Improving Your Image

These activities are designed to help teachers develop familiarity with computer image technology. Some of the activities might be suitable for students as well. While this work is designed to develop underlying concepts, example connections with particular achievement standards and unit standards are listed below. You will probably need help with some of the questions. Just ask!

Example connections to standards:
This work connects with AS 91070 (file formats), US 2780 and US 26745 (how displays work and image data), AS 91371 (multiple connections), AS 91636 (effectiveness of algorithms).

Useful references for image technology: http://www.csfieldguide.org.nz/CompressionCoding.html http://www.csfieldguide.org.nz/DataRepresentation.html4 http://www.victoria.ac.nz/science/Awhina/TeReoPhysics/Light_and_Waves/ComputerColours/ComputerColours.php (this is where you can get the colour number software).

Useful reference for human vision, colour perception, and connections to computer image/camera technology: http://resource-bank.nzip.org.nz/colour-perception-and-the-physics-of-vision/

Computer Colours

Launch the ComputerColours software. Note this is available for free at the link above.

1. Adjust the amounts of red, green, and blue and observe the results. What range of values can each colour take? What is the significance of this?

2. Set R=255, G=255, B=0. You should see yellow. Use the strong magnifier to verify this is actually made up of red and green pixels.

3. Find values of RGB that make pink and brown Pink: R _____ G_____ B_____

   Brown: R _____ G_____ B_____

   Is the yellow we made perceptive yellow or spectral yellow? Are the pink and brown perceptive or spectral? Which colours on a computer screen are spectral and which are perceptive? Explain.

4. Turn on the colour number display by pushing the display 24-bit colour number button. Write down the formula for a colour number. Can you explain why it is set up this way? What is the number corresponding to white? What would the number for white be in binary?

5. The software shows 24 bit (or 3 byte) colour but computers are usually said to use 32 bit colour. How are these related?

Image File Formats

1. Raw image data results in huge files. Approximately what would be the file size of a 400 x 250 pixel colour image? (Assume 3 bytes or 24 bits per pixel)?

2. Images on the internet and particularly in movies would be unmanageable at this size, so we use data compression to reduce the file sizes. Describe lossy and lossless compression for images.

3. A practical example. Use ColourNumber to save a single colour image as a bmp, png (lossless compression) and jpg (lossless and lossy compression). Compare the file sizes and comment. You may be slightly surprised!

4. Predict qualitatively what would happen if you saved the completely random image the same way. For example, would lossless compression work well? Lossy? Test your prediction and comment.

5. Have a look at image 1 and image 2 and predict how lossless and lossy compression would work. Test your predictions.

6. Your friend gives you a bitmap (.bmp) image and you save it as a smaller .png and then delete the original. Can you recover the original image from the png? Explain.

7. Your friend gives you a bitmap (.bmp) image and you save it as a smaller .jpg and then delete the original. Can you recover the original image from the jpg? Explain.

8. In general, what kinds of data are suitable for lossless compression? Lossy?

What is an image anyway?

1. We will use the ExcelImage software to make an image of the example .csv fiile. Explain the results. Nearly any numerical data can be displayed as an image and we are used to seeing this. We might see a false-colour image of temperature versus 2 D position, magnetic field versus 2 D position, and so on. This is part and parcel of modern scientific data display.

2. Make your own .csv file and make an image out of it!

So many kinds of data can be displayed in the form of an image. Just use your image-ination!