CS 0
Adventures in Media Computing

Introduction to Programming,
Chapter 3, 3.1..3.2
Admin

- Check your CIS account which allows you to get onto these machines – if you have issues, let us know TODAY and email me: mike@cs.hmc.edu, a time that you can come Friday.

- Twiki Page –
  https://www.cs.hmc.edu/twiki/bin/view/CS0Spring2009/WebHome
  - Make sure you register, go to: http://www.cs.hmc.edu/twiki and click on Users, look for your name. Any issues, email me: mike@cs.hmc.edu
  - On Friday, I will go through all your twiki pages with someone who can set protections. Until then, if you have issues with uploading your labs, do not worry about.

- Software
  - JES, http://coweb.cc.gatech.edu/mediaComp-teach/26
  - Media, http://coweb.cc.gatech.edu/cs1315/814

- Friday Afternoon Open Lab: 2:45 – 5:00
Today’s Goals

- To understand how our images will be “digitized” to take advantage of limits in human vision
- To look at JES model for color, RGB – Red, Green, Blue
- To manipulate color values in a picture
- To convert a color picture to grayscale
- CS – matrix representation...
- CS - look at objects...pictures
- CS - iteration in a look
- CS - nested code blocks
Pixels – Picture Elements

In gray scale image each pixel is typically one byte (8 bits – 256 values)

Figure 3.2
Cursor and icon at regular magnification on top, and close-up views of the cursor (left) and the line below the cursor (right).
Color Perception – Sensitivity of Cone Cells

NORMALIZED

UN-NORMALIZED

Original data from: Stockman & Sharpe (2000)
Encoding Color

- Each pixel encodes color for that spot in the picture
- There are many encodings for color
  - Printers use CMYK: Cyan, Magenta, Yellow, and Black
  - Humans often prefer HSV (Hue, Saturation, Brightness)
- JES uses RGB – most common for computers
  - RGB – Red, Green, Blue
In RGB, each color has 3 component colors: Amount of Red, Amount of Green, Amount of Blue

Figure 3.4
Merging red, green, and blue to make new colors.
Color Pixels

- In a color image, each pixel is typically represented with 3 bytes: one for red, one for green, one for blue
  - 24 bits per pixel
  - 16,777,216 different colors

- Image Example
  - $1280 \times 1024 = 1,310,720$ pixels
  - $1,310,720 \times 24 = 31,457,280$ bits = ~4MB

- JES provides pixel data type that has:
  - x, y position
  - R,G,B values
Pictures and Pixels
Figure 3.9

RGB triplets in a matrix representation.

See Figure 3.9, Top of page 46

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Figure 3.7
The Macintosh OS X RGB color picker.

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Figure 3.8
Picking a color using RGB sliders from JES.
Playing with Python

- Get a file, convert to picture, show the picture
  - Investigate the picture

- Get and play with Pixels
  - Look at ‘a’ pixel
  - Get all the pixels
  - Change the color of a pixel
  - Have our changed picture show up
Figure 3.10
Directly modifying the pixel colors via commands:
Note the small yellow line on the left.
Summary

- Pixels – Picture elements
  - 3 color values, Red, Green, Blue
- JES has many commands to manipulate pictures by changing RGB values for each pixel
- Lab 1 plays more with Functions. Something to do on your own. Due date is next Monday or Tuesday. See email for more information (come Friday and do it!!!)