

CPS111 Victory Thru Scratch Lab

Introduction:

Computer Science (or computational science) is all about algorithms – those lists of steps that carry out some sort of task. Therefore to better understand computer science we trace and create many algorithms on paper. However, it is more fun to feed an algorithm into a computer, using some sort of programming language, to see what happens. This is where Scratch comes in – it is both simple enough for a first time programmer and yet powerful enough to allow a more experienced programmer to be creative.



In this lab, you will be given the opportunity expand your understanding of algorithms and hopefully learn about most of the instructions available within Scratch.

Part A: Getting Started

1. Login to our class account
2. Click on the Scratch icon (the cartoon cat) on the dock. (This will start Scratch with a default Scratch project.)
3. Click the “Want Help?” button at the top right of the IDE (integrated development environment). *List on your lab write-up sheet the 4 different types of available help and give a short description of each.*

Part B: Developing a Sprite

The definition of sprite is a “two-dimensional/three-dimensional image or animation that is integrated into a larger scene.” There can be multiple “sprites” wandering around the stage at the same time during the execution of a Scratch program. Each sprite can be controlled by statement lists known as “scripts”. In this lab section, you will be given the opportunity to create a couple of different sprites.

1. At this point, you have a default Scratch program containing one sprite appearing on your Scratch IDE (integrated development environment)
2. Right-click (ctrl click) the sprite and delete it.
3. Click the “paint new sprite” button.
4. The “Paint editor” window comes up. At this point you have 2 choices – either paint your own sprite or import a graphic (gif or jpg). For this lab step, I want each lab partner to paint a sprite which represents their favorite animal. (take no more than 5 minutes – your lab partner will time you.)
5. Now browse the Internet and find 2 pictures that you can make into sprites. (Right-click these graphics and save onto the desktop.) For each of these new sprites, click the “paint new sprite” button and import from desktop.
6. Change the name of each of the sprites to names that better represent them: click a sprite in the “sprite list” (bottom right) and then double-click the current name of the sprite in the “sprite info area” (middle top) – now type in the new name for the sprite.

7. *Get a TA to admire your 4 new sprites and initial your write-up form.*
8. Drag a “hide” and “show” block (from the Looks blocks) onto the scripting area for each sprite. Go to each sprite and double-click the “hide” block.

Part C: Motion, looks, and Pen Blocks

Motion Blocks

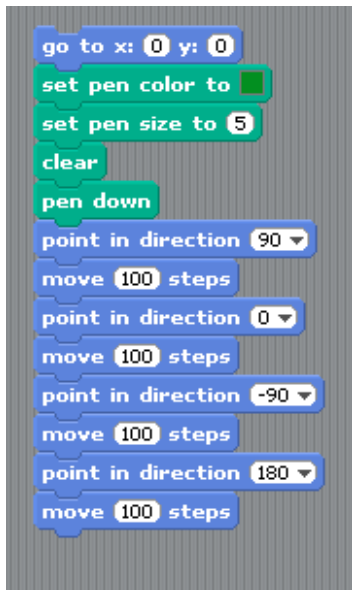
1. Let’s add a little motion to your sprites. Select the first sprite you created (double-click it’s “show” sequence block) and then click on the “Motion button” in the top left – the “motion blocks palette” will appear on the left of the IDE.
2. Click and drag the “move 10 steps” onto the scripts area.
3. Double-click the “move 10 steps” block that is now in the scripts area.
4. Change the number of steps from 10 to 100. Double-click the “move 100 steps” block again. Double-clicking a scripting block allows you to run only that instruction (or set of instructions).
5. Drag the move, turn, point, go, glide, change, and set motion blocks onto the scripting area and double-click and change any control values until you are certain what the instruction blocks do. (Note: Sometimes your sprite will wander off the stage - you may then drag the sprite back into the center of the stage) *On your write-up, describe what each instruction does.*
6. The bottom 4 blocks are a bit unique and I will describe these in class.
7. Let’s try grouping blocks together. Click and drag each block out of the sprite’s scripting area. Now, drag the glide block with x:0 and y:0 to the scripting area. Next drag the walk 100 steps block onto the scripting area and link it onto the bottom of the glide block. Click the group of blocks (block sequence.) *Describe what is happening on the write-up sheet.*
8. Drag this block sequence out of the scripting area. Now create a new block sequence that makes the sprite make a clockwise circle around the stage – starting at the top left and ending at the top left. (This should only be a block sequence.) At the end of the execution, the sprite should be in the exact same place and also pointing the same direction. *Have a TA admire your work and initial your write-up form.*

Look Blocks

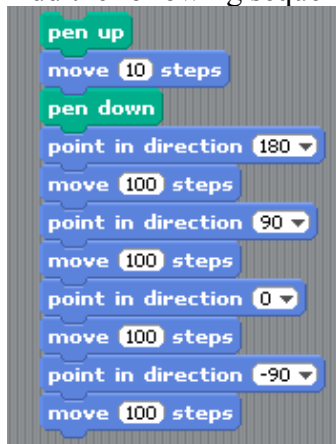
1. Remove the block sequence.
2. Click on the “Look button”.
3. Drag the say, think, change, set, clear, show, and hide look blocks onto the scripting area and double-click and change any control values until you are certain what the instructions do. *On your write-up, describe what each instruction does.*
4. The go and costume instruction are difficult understand – I’ll explain them in class.

Pen Blocks

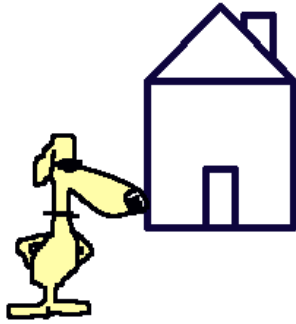
1. Remove any blocks from the scripting area
2. Click on the “Pen button”
3. Assemble the following block sequence:



4. Execute the block sequence and describe the results on the write-up sheet.
5. Add the following sequence block to previous sequence block.



6. Execute the block sequence and describe the results on the write-up sheet.
7. Create one sequence block that draws a house with a door, 2 windows, chimney, and pitched roof. At the end of the execution, your sprite should be to the left of the house and standing upright (see my example below – however your house should include windows.) *Have a TA admire your house and initial your write-up form.* (HINT: The Pythagorean theorem will come in handy when you are trying to figure out how many steps your sprite should take as it is creating the roof for your house.)



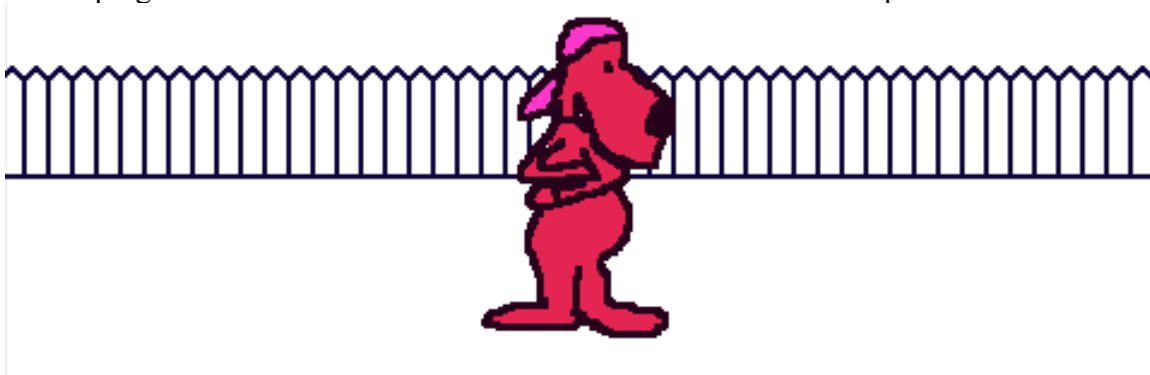
Part D: Control and Sensing

Control Blocks

1. Select another sprite by clicking another sprite in the bottom right list of sprites. Double-click its “show” sequence block so that it appears on the stage. Hide the other sprite.
2. Click on the “Pen button” and drag onto the scripting area the “clear” block. Now, double-click the clear button.
3. Create a block sequence which will draw a picket (see right) which is approximately 10 pixels wide by 40 pixels high. (Place the clear block before the picket sequence – so that the stage is cleared before the sprite draws.)
4. *Try the following blocks with your picket sequence and explain their functionality in the lab write-up.*



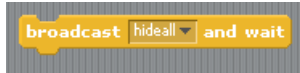
5. Make the sprite draw the picket at location x: -200 and y:0. What sequence block will you need to include before you create the picket? (Hint: It is found in the “motion” sequence blocks)
6. Now let’s get the sprite to create 2 pickets – beside each other. (Hint: Your sprite will need to pickup its pen, move and then put down its pen again. When your sprite picks up its pen, it can move without writing.)
7. Now you are ready for your sprite to create an entire picket fence. Use some type of looping construct found in the control blocks to create the entire picket fence.



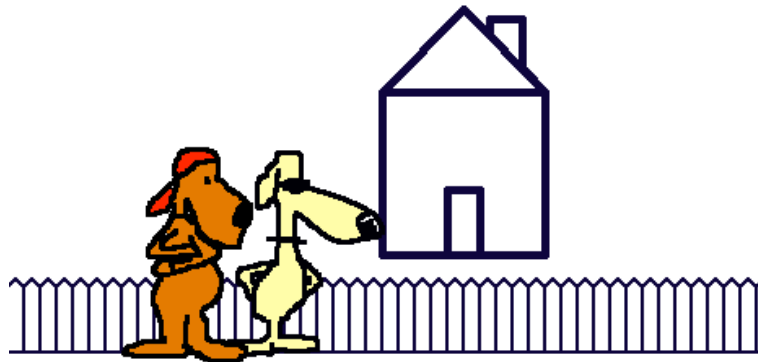
8. *Have a TA admire your fence and initial your write-up form.*
9. Now it's time to build both the house and fence – using two separate sprites. Let's start by selecting the house building sprite and dragging a “when greenflag” sequence block onto the scripting area of the house building sprite.
10. The “when greenflag” sequence block will cause a script to be executed when someone clicks the green flag.
11. Click and drag a “broadcast and wait” block underneath the “when greenflag” block.
12. Within “broadcast and wait” block pull down and select new within its pulldown menu.
13. Within the resulting popup type “hideall”.
14. Within each sprite's scripting area put the following block sequence:



15. Go to each sprite and double-click “show” – thereby showing all sprites.
16. Go back to the house building sprite and double-click the following block:



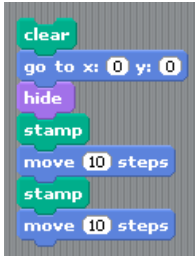
17. *Describe what happens on the write-up form.*
18. Let's have the actions of 2 sprites occur in sequence using the broadcast block.
 - a. The first sprite will build the house, stand beside the house, and send a message to build a fence.
 - b. The second sprite will wait for message, build fence, and stand beside fence.
19. The resulting stage should look something like this:



Note: if your fence is overlapping with your house then the house can be seen through the fence. Why? Remember we didn't color the fence.

20. *Have a TA admire your house and fence and initial your write-up form.*
21. There is another way to create the fence – using an actual fence sprite.
22. Create a new sprite (a single picket) – inside the paint editor draw a picket with width:10 and height:40. Hint: Use the smallest brush size and use the x,y position from the stage to see the position of your paint brush. Fill the picket in with your favorite fence color.
23. The “stamp” block under the “Pen” section allows a sprite to leave a self-portrait at its current location.

24. Try this sequence: move the picket sprite to the center of the stage and stamp and move 30 steps and stamp. Here is the sequence:

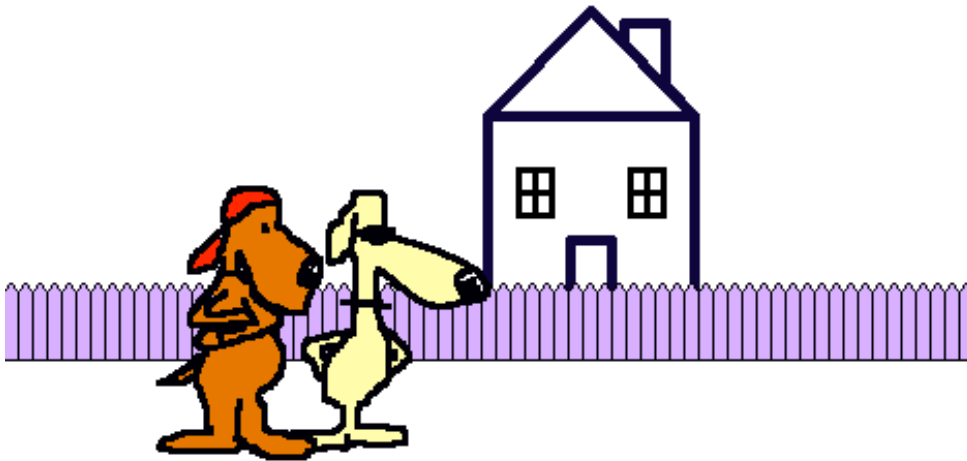


25. *Describe what happens on the lab write-up sheet.*

26. Create a fence using this stamp instruction – the fence should cross the entire yard.

27. Come up with the new “broadcast/when I receive” pair that will build a house, the new fence and show both sprites on the stage.

28. The resulting stage should be something like this:



29. *Have a TA admire your house and new fence and initial your write-up form.*

Part E: Working With Variables and Numbers

I'll go over setting and working with numbers during class.

Part F: Final Look at Scratch

1. Design a Scratch program which will have one of your unused sprites write your name on the stage (perhaps using block letters) and then the sprite should ask another unused sprite to write your lab partner's name. Your objective is to use the minimum number of instructions.
2. *Have a TA admire your Scratch signatures and initial your write-up form.*