

## Manipulating Pictures, Arrays, and Loops part 5

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August 2005

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## Learning Goals

- Understand at a conceptual and practical level
  - How to change more than one color in a method
  - How to use a for loop
  - How to print out values in a loop
  - How to convert a while loop into a for loop

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## Faking a Sunset

- If you want to make an outdoor scene look like it happened during sunset
  - You might want to increase the red
    - But you can't increase past 255
  - Another idea is to reduce the blue and green
    - To emphasize the red
    - Try to reduce the blue and green by 30%



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## Faking a Sunset Algorithm

- Reduce the blue and green by 30%
  1. Get the array of pixels from the picture
  2. Set up an index to start at 0
  3. Loop while the index is less than the length of the array
    1. Get the pixel at the current index from the array of pixels
    2. Set the blue value at the pixel to 0.7 times the original value
    3. Set the green value at the pixel to 0.7 times the original value
    4. Increment the index and go back to step 3

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## Faking a Sunset Method

```
/**
 * Method to simulate a sunset by
 * decreasing the green
 * and blue
 */
public void makeSunset()
{
    Pixel[] pixelArray = this.getPixels();
    Pixel pixelObj = null;
    int value = 0;
    int i = 0;

    // loop through all the pixels
    while (i < pixelArray.length)
    {
        // get the current pixel
        pixelObj = pixelArray[i];

        // change the blue value
        value = pixelObj.getBlue();
        pixelObj.setBlue((int) (value * 0.7));

        // change the green value
        value = pixelObj.getGreen();
        pixelObj.setGreen((int) (value * 0.7));

        // increment the index
        i++;
    }
}
```

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## Testing makeSunset

- String file =  
"c:/intro-prog-java/mediasources/beach.jpg";
- Picture pictureObj = new Picture(file);
- pictureObj.explore();
- pictureObj.makeSunset();
- pictureObj.explore();

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## For Loops

- Programmers like shortcuts
  - Especially those that reduce errors
  - And mean less typing
- We have been using a while loop with an index
  - We had to declare the index variable and initialize it before the loop
    - If you forget this there will be a compiler error
  - We had to increment the index in the loop
    - If you forget this it will be an infinite loop
- The shortcut for this is a For Loop

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## For Loop Syntax

- for (initialization area; continuation test; change area)
  - Initialization area
    - Declare variables and initialize them
  - Continuation test
    - If true do body of loop
    - If false jump to next statement after the loop
  - Change area
    - Change the loop variables
      - Increment or decrement them

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## Comparison of While and For Loops

```
int index = 0;           for (int i=0;
while (index <         i < pixelArray.length;
  pixelArray.length)  i++)
{
  statements           {
  .                   statements
  .                   .
  .                   .
  index++;            }
}
```

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## Change clearBlue() to use a For Loop

```
/**
 * Method to clear the blue (set
 * the blue to 0 for all pixels)
 */
public void clearBlue()
{
  Pixel pixelObj = null;

  // loop through all the pixels
  for (int i = 0;
       i < pixelArray.length;
       i++)
  {
    // get the current pixel
    pixelObj = pixelArray[i];

    // get the array of pixels
    Pixel[] pixelArray =
    this.getPixels();

    // set the blue on the pixel to 0
    pixelObj.setBlue(0);
  }
}
```

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## Using System.out.println() in a Loop

- One way to check what is happening in your program is to add
  - System.out.println(*expression*);
- You might add this to the loop to check the value of 'i' during it.
  - And to verify that the increment happens after the last statement in the loop

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## Change to For Loop Exercise

- Edit makeSunset() and change it from using a while loop to using a for loop
  - Move the declaration of the index to the for loop initialization area
  - Move the index increment to the for loop change area
  - Execute the code to make sure it still works

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## Summary

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- You can change more than one color in a method
  - Like in make sunset
- You can use a for loop to repeat a series of Java statements until a test is false
  - for (initialization area; continuation test; change area)
  - Executes the same way a while loop does
    - But less error prone when executing a loop at set number of times
  - You can convert code that uses a while loop into using a for loop
  - You can print values in a loop using `System.out.println(expression);`

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