Creative Computing II

Device-Dependent Colour Spaces

Wednesday 20th October 2010

This lab sheet explores device-dependent colour spaces and some related perceptual aspects of colour vision.

1. This part of the lab involves implementing the mathematical transformations to convert between the HSB and RGB colour spaces.

   (a) Write a *Processing* sketch including a function which converts from an RGB representation of a colour to HSB, and some way for the user of your sketch to specify an input colour. You will need to choose an appropriate data structure for your colours; one possibility is a *Processing* class, but there are others.

   (b) Implement for your sketch the reverse conversion, from HSB to RGB. Again, provide for the user of your sketch some way to specify an input HSB colour to this conversion.

   (c) Test whether your conversions agree with the built-in conversions in *Processing*, using the various colour accessors or `colorMode()`. If you observe a difference, try to explain why.

2. This part of the lab explores colour mixing by area.

   (a) Write a *Processing* sketch which fills a 100×100-pixel square with a checkerboard pattern of pixels, alternately full red (the maximum value in red, and zero in the green and blue channels) and full yellow (maximum values in red and green, and zero in blue).

   (b) Run your sketch and step far enough back from the screen that the pixellation is no longer obvious. What colour does the square appear to be?

   (c) Make a guess at the RGB values of the mixture colour in part 2b. By trial and error, find the RGB colour values of the single colour that best matches the mixture. Was your guess right? Try to explain any discrepancy.

   (d) Repeat this with some other colours. Make a table of the colour values in the mixture, and the closest match in RGB colour space to the mixture that you find. (We will return to this table of values in a week's time).

3. This part of the lab explores a particular effect of the low-level details of visual perception.

   (a) Construct a *Processing* sketch which works on a colour image to display alternately (switching under user control): a greyscale version of that image, and a version of that image with the hue inverted (but saturation and value unchanged).

   (b) Select an image from your own collection or from the Commons, ideally with many strong colours. Incorporate it into your sketch.

   (c) Run your sketch, displaying the inverted hue version. Stare at a fixed point in the image for a few seconds, before switching (without moving your focus) to the greyscale version. What do you observe? (You might want to draw a small black dot to enable you to focus on a fixed location without distraction).

Further Reading:

- Stokes, M., M. Anderson, S. Chandrasekar and R. Motta, *A Standard Default Color Space for the Internet – sRGB*. `http://www.w3.org/Graphics/Color/sRGB`
- Mann, J., *Lessons Learned from Mondrians Applied to Real Images and Color Gamuts*, Proc. Seventh Color Imaging Conference (1999).