Assignment II: What do you see?

DUE DATE: January 29, 2020 11:59pm

Purpose: Image processing is one of the sub-fields of Computer Science where the bitwise operations are widely used. The purpose of this assignment is to design and develop a Java application to practice bitwise operations, and get familiar with basic image processing concepts.

Skills: This assignment will help you to practice the following skills that are essential to your success in this course and in CS discipline:

- Understanding bitwise operations including left shift, right shift, and/or logical functions and masking
- Applying basic CS knowledge to problem-solving
- Object-Oriented Programming skills
- Debugging and Testing skills

Knowledge: This assignment will also help you to become familiar with the following important content knowledge in this discipline:

- The representation of images
- Creating and processing image objects in java
- Using Bitwise operators in a high-level language such as Java

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TASK

An image is an array, or a matrix, of pixels (picture elements) arranged in columns and rows. RGB is one of the models used in color pixels. In a color image, each RGB pixel is an integer number which contains the mixture of red, green and blue colors.

In this assignment, you will be provided with an image data file, image.dat. The first line in data file contains the height (rows) and width (columns) of the image. The following lines gives the red, green and blue color integer values for each pixel.

Here is a sample data file:

image.dat (this will be given)

```
4 3
114,39,40 249,35,64 245,41,72
80,45,37 236,31,53 239,37,65
21,50,39 20,50,40 38,55,45
211,84,104 126,78,79 95,66,67
```

According to this input file, the image has 4 rows and 3 columns. The pixel at [0][0] has red value 114, green value 39 and blue value 40.

Your program will create an image object with the given width and height. Then, it'll read red, green and blue color values for each pixel from data file, and calculate RGB integer value using bitwise shifting and masking operations. This is how you'll mix the colors and express the color pixel with one single integer. After generating RGB value for each pixel, your program will set the RGB value of each pixel with the computed RGB value. Your program will generate a .png image file as an output.

image.png (**your program will generate this for the given input file above**)

HINTS

- The following Java statement create an image object with the given height, width and image type of RGB

```
BufferedImage canvas = new BufferedImage(width, height, BufferedImage.TYPE_INT_RGB);
```

- The following Java statement updates the RGB value of the pixel located at row y, and column x of the image.

```
canvas.setRGB(x, y, rgb);
```

- The following Java statement created a .png file(image.png) from a `BufferedImage` object.

```
ImageIO.write(canvas,"PNG",new File("image.png"));
```

How to submit:

You are asked to submit your work as a single zip file via CANVAS. Zip file will include the following two archive files for each part:

- sourcecode.zip
- image.png

Please use the following file format while naming the zip file:
LastNameFirstnameX_Y.zip where LastNameFirstname is your last name with the first letter in capital, followed by your first name with the first letter in capital; the X is the course code; the Y is the assignment #. (ex: SerceFatmaCS351_2.zip)

How to grade:

Full Points: program generates correct image and uses bitwise operations (shifting, making) to generate RGB values and to build the image

Half Points: program generates slightly wrong image and uses bitwise operations (shifting, making) to generate RGB values and to build the image

No Point: program doesn't compile or program doesn't generate an image file