

3D Arrays

Background

A color image is stored as 24-bits (3 bytes) per pixel (picture element). All red pixel values grouped together to create a 2D image *plane*. Similar for green and blue. Various standard image file formats exist including “RAW”, typically defined as a small number of header bytes (metadata – information about the image) followed by the bytes that make up the image pixels in “raster” order (top to bottom, left to right.)

The Problem: Read and process a RAW image file

The raw (raster) image file format you will be reading is shown here:

Byte Position	File Data	Explanation
0	colors per pixel	byte
1	height high byte	Combine to a short
2	height low byte	
3	width high byte	Combine to a short
4	width low byte	
5	red	Color pixel
6	green	
7	blue	
8	red	Color pixel
9	green	
12	blue	
...

It is considered an interleaved RGB format. To read the file perform the following steps:

1. Open the file in **binary** (non text) mode
 - a. Use the **FileInputStream** stream class
2. Read the number of image planes (colors per pixel) into a **byte**
 - a. Use the **read()** method from **FileInputStream**
3. Read the image height
 - a. Use two **read()** calls from **FileInputStream** to get the high and low bytes then assemble the bytes into a single int using
short height = (short)high << 8 + (short)low;
4. Read the image width
 - a. Use two **read()** calls from **FileInputStream** to get the high and low bytes then assemble the bytes into a single int using

```
short width = (short)high << 8 + (short)low;
```

5. Construct a 3D array using

```
int[][][] image = new int[colors][height][width];
```
6. Read the raster (image pixel) data into the 3D array, top to bottom, left to right using **read()** calls from **FileInputStream**
 - a. The red value is placed in **image[0][i][j]**
 - b. The green value is placed in **image[1][i][j]**
 - c. The blue value is placed in **image[2][i][j]**
7. Compute the mean and standard deviation of each of the three image planes
8. Print the means and standard deviations to the console.

Deliverables

1. Your source code (.java) files for each class.
2. A reflective essay describing
 - a. Successes
 - b. Difficulties and how you overcame them
 - c. How you tested your code to ensure correctness
 - d. A screen shot of your program processing the raster file provided.