Blue Waters Petascale Semester Curriculum v1.0
Unit 10: Productivity and Visualization
Lesson 3: Visualization 1
File: What is ARGB?

Developed by R. Phillip Bording for the Shodor Education Foundation, Inc.

Browse and search the full curriculum at
http://shodor.org/petascale/materials/semester-curriculum

We welcome your improvements! You can submit your proposed changes to this material and the rest of the curriculum in our GitHub repository at
https://github.com/shodor-education/petascale-semester-curriculum

We want to hear from you! Please let us know your experiences using this material by sending email to petascale@shodor.org

What is ARGB? By Phil Bording – July 20, 2020

ARGB sets the pixel definitions for generating computer/digital visual screen images. A screen image has pixel patterns organized as objects, typically shown as rectangles. The ARGB encoding defines four 8 bit data sections of a 32 bit data, a "pixel".   See the *cmap.f* program for a detailed mapping run.

The RGB stands for the color pallet of Red, Green, and Blue colors. Using the range of 0-255 for three integers creates the part of the color pallet which the human eye can discern. While we use the color attribute to describe these three 8 bit integers, they actually cover the gray scale pixels as well, from black, to gray shades, and white. The Alpha byte representing the data channel presenting a measure of image opacity.

Next we consider the RGB map values…

Gray scales color map values, set the red, green, and blue values to the same value.

White	FFFFFF in octal	1111 1111 1111 1111 1111 1111 as binary
Light Gray	c1c1c1	1100 0001 1100 0001 1100 0001
Gray	818181	1000 0001 1000 0001 1000 0001
Dark Gray	414141	0100 0001 0100 0001 0100 0001
Black	000000	0000 0000 0000 0000 0000 0000

Alpha opacity values, when an image is displayed it can be constructed as linear combination of the background image and the current display image.

The values of alpha range from one to zero as an unsigned 8 bit integer.   When alpha = 1, or FF the images are opaque. When alpha = 8000, the background image has an almost equal contribution to the final image. When alpha equals zero then the background image is in full display.

The pixels are selected from the Foreground – Background images, the pixel weight applied as:

Output = alpha*Foreground + (1-alpha) * Background

generating a final image.

For the .png file the 32 bit pixel format is: Alpha byte, Red byte, Green byte, and Blue byte.

If alpha is equal to one (1.0) then it has an binary/octal equivalent of 1111 1111 or FF.

Using a two's complement arithmetic for an integer the process of generating a 32 bit pixel follows.

Int pixel;

Int irint, igint, ibint;

pixel = -256*256*256 + 256*256*irint + 256*igint + ibint;

The 256 multiplies simply shift left the 8bits of the color value.

If the image is in gray scale then irint = igint = ibint.

References: https://www.w3.org/TR/2003/REC-PNG-20031110/#13Alpha-channel-processing.

What is *cmap.f*? and *cfrgb*

By Phil Bording

July 22, 2020

CMAP is a Fortran program that develops a color output table for gray scale images. It shows a sample for the gray scale from 0 to 255 using the ARGB pixel byte layout suitable for .png files.

Assuming an array of values has a maximum positive value of 2.6 and a minimum negative value of -2.2 and all values of the array are within these bounds, a mapping is made in *cmap* to show possible ARGB pixel values.

Cfrgb is a C program that develops a color output table for gray scale images. It shows a sample for the gray scale from 0 to 255 using the ARGB pixel byte layout suitable for .png files.

Assuming an array of values has a maximum positive value of 2.6 and a minimum negative value of -2.2 and all values of the array are within these bounds, a mapping is made in *cfrgb* to show possible ARGB pixel values.