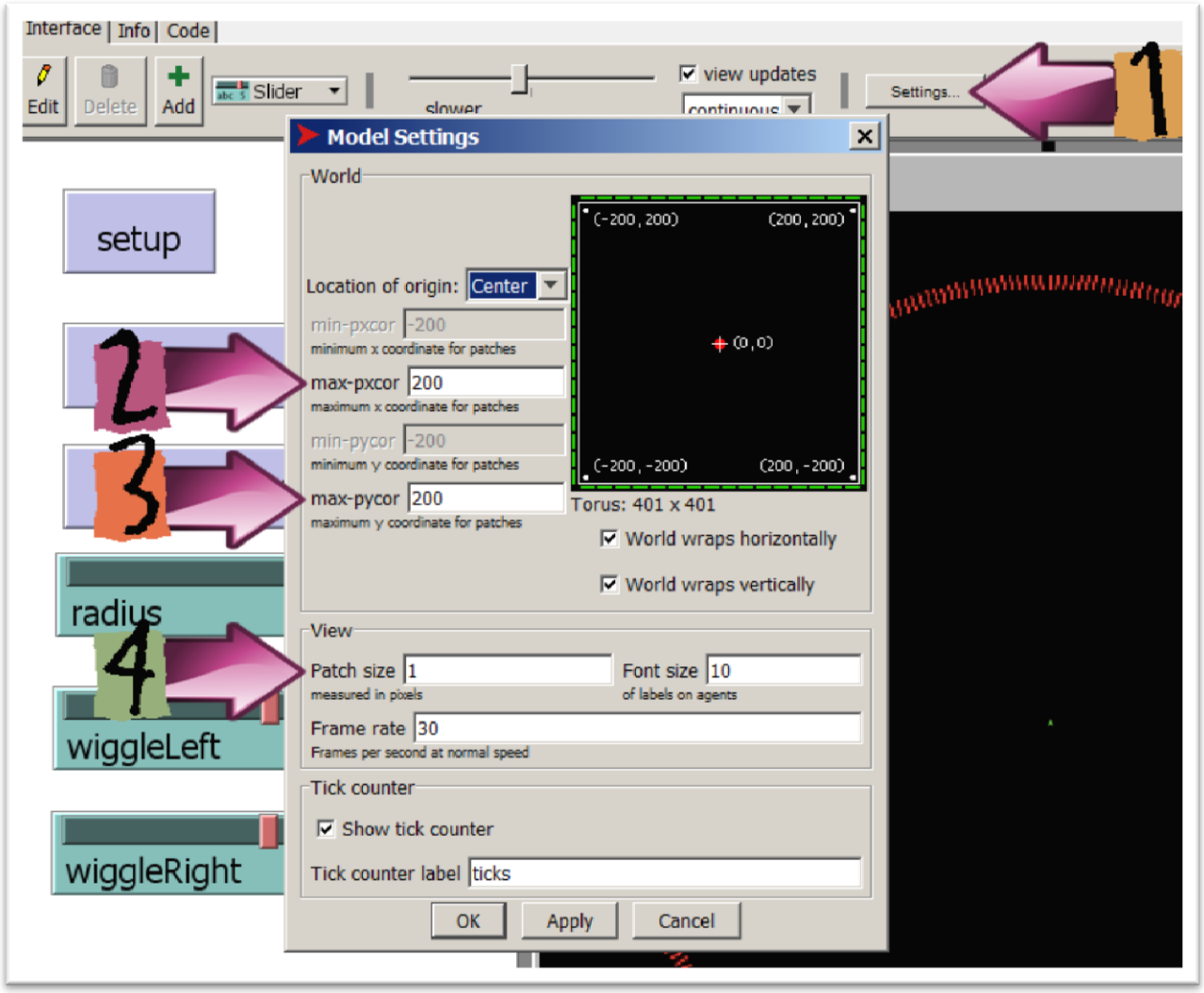
In general, when working with random processes, answers will need to be qualified as "on average" or "usually". The randomness of the process means that every time you run your model your answer will be somewhat different, yet the average behavior of many random events is highly predictable (this is why casinos make a profit without needing to cheat).

In order to be ***quantitative*** with our experiments, we need a way of counting each step taken in the two different types of walks. For this, we will use Netlogo's built-in ***tick*** feature. In the screen capture on the first page, the random walker took approximately 16118 steps before it reached the boundary circle. The number of steps is approximate because as the walker neared the boundary circle, I slowed

the model speed and tried to click off the "RandomWalk" button when I believed the walker touched the boundary.

reset-ticks	Call this at the end of setup.
tick	Advances the tick counter by one. Call this ONCE EACH TIME the walker takes a STEP in both "RandomWalk" and in "WiggleWalk". It must be called OUTSIDE any **ask turtle** blocks.

NetLogo's default World View settings show an area from -16 to +16 on the x and y-axis. For this lab, you will need to change these settings. The **max-pxcor** and **max-pycor** must be 200 while **min-pxcor** and **min-pycor** must be -200. To keep this from making a world too large to fit on your display, set the **Patch size** to 1 pixel.



In this model, each experiment is a run where the user:

1) Sets the "radius" slider.

2) Clicks "setup".

3) Clicks either "RandomWalk" or "WiggleWalk" and lets the selected walker continue until it touches the boundary circle.

3) Records the number of ticks.

Each student in the class is assigned an owl: "Barn", "Long-eared", "Snowy", or "Screech". After writing your program, you must perform 10 experiments with

each of the two radius settings required by your owl type for each of the two walks. Thus, you will perform 40 experiments.

Required Radius (for Random and Wiggle) & Left/Right Turn (for Wiggle)		
Barn	Radius: 10 and 100	Left: 90°, Right 90°
Long-eared	Radius: 20 and 200	Left: 45°, Right 45°
Snowy	Radius: 80 and 150	Left: 90°, Right 45°
Screech	Radius: 40 and 130	Left: 120°, Right 90°

Grading Rubric [20 points total]:

[A: 2 points]: Submit Two documents to your instructor:

1) NetLogo source code named: `W4.`*firstname*`.`*lastname*`.nlogo`.

2) A graph showing the results experiments run by three different students. Your graph may be hand drawn using the attached graph paper or printed from a spreadsheet program.

[B: 2 points]: The first few lines of your code tap are comments including your name, the date, your school, and the assignment name (Lab 4: NetLogo Experiments in the Random Walk and Wiggle Walk).

[C: 2 points]: The code in the code tab of your program is appropriately documented with "inline comments".

[D: 3 points]: Your sliders are set up correctly as show below:

Slider	Minimum Value	Maximum Value	Increment
Radius	1	200	1
WiggleLeft	0	180	1
WiggleRight	0	180	1

[E: 5 points]: Program runs correctly:

- When "setup" is clicked, the NetLogo world is cleared and a circle centered at the origin is drawn with the radius specified by the "radius" slider.

- When "randomWalk" is clicked, a walker starts in the center and repeatedly takes one step per tick in a random direction as specified in the video.
- When "wiggleWalk" is clicked, a walker starts in the center and repeatedly makes a turn to the left by a random number of degrees from 0 through the "wiggleLeft" slider specified degrees, makes a turn to the right by a random number of degrees from 0 through the "wiggleRight" slider specified degrees, then takes one step as specified in the video.

[F: 4 points]: Data collected correctly. Your data sheet includes:

- The owl type assigned to you and the results of each of the 40 experiments you ran.
- The average number of steps of in the 10 experiments you ran for your owl's two required radii for the Random Walk and for the Wiggle Walk (a total of 4 averages).
- The average number of steps calculated by students of the three owl types different then your own. You do not need the number of ticks from each of their experiments, just the averages. This is a total of 12 averages – 4 from each of 3 other students.

[G: 2 points]: Create a graph of the Random Walk data with radius on the horizontal axis and number of steps on the vertical axis. Your graph must include the 16 average reported in your info section.

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Lab 4: NetLogo Experiments in the Random Walk and Wiggle Walk				
Name:				
Date:				
School:				
Owl Type:				
	RANDOM 1	RANDOM 2	WIGGLE 1	WIGGLE 2
Radius				
Left Turn Angle				
Right Turn Angle				
Experiment No	Number of Ticks			
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Average (Mean)				
Other Students Average Data				
Student Name/ Owl Type	RANDOM 1	RANDOM 2	WIGGLE 1	WIGGLE 2

CS 4 all

TITLE	
NAME	DATE