Perception and Multimedia Computing

Device-dependent Colour Spaces

Friday 27th Oct 2017

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

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

(a) Write a p5.js 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 1b. 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 comma-separated values table of the colour values in the mixture, and the closest match in RGB colour space to the mixture that you find: your table should have headings R1, G1, B1 (RGB values of the first colour), R2, G2, B2 (RGB values of the second colour), RM, GM, BM (RGB values of the matching colour); use a spreadsheet application, or a text editor using the example in the git repository below.

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

(a) Select an image from your own collection or from the Commons, ideally with many strong colours. Construct a p5.js sketch which works on a colour image to display alternately (switching under user control): a greyscale version of that image, and an inverted version of the original image.

(b) Run your sketch, displaying the inverted 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).

(c) Did you use the default invert filter function? Can you use other methods to create the same effect? Try changing the hue directly (invert hue). What do you need to do with saturation and lightness to have the same or maybe even a stronger effect? Write a paragraph (up to half an A4 page) explaining your chosen method.

Further Reading:

- Stokes, M., M. Anderson, S. Chandrasekar and R. Mo a, 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).