



Interactive Art

One of the most popular uses for Scratch is the creation of art. Have you ever wanted to animate a digital creation? Or have you ever wanted your artwork to change color or shape as the viewer interacts with it? With Scratch, you can add those features! Scratch allows you to enhance your images, drawings, sketches, and other digital creations with code to make your art dynamic or interactive.

Parallax: Adding Depth to a Landscape

Imagine you are driving down the highway looking out the window. Houses, trees, and signposts zip by as you move. On the horizon, a lake appears; the lake creeps closer and closer and then retreats as you zoom by. In the distance, the mountains loom, hardly seeming to move at all.

When you are in motion, objects closer to you seem to move more than those farther away. This visual effect is called “parallax.” Animators use parallax to create depth when designing anything from simple illustrations to complex video games. Astronomers use the parallax of stars to estimate distances between them.

In this interactive Scratch art project, you’ll write code to create the parallax effect in a landscape scene. The landscape will consist of five layers, with each layer containing some element (or elements) of the landscape. The Stage backdrop will be the bottom layer and will only show the sky and sun. The second layer will include the mountains, the third layer will include some of the forest, and so forth. You’ll create code so that each layer moves side-to-side as you move the mouse back and forth. The closest layer will move the most. The backdrop won’t move at all. By making closer layers move more than farther layers, the scene will gain apparent depth.



Figure 1 Parallax

The background appears stationary.

Objects farther from the viewer appear to move slowly.

Objects closer to the viewer appear to move more quickly.

Getting Started

1. Open the Scratch editor window at <http://scratch.mit.edu/projects/editor>
2. From the File menu, choose “Load from your computer”.
3. Select the “Interactive Art.sb3” file and open it.

The Scratch window is divided into three main sections:

- A. Stage and Sprites**—The upper-right section of the Scratch window is the Stage. This is where the action happens! Below the Stage, you'll see all the sprites used in your Scratch project. Sprites can be anything from game elements to story characters to user instructions.
- B. Sprite Code**—The center section is where you create programs for each sprite.
- C. Block Palettes and Code**—The interlocking blocks on the left, organized into palettes such as Motion, Looks, and Variable, are the code you use to control sprites and the Stage. You will drag blocks from this section into the Sprite Code section to create your programs.

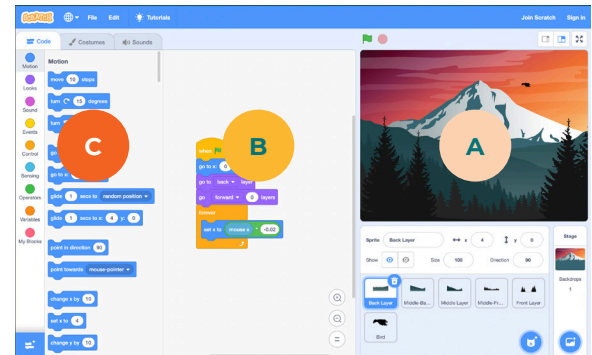


Figure 2 The Scratch Window

By starting with the Interactive Art.sb3 file, you'll already have six sprites and the Stage.



A mountain/sunset backdrop for the Stage—In this project, the backdrop is the most distant layer of the landscape; it will not move. The landscape sprites will all move in front of the backdrop.



Five incomplete landscape sprites—These sprites form the landscape layers and elements that will move in response to the movement of the mouse. You will create code to make these landscape sprites move in such a way as to produce the parallax effect.



One incomplete bird sprite—The bird sprite will fly across the landscape to give the scene an interesting embellishment.

Landscape Sprites Code

Now it's time for you to start coding! You'll start by creating the code for the five landscape sprites.

4. Select the Back Layer sprite in the Sprites section (bottom-right of the Scratch window).
5. Look in the Palettes section to find the blocks in **Figure 3**. Drag the blocks to the Sprite Code section (center of the window) and snap the blocks together to create the program in Figure 3.
6. All the other landscape sprites use the same program as the Back Layer sprite, except you'll need to make some small, but important, changes to the values in the blocks. Start with the Middle-Back Layer. First, select the Middle-Back Layer sprite. Construct the same program as you did for the Back Layer sprite, but insert the correct values, shown in **Table 1**, for the "go forward layers" and "set x to" blocks. Then, repeat this process for the remaining landscape sprites: Middle Layer, Middle-Front Layer, and Front Layer.
7. Try it out! Click the green flag above the Stage to run your program. Position your mouse so the pointer is over the Stage, and then move the mouse from side to side. The landscape sprites should move back and forth. You can modify the values in the "set x to" blocks to fine-tune how much you'd like them to move.

See page 4 for tips on building the code.

| Table 1 | | |
|--------------------|-------------------|--------------------|
| Landscape Sprite | go forward layers | set x to mouse x * |
| Back Layer | 0 | -0.02 |
| Middle-Back Layer | 1 | -0.05 |
| Middle Layer | 2 | -0.09 |
| Middle-Front Layer | 3 | -0.12 |
| Front Layer | 4 | -0.2 |

Think about how the code works:

- A. After the program starts (the green flag is clicked), the next three blocks set the starting position of the sprite. All the sprites sit in front of the Stage. So when the Middle-Back Layer sprite starts at the back layer and moves forward by one layer, it will appear in front of the Stage and the Back Layer sprite, but behind the other landscape sprites (Middle-Back Layer, Middle Layer, and Front Layer).
- B. The "forever" loop moves the landscape sprite side-to-side as you move the mouse back and forth across the Stage.
 - The motion is accomplished by a "set x to" block. The "set x to" block changes the horizontal position of the sprite to a specified value. In this case, that value depends on the mouse's position.
 - The "mouse x" block reads the position of your mouse pointer. By multiplying the mouse's position by a small number, the large motion of your mouse pointer is translated into the smaller motion of the landscape sprite. The greater the value of the number in the multiplication block, the more the landscape sprite will move. As you can see in **Table 1**, the Front Layer sprite has a much larger constant than the Back Layer sprite.

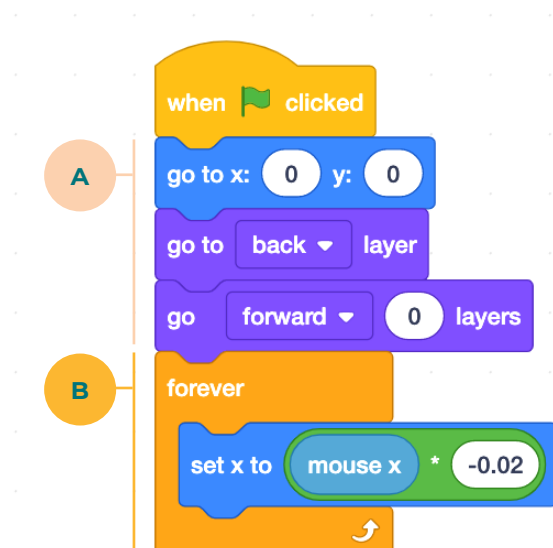
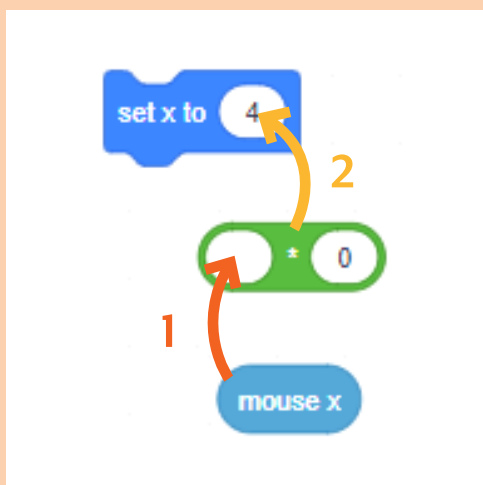


Figure 3 Back Layer sprite code

Tip

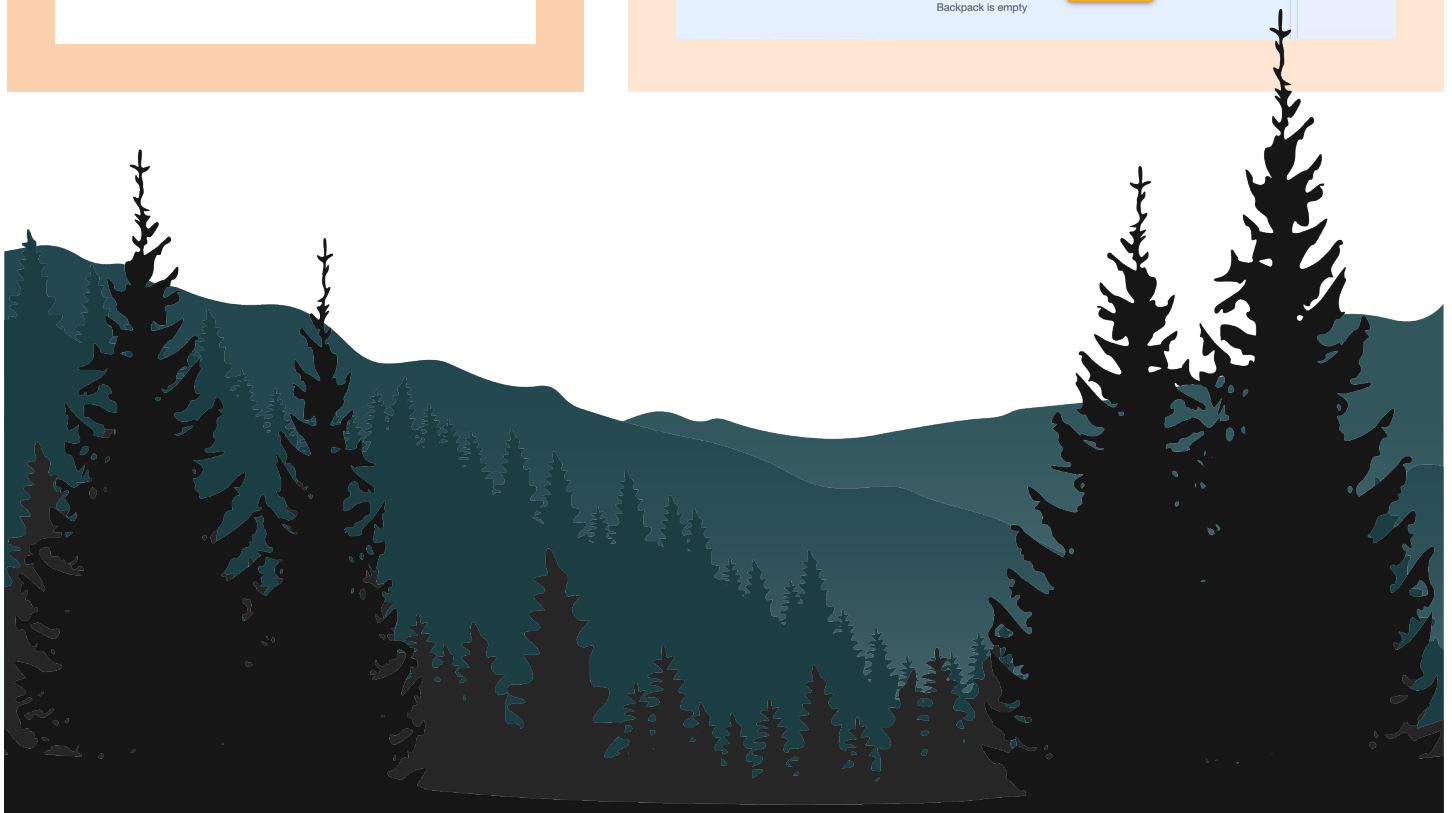
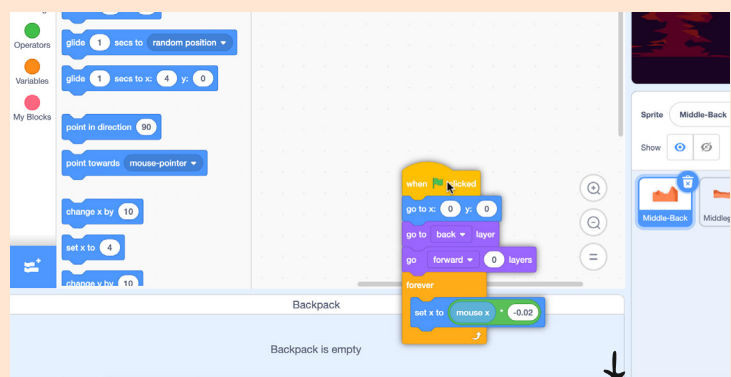
To build the “set x to” block in the program in **Figure 3** on page 3, insert the “mouse x” block into the “multiplication” block, and then insert the “multiplication” block into the “set x to” block. Finally, change the value in the “multiplication” block to “-0.02”.



Use Your Backpack

Note: If you are logged into a Scratch account, the easiest way to duplicate the Back Layer code is to use your Backpack.

1. While logged into your Scratch account, open your Backpack by clicking the Backpack bar at the bottom of the Scratch editor.
2. Drag the Back Layer code into the Backpack. Doing so will place a copy of the code in your Backpack.
3. Switch to another landscape sprite, and drag the code from the Backpack into the Sprite Code area.
4. Edit the “go forward layers” and “set x to” blocks as necessary!



Bird Sprite Code

Next, create the code for the Bird sprite. This sprite has eight costumes that are used to make the bird look like it is flying.



8. Select the Bird sprite in the Sprites section.
9. Create the **Figure 4** program in the Sprite Code section using the blocks from the Palettes section.
10. Once you've completed the Bird sprite code, click the green flag to see your finished interactive art project!

Think about how the code works:

- A. When the program starts (the green flag is clicked), the bird sprite goes to the same layer as the Middle-Front Layer sprite.
- B. The "forever" loop controls the motion of the Bird sprite. At first, the Bird sprite moves to the far left side of the Stage ($x = -240$) and hides. Then, it waits 1 to 3 seconds, moves to a vertical position between $y = -40$ and $y = 120$, and reappears.
- C. The "repeat until" loop moves the Bird sprite from its location at the far left side of the Stage to the right side of the Stage (i.e., its x position is greater than 240). The bird's motion is animated by switching from one costume to the next. You can make the Bird sprite move faster by shortening the "wait" time or increasing the "move" steps.

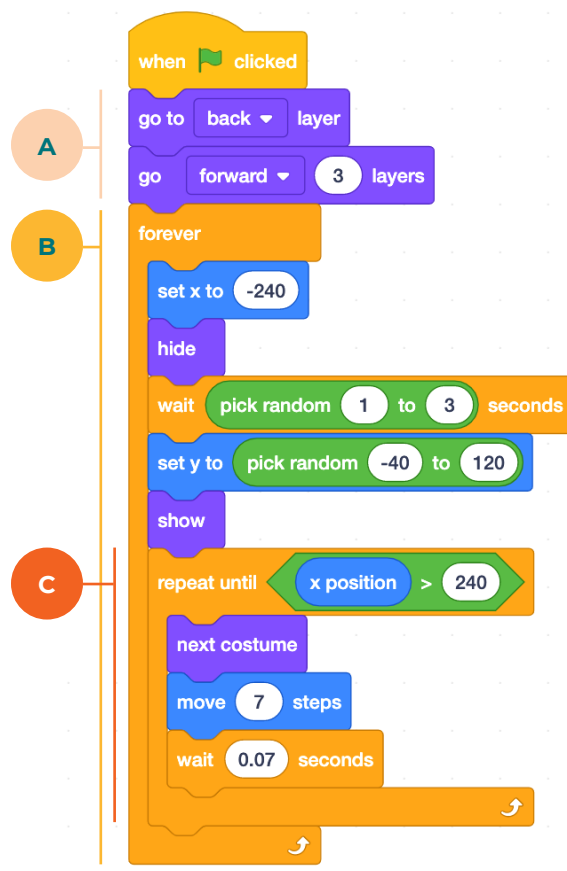


Figure 4 Bird Sprite code

Challenge Extensions

1. Use the cloning blocks in the Control palette to create a flock of birds out of your single Bird sprite. You will need to replace the “when green flag clicked” hat block in your Bird sprite code with a “when I start as a clone” hat block. Then, make another program that uses the “create clone of myself” block to create several bird clones when the green flag is clicked.
2. Use a [Go Direct® Force and Acceleration Sensor](#), instead of the mouse, to control the motion of the landscape.
 - a. Click the Extensions icon in the lower-left corner of the Scratch window.
 - b. Select the Go Direct Force and Acceleration extension. Be sure to have the Scratch Link software running and your Force and Acceleration Sensor powered on; a window will pop up allowing you to choose your sensor from a list.
 - c. Once you've added the extension and connected to your sensor, you'll have a whole new set of blocks. For each of the landscape sprites, modify the code as follows:
 - Remove the “set x to” block (including the “multiplication” block).
 - Drag blocks from the palettes to create the code in **Figure 5**.
 - Insert the “change x by” code into the “forever” loop for each sprite. As before, the multiplication block translates movement of the Force and Acceleration Sensor to produce smaller motion in the landscape.
 - d. Try it out! As you rotate the Force and Acceleration Sensor back and forth, the landscape will move! See **Figure 6**.
3. Are you skilled with the use of a graphics editor? Create your own layered landscape sprites!
 - a. Find a beautiful, interesting landscape online, decide how many layers it requires, and pull it into a graphics editor, such as Google Slides™ or Google Drawings.
 - b. Use shapes and lines to recreate the image. Make the image at least 550 pixels wide so that it can move side-to-side on the Scratch Stage without the left and right edges being seen.
 - c. Import your line/shape images into Scratch as new sprites.
 - d. Add code to each of your sprites and try it out!

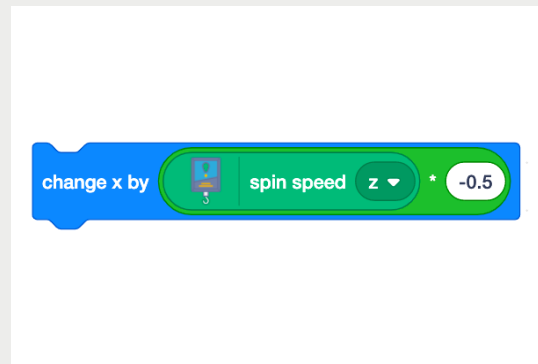


Figure 5 The “change x by” block replaces the “set x to” block for each landscape sprite.



Figure 6 Interactive Art in action