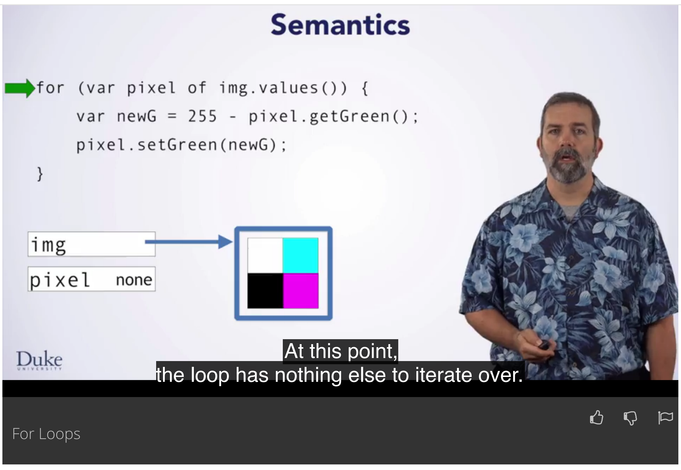

For Loops

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0:03
Now that you've seen some of the basics of JavaScript and have seen the Duke Learner Program environment, you still have a few pieces to learn in order to be able to implement the green screen algorithm.

0:13
One of those pieces is repeating some steps of the algorithm. Doing them once for each pixel. Repeating steps is incredibly common in algorithms. As you program more you'll find that most algorithms you write have some form of repetition. So how do you write repetition down in Java Script? You use a loop, in this case you would use a for loop. Which will repeat some steps for each pixel. You can see an example of a for loop here. Although the steps inside of it are not the ones for green screen algorithm, you still have a few things left alone before you can do that.

0:50
Let's start by breaking down the syntax of this loop.

0:54
First, we have the keyword, for, which says you're providing a for loop. Next, you have information about how to do the repetition inside of the parenthesis.

1:05
The first part of this information is the variable repetition. Here var pixel, which makes a new variable to refer to the current item.

1:14
The loop will automatically update this variable each time it repeats. Setting its value to the next piece of data. In this case of this loop, each piece of data will be a pixel.

1:26
Next is the keyword, of. Which says that you are about to say what pieces of data to iterate over.

1:34
Then, you have the expression that evaluates to the data you want to iterate over. In this case, we have img.values. The .values method inside of simple image gives back all of its pixels, to access each one in turn within the loop body via the variable pixel. Finally, you have the body of the loop inside of curly braces. The body of the loop is the set of statements that should be repeated for each piece of data.

2:03
Okay, great. Now, that you have the basics of the for loop syntax let's look at the semantics.

2:09
Here, we are about to begin execution of the for loop. We are assuming that the variable img was previously declared and initialized to refer to this two by two image.

2:20
We've drawn a light blue box around the image and made the area arrow in img's box match this color, to help make it clear what the arrow is referring to once we start drawing other arrows.

2:34
Img's arrow refers to the image as a whole.

2:39
The first part of the for loop creates a new variable named pixel. So we are going to create a box for that variable. The second part says that we're going to do a loop over each pixel in the image. So we will start with the pixel variable referring to the first pixel in the image. Notice that the arrow is pointing at one particular pixel. It is also important to note that we are referring to an existing pixel inside of the image. Not making a new pixel. Why does this matter? In a moment, we are going to change the color of the pixel and the change will show up in the image, since var pixel is the actual pixel inside that image.

3:21
This box on the right let's you peak inside of the pixels numerical data. The pixel has e and y coordinate and red, green and blue component values. These are not separate data, but we write them here so that they're clear as we manipulate the pixel, since they don't show up directly in the conceptual colored squares picture.

3:41
Now we go inside the body of the loop and begin executing statements there. The first statement declares a variable called newG and initializes it to 255- pixel.getGreen. If you look at the numerical data for this pixel, you will see that its green value is 0, so newG will be initialized to 255. Next, you are going to do pixel.setGreen to newG. Since newG is 255, this will set the pixels' green value, 255, changing its color from magenta to white. Now, the next thing in the code is the closed curly braces. Which ends the body of the for loop. Whenever you reach the end of the for loop's body, you go back to the top of the loop and move to the next piece of data. In the case of this loop, that means updating the pixel variable to the next pixel in the image like this.

4:41
Now you are going to do the steps in the for loop again with the next piece of data. Or as a programmer would say, you are ready to do the next iteration of the loop.

4:51
We start by going inside the body of the loop and executing the statements there again. Again, we declare and initialize newG to be 255, and then do pixel.setGreen to 255 and that changes the second pixel from blue to cyan.

5:08
Again, we are at the end of the loop, so there is time to go back up to the start of the loop and update the pixel to refer to the next pixel in the image.

5:17
Again, we go into the body of the loop and declare and initialize newG. This time however since the green value is 255, the value of newG is 0. We do pixel.setGreen to 0 which will change this pixel from green to black.

5:34
We once again find ourselves at the end of the loop. Can you guess what happens next?

5:40
We go back to the top of the loop, updating the pixel to refer to the last pixel in the image. We go into the loop body, declare and initialize newG, and then do pixel.setGreen to 0. Which changes this last pixel from white to magenta.

5:57
And once again, we are at the end of the loop. Now, there is not another pixel. So when we go back to the top of the loop, there is no pixel left. At this point, the loop has nothing else to iterate over. So we jump down past to end of the loop body and continue executing whatever code might be there.

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