Day 4: Android Studio Afternoon

Image flips and turn
What is an Array?

- Storage for a sequence of items
  - Of the same type
- You can access items by using an index
- The index starts at 0
  - The first item is at index 0
  - The last item is at index (length – 1)
- Arrays know their length (have a public length field)
  - arrayObj.length
For-Each Loop

• Loops through all of the elements in an array

• Syntax
  for (type name : array)

• Example
  for (Pixel pixelObj : pixelArray)

• Each time through the loop this will be a different pixel from the array of pixels until all of the pixels in the array have been processed
for each pixel

treat rectangular image as a 1D array

```
for (Pixel p : pic.getPixels())
{
    //code to apply to every pixel in the image
}
```
What is a two-dimensional array?

• The pixels in a picture are really stored in a two-dimensional array
  • Each pixel has a x value (horizontal location)
  • Each pixel has a y value (vertical location)
  • pictureObj.getPixel(x,y) returns the pixel at that location
For Loop

• Has three areas: declaration, condition, and change

• Syntax
  for (declaration; condition; change)

• Example
  for (int i = 0; i < pixelArray.length; i++)

• Do the declaration before the body of the loop then each time through the loop check the condition and if true execute the body of the loop and then do the changes
Processing every pixel

```java
for (int x = 0; x < picture.getWidth(); x++) {
    for (int y = 0; y < picture.getHeight(); y++) {
        //process pixel (x,y)
    }
}
```
Nested Loop

• How would you get all the pixels in a picture using their x and y values
  • From left to right and top to bottom?
    • x=0 and y=0, x=1 and y=0, x=2 and y=0, ...
    • x=0 and y=1, x=1 and y=1, x=2 and y=1, ...
    • x=0 and y=2, x=1 and y=2, x=2 and y=2, ...
  • We need to have one loop inside another
    • The outer loop counts y from 0 to height - 1
    • The inner loop counts x from 0 to width - 1

```java
for (int y = 0; y < picture.getHeight(); y++)
{
    for (int x = 0; x < picture.getWidth(); x++)
    {
        //process pixel (x,y)
    }
}
```
Alternative Nested Loop

• How would you get all the pixels in a picture using their x and y values
  • From top to bottom and left to right?
    • x=0 and y=0, x=0 and y=1, x=0 and y=2, ...
    • x=1 and y=0, x=1 and y=1, x=1 and y=2, ...
    • x=2 and y=0, x=2 and y=1, x=2 and y=2, ...
  • We need to have one loop inside another
    • The outer loop counts x from 0 to width - 1
    • The inner loop counts y from 0 to height - 1

```java
for (int x = 0; x < picture.getWidth(); x++)
{
    for (int y = 0; y < picture.getHeight(); y++)
    {
        //process pixel (x,y)
    }
}
```
@Override
public Picture transform(Picture in)
{
    Picture out = new Picture(in.getWidth(), in.getHeight());
    for (int x = 0; x < in.getWidth(); x++)
    {
        for (int y = 0; y < in.getHeight(); y++)
        {
            out.getPixel(x, y).setColorFrom(in.getPixel(x, y));
        }
    }
    return out;
}
Flip Vertical

• Make a new class FlipVertical
• Use nested loops to create a vertical flip of the image
• Remember to change MyClass to instantiate a FlipVertical object.
Rotate Left

• Make a new class RotateLeft
• Use nested loops to create a vertical flip of the image
• Remember to change MyClass to instantiate a FlipVertical object.
Crop

- Make a new class Crop
- Have it crop out the center ¼ of the photo
- What parameters should you send to setColorFrom?
- Experiment as needed to figure it out!
- Try making variations of the crop class!
Assignments

• Try calling new combinations of the transformations. What if you RotateLeft and Flip? Flip and MultiColor? More transformations?

• Write new transformations. Write RotateRight? Can you think of more than one way to code this? (HINT: use nested loops, reuse other transformations)

• Can we generalize? How would you write a generic Rotate class? Which direction would it rotate? And how many degrees?

• Write VerticalMirror and HorizontalMirror transformations