

## Painting and Drawing

May 23, 2007

KangKang Yin

## Key Learning Goals

- ▶ Brushes, layers, filters in painting/image editing software
- ▶ Define the term "pixel"
- ▶ Translate colours between English language, RGB, hexadecimal, and binary representations
- ▶ Explain how to represent an image as a grid of pixels ("raster graphics"), or as a list of drawing commands ("vector graphics")
- ▶ Break down the behaviour of a filter into its effect on pixels
- ▶ Compare and contrast different methods for compressing images

## Digital brushes

- ▶ Real paint brushes: have certain properties, like size, shape, type of bristle
- ▶ Digital brushes: more general in a program like GIMP, taking on different shapes, sizes, colours, and other attributes

What do you think a digital brush lacks?

## Combine real and digital brushes

<http://web.media.mit.edu/~kimiko/iobrush/>

## Layers (Not Again!)

- ▶ In a paint/photo editing program: a **layer** is one "slice" of a picture that can be placed above or below other slices to make the whole picture
- ▶ In a sound editing program: a channel, one sound source

## Filters (finally something fun)

transform images in specific ways

- altering colours
- blurring or sharpening the image
- changing the properties of a part of the image based on nearby parts

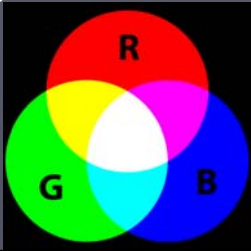


## Colour in paint programs

- ▶ in most drawing programs, colours can be selected from a palette
- ▶ alternatively, colours can be specified by selecting the red (r), blue (b), and green (g) intensities
- ▶ intensities range from 0 to 255
- ▶ this is the same RGB colour coding as used in HTML

## RGB Color model

- ▶ r, g, b all 0's represents black (no colour)
- ▶ r, g, b all 255's represents white
- ▶ r, g, b all the same is a shade of grey



<http://en.wikipedia.org/wiki/RGB>

## Color Intensities in Binary

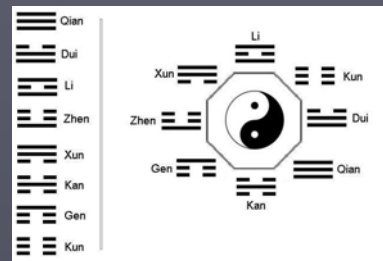
- ▶ In the computer memory, colours are represented in *binary notation* (0's and 1's)
- ▶ 8 *bits* (= 0/1 variables) are needed to represent 256 possibilities
  - 1 bit: 0 or 1
  - 2 bits: 00, 01, 10, 11

## Binary?

- I have never used the binary system
- I know a little bit how to represent and compute with binary numbers
- I am a master with binary numbers



## Binary? Old or New



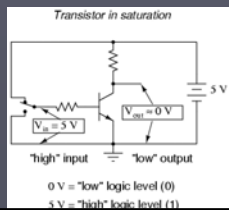
[http://en.wikipedia.org/wiki/Bagua\\_\(concept\)](http://en.wikipedia.org/wiki/Bagua_(concept))

## Philosophy behind binary

### ► Analog Signal vs. Digital Media



### ► Digital Circuitry



[http://www.ibiblio.org/obp/electricCircuits/Digital/DIG1\\_3.html](http://www.ibiblio.org/obp/electricCircuits/Digital/DIG1_3.html)

## Three Number systems

- Decimal: 0 - 255
  - 0, 5, 255
  - human friendly
- Binary: 8-bit numbers
  - 00000000, 00000101, 11111111
  - computer friendly
- Hexadecimal: 2-bit numbers
  - 00, 05, FF
  - a compromise inbetween

## Three Number systems

	digits	base(radix)	place value
decimal	0,1,...9	10	$10^0, 10^1, 10^2...$
binary	0,1	2	$2^0, 2^1, 2^2...$
hexadecimal	0,1,...9,A,B,C,D,E,F	16	$16^0, 16^1, 16^2...$