

CS101 Assignment Three

February 8, 2008

Objective: write functions in Java.

1 RGB2Gray

Colors in computers are represented using three values R, G and B that indicate the amount of red, green and blue components.

There are two ways to represent R, G and B. One way is using floating point number in $[0, 1]$ to represent each component. $(0, 0, 0)$ is the black color and $(1, 1, 1)$ is the white color.

Another way is representing R, G, B with integers in the range $[0, 255]$. In this case, $(255, 255, 255)$ is the white. In fact, this is how most image formats in a computer store colors. Since we have fewer levels in the integer representation than in the floating point one, the integer color representation is rougher. But human eyes in fact cannot see small changes of colors. So, the integer representation is in fact as good as the floating point one.

In this question, we write functions (static methods) using Java to convert a color to the corresponding grayscale level. The conversion uses the following formula,

$$Y = 0.3 * R + 0.59 * G + 0.11 * B$$

where Y is the grayscale value of the color (R, G, B) .

Write two functions to do the conversion for both the floating point and integer color representation. The functions are called `RGB2Gray` and should have the following interfaces:

```
public static double RGB2Gray(double r, double g, double b)
public static int RGB2Gray(int r, int g, int b)
```

Note that the two functions have the same name. We overload the function `RGB2Gray` with two different definitions. Apart from color conversion, we want to ensure that users input the color in the right format. For the floating point version, if r, g and b are not in $[0, 1]$, the function should print out an error message “Out of color range” and return a -1. The integer color converter function also needs to check the input range. If they are out of $[0, 255]$, print the error message and return -1.

Wrap the functions in a class called `ColorConversion` and save the class as a single file `ColorConversion.java`. Write another class `TestColor` to call these defined functions. Test several cases in your program to show how your functions work. You need to submit the Java files for the two classes.