CS 351 Computer Architecture I

Extra Point Activity [3 points]

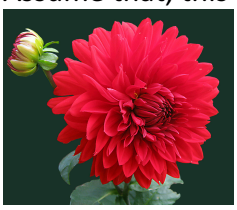
Due Date:01/09/2018

You are asked to implement a Java program to manipulate the hue property of images.

The suggested steps to complete the activity are as follows:

1. Read RBG value for each pixel in the given image
2. Extract Red, Green and Blue values from RGB value using shift operators and masking operators
3. Convert RGB value to HSB(Hue, Saturation and Brightness). You can use `Color.RGBtoHSB()` method to convert RGB values to HSB. Note that Hue value will be hard coded already.
4. Then we need to convert HSB value back to RGB. You can use `Color.HSBtoRGB()` method for performing the conversion.
5. Set RGB value to the pixel of the image.

Assume that, this is the original image:



If we set 90 as Hue value, then you program needs to manipulate the image as follows

If Hue = 180

If Hue = 270

Hints:

HSB Model and Hue Property

The HSB Model

We are quite familiar with the RGB color model where all colors are formed by the mixtures of the Red, Blue and Green colors. A full measure of all the colors forms white while no color makes blue. This model however is not intuitive. Another color model is the HSB/HSV color model.

Hue:

Hue

Hue is the color sensation of the light i.e. whether the color is red, blue, orange, cyan etc. This can be represented on a circle with values in degrees i.e. 0-360.

Saturation:

Saturation

Saturation defines how vivid the color is i.e. how much does it differ from the corresponding shade of gray.

Brightness/Value:

Brightness

Brightness as the name suggests represents the brightness of the color. A 0 brightness indicates the color is black while a brightness of 100% indicates the full bright color of corresponding hue.

We can get some really cool effects on the images by playing with HSB values. Here I elaborate on changing the hue of each pixel to a constant value.

A Skeleton for Reading and Manipulating Images in Java

```
import java.io.*;

import javax.imageio.*;
import java.awt.image.*;
public class ColorChanger{

      public static void main(String args[])throws IOException{

            BufferedImage raw,processed;
            raw = ImageIO.read(new File("flower.png"));

            int width = raw.getWidth();
            int height = raw.getHeight();

            processed = new BufferedImage(width,height,raw.getType());
            float hue = 90/360.0f;//hard coded hue value
            for(int y=0; y<height;y++){
                  for(int x=0;x<width;x++){
                        //this is how we grab the RGB value of a pixel at x,y coordinates in the image
                        int rgb = raw.getRGB(x,y);
                        //extract the red value

                        //extract the green value

                        //extract the blue value

                        //user Color.RGBtoHSB() method to convert RGB values to HSB

                        //then use Color.HSBtoRGB() method to convert the HSB value to a new RGB
                        //value


                        // set the new RGB value to a pixel at x,y coordinates in the image
                        processed.setRGB(x,y,newRGB);

                  }
            }
            ImageIO.write(processed,"PNG",new File("processed.png"));
      }
}
```