Learning

to

SCRATCH

Version 1.4

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Kids Tech University
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Presented by the MyVICE Project
from the Synergy Laboratory
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Invent the Future

Lesson 1: Starting Scratch and Animating Your Sprite

Have you heard of Scratch? No, not what you do to your itch, but Scratch from MIT. If you have not heard, seen, or played with Scratch, then you've been missing out … because it is a lot of FUN!!!

Overview: What Can You Do With Scratch?

Scratch is a computing environment that makes it easy to create your own interactive stories, games, and animations and then to share your creations with others over the Internet, if so desired. As you create and share Scratch projects, you learn important mathematical and computational ideas, while also learning to think creatively, reason systematically, and work collaboratively.

Developed by MIT Media Lab (http://llk.media.mit.edu), Scratch is a computing environment for kids, both young and old (or "young at heart"). It is easy to learn and use. You can create animations like never before; you can even create games. Once you start, you will be just like me: Can't Scratch Enough!

As shown below, the STAGE is where you see your stories, games, and animations come to life. Sprites move and interact with one another on the STAGE. The SPRITE LIST displays thumbnails for all sprites in a project. The name of each sprite appears below its thumbnail. To animate (or "program") a sprite, you drag blocks from the BLOCKS PALETTE to the SCRIPTS AREA. To run a block, click on it. You can then snap blocks together into a stack of blocks to create a "Hollywood" script for your sprite. Click anywhere on the stack of blocks to run the whole script (from top to bottom).
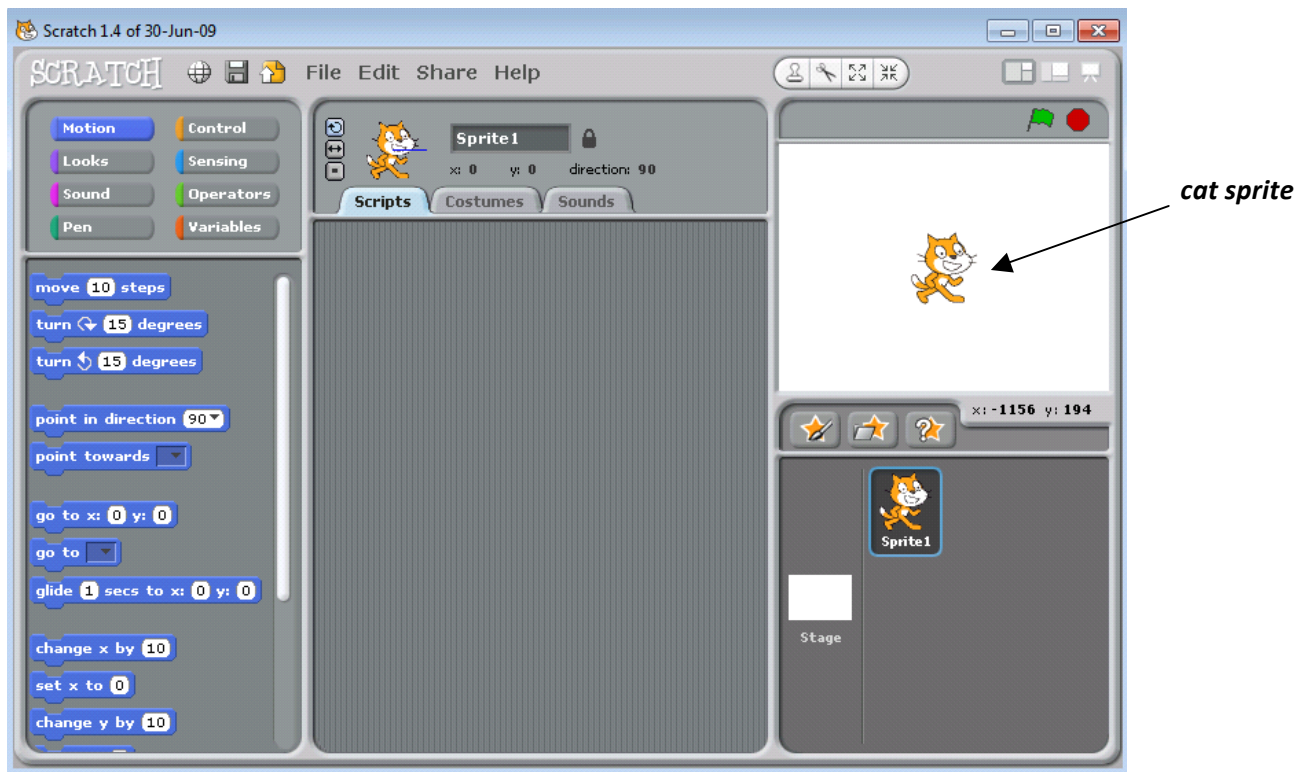

Without further ado, let's start to Scratch!

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Step 1: Getting Started with Scratch

Start the Scratch Program by clicking on the Scratch.sb icon that has been placed on your desktop for Kids Tech University:

When you start a new Scratch project, you will see the following window appear on your desktop:

On the STAGE in the upper right of the figure, you will see a single _cat sprite_. In the SPRITE LIST in the lower right of the figure, you will see that the name of that single cat sprite is `Sprite1`.

Scratch projects are made up of these objects called _sprites_. You can make a sprite look like a person or a train or a butterfly or anything else. You can give instructions to a sprite, telling it to move or play music or react to other sprites, for example. To tell a sprite what to do, you snap together graphical blocks (similar to snapping together Lego blocks) into stacks that are called _scripts_. When you click on a script, Scratch runs the blocks in that script from the top to the bottom.

Step 2: Animating the Cat Sprite

Moving Forward Using a Single Scratch Block

First, you need to choose the right sprite to animate. The sprites are listed in the SPRITE LIST area (i.e., lower right corner of the Scratch window shown below). Select the cat sprite, i.e., Sprite1, by clicking on the Sprite1 icon.

Sprite1 icon
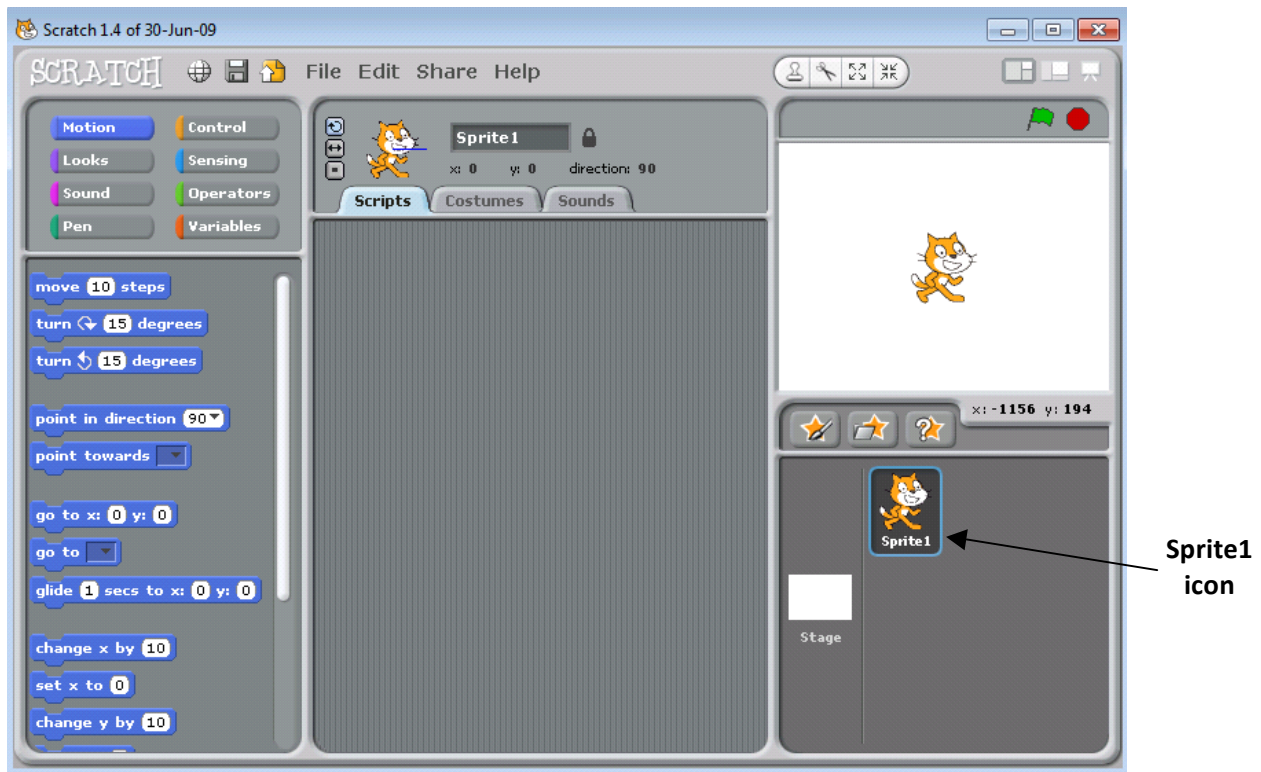
Let's start animating the cat sprite by making it to move in the forward direction.

First, click on the [Motion] button in the BLOCKS PALETTE area (i.e., upper left corner of the Scratch window).

Next, select the "move 10 steps" block (i.e.,) and drag it to the SCRIPTS AREA, as shown below:
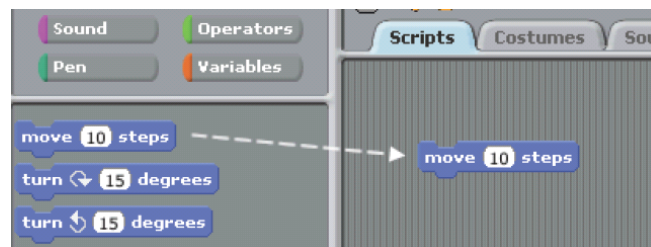
This block tells the sprite what to do. One way to execute or run the block (also referred to as a single-block script) is to click on the blue part of the block. That is, to make the cat sprite move 10 (tiny) steps forward, click on the `move 10 steps` block in the SCRIPTS AREA.

Let's now move the sprite forward 50 steps instead of 10 steps. In order to do this, simply change the number of steps from 10 to 50 by clicking once on the number 10 inside the "move" block and typing 50. Now if you click on the new "move 50 steps" block, your sprite will move forward 50 steps.
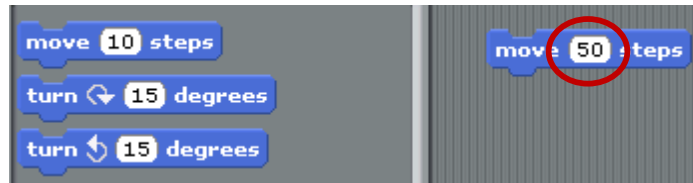

Note: If your sprite is not fully visible on the STAGE (e.g., when it moves towards the extreme edges of the STAGE), you can click-and-drag the sprite back to any location on the STAGE.

Moving Forward and Backward with Two Scratch Blocks in a Script

If you want your sprite to move both forward (50 steps) and backward (40 steps) in one script, you need to stack your blocks. Let us see how to stack blocks.

Drag another "move 10 steps" block from the BLOCKS PALETTE area[1] and stack it below the already existing move block in the SCRIPTS AREA, as shown to the right. Change the number of steps to 50 in the first "move" block, if you have not already done so, and to -40 (number of backwards steps) in the second "move" block. This will make your sprite move 50 steps forward and then 40 steps backward, i.e., -40.
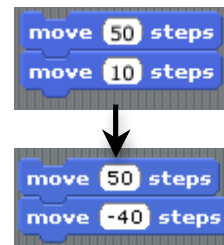
To run this script (i.e., animate the sprite), click on any of the two blocks of your script. (*Please remember that the sprite will stop moving once it reaches the edges of the STAGE. You can bring it back by clicking-and-dragging the sprite to your desired location on the STAGE.*)

What do you observe by running the above script? It should appear as if the sprite moves only in the forward direction. Does this mean that the cat sprite ignored the "move -40 steps" instruction block? **No.** It is following both of your instructions, but the computer is executing the instructions too fast for us to see. (Remember how fast the Watson supercomputer was in Jeopardy!)

To be able to observe both the forward and backward movement of the cat sprite, you need to introduce a delay between the two "move" blocks by using a "wait" block, i.e., `wait 1 secs`

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[1] If you do *not* see the "move 10 steps" block, make sure that the [Motion] button in the upper-left corner of your Scratch window is selected.

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                                          http://synergy.cs.vt.edu

To add this "wait" block, click on the [Control] button in the BLOCKS PALETTE area (i.e., upper left corner of the Scratch window) and drag the "wait 1 secs" block between the "move" blocks, as shown below.

Now, run your script by clicking on any of the blocks. The "wait 1 secs" block inserts a delay between the move blocks so you can clearly see the forward and backward movement of your sprite.

Until now, you have run your script by clicking on any block in the script. Now let's see another way to run your script by using the "green flag" block, i.e.,

The "green flag" block can be dragged from the BLOCKS PALETTE area to the SCRIPTS AREA. This block should be stacked on top of your script, as shown below.

You can now run your script now by clicking the GREEN FLAG ( ) at the top-right corner of your Scratch window and above the STAGE area.

Again and Again and Again …

What if you want to run the same script again and again? Use the "forever" block.
… but where is the "forever" block?

First, click on the [Control] button in the BLOCKS PALETTE area (i.e., upper left corner of the Scratch window). In the BLOCKS PALETTE area, you should see the "forever" block appear. Drag the "forever" block in-between [when 🏳 clicked] and [move 50 steps]
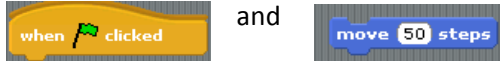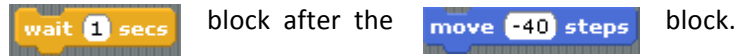
The resulting script should now look like the picture below. The "forever" block runs the set of three blocks (move 50 steps, wait 1 secs, and move -40 steps) that it encompasses over and over again.
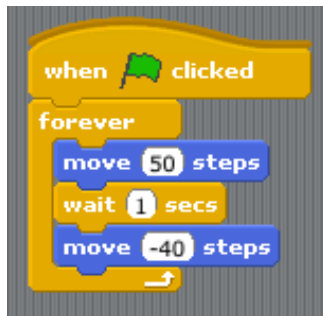
Run the script by clicking the GREEN FLAG (🏳) at the top-right corner of your Scratch window and above the STAGE area. The sprite does the following actions: "move forward 50 steps, wait 1 second, and then move backward 40 steps" *forever*. To stop execution of the "forever" block is halted by pressing the stop sign (i.e., 🔴) at the top-right corner of the Scratch window above the STAGE area.

A big problem with the above script is that it is hard to see the cat sprite actually go backwards 40 steps. (You may see a quick backward flicker, but that's it.)   One way to address this is to insert another "wait" [wait 1 secs] block after the [move -40 steps] block.

The resulting script should now look like the picture below. The "forever" block runs the set of four blocks (move 50 steps, wait 1 secs, move -40 steps and wait 1 secs) that it encompasses over and over again.

Run the script by clicking the GREEN FLAG (🏳) at the top-right corner of your Scratch window and above the STAGE area. The sprite does the following actions: "move forward 50 steps, wait 1 second, move backward 40 steps and wait 1 second" *forever*. To stop execution of the "forever" block press the stop sign (i.e., 🔴) at the top-right corner of the Scratch window above the STAGE area.

Again and Again and Again … But Not Forever

A convenient way to run a script for only a *specified number of times* (instead of forever) is to replace the "forever" block with the "repeat" block, which you will see next.

Drag the "repeat" block ( ) from the BLOCKS PALETTE area[2] and place it below the already existing script with the "forever" block in the SCRIPTS AREA, as shown below.

The "repeat" block will run the blocks that it encompasses for the specified number of times shown in the "repeat" block – the default is 10. In order to have the script consisting of "move 50 steps, wait 1 second, move -40 steps, and wait 1 second" repeated only 5 times, we do the following:

1. Click and drag any of the blocks from inside the "forever" block and move them inside the "repeat" block.

2. Click on the number field in the "repeat" block and change the number of times to repeat from 10 to 5.

Now, instead of moving the cat sprite forever (or until it reaches the edge of the STAGE), the sprite will repeat the sequence of "move 50 steps, wait 1 second, and move -40 steps" only 5 times. In total, the cat sprite will move forward by 10 * 5 = 50 steps. To see that this is the case, click on the "repeat" block to run the script.
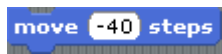

Special Effects

You have reached the final section of our lesson. You will end the lesson by playing with a few blocks that reside in the BLOCKS PALETTE area when the [Looks] button is pushed. In short, you will add some special effects to the cat sprite by making it think, say "Hello!" and even change color.

In order to have the following sequence repeat 5 times: "Move 50 steps, wait 1 second, think Hmm… for 2 secs, say Hello! for 2 secs, change color effect by 25, move -40 steps and wait 1 secs", you do the following:

1. Click on the [Looks] button in the BLOCKS PALETTE area (i.e., upper left corner of the Scratch window).

2. Click and drag the "think Hmm… for 2 secs" ( ) block in-between the first block of the script and block.

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[2] If you do *not* see the "repeat" block, make sure that the [Control] button in the upper-left corner of your Scratch window is selected.

3. Click and drag the "say Hello for 2 secs" (`say Hello! for 2 secs`) block in-between the

   `think Hmm... for 2 secs` block and `move -40 steps` block.

4. Click and drag the "change color effect by 25" (`change color effect by 25`) block in-between

   the `say Hello! for 2 secs` block and `move -40 steps` block.

The resulting script should now look like the picture to the right.

In summary, the cat sprite will repeat the following sequence *five times*: "move 50 steps, wait 1 second, think Hmm… for 2 secs, say Hello! for 2 secs, change color effect by 25, move -40 steps and wait 1 secs."
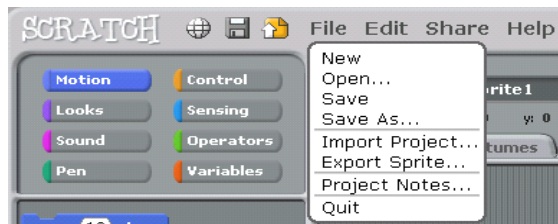
To save your project, click the "*File*" menu in the top of the window, and select the "*Save*" option from the "*File*" menu.
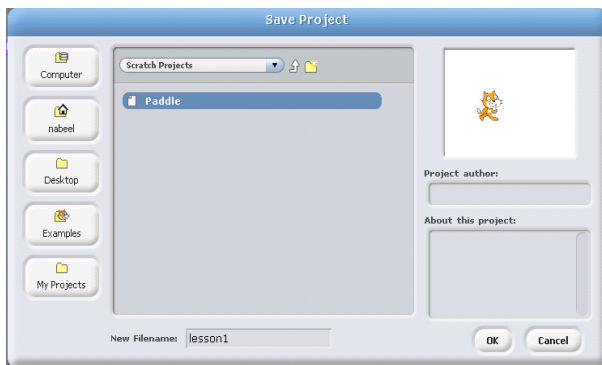
Enter "Lesson1" as the New Filename and click OK to save your project.