Image and Sound Data

Michael J. Watts

http://mike.watts.net.nz

Lecture Outline

- Image data
  - Representations
  - File formats
  - Transformations
- Sound data
  - Representations
  - File formats

Image Data

- What is an image?
- Data in a visual medium
- Images on a computer are displayed as pixels
  - each pixel is one colour
  - Resolution

Graphics Formats

- Raster vs Vector
- Raster represents each pixel
- Vector represents shapes
- Meta files combine both
- We will focus on raster representations

Raster Images

- Image is divided into regularly sized cells
  - pixels
- Each pixel is one colour
- Number of pixels / unit length = resolution
- Bits / pixel = number of colours / pixel
  - 1, 2, 4, 8, 16, 24 bit colour
  - How many colours each?
- File size is a function of resolution and bits / pixel

Image Formats

- These are all raster formats
- What're the advantages of each?
  - JPEG
  - GIF
  - PNG
  - TIFF
  - BMP

Image Formats / MATLAB

- MATLAB has four methods of representing images
  - Indexed
  - Intensity
  - Binary
  - RGB
- You will use the first two in Lab 3

Image Formats / MATLAB

- Indexed images
  - A matrix and a colourmap
  - Each row of the map represents the RGB components of a pixel in the matrix
- Intensity images
  - A single matrix
  - Each value in the matrix represents an intensity between black (0) and white (1)

Image Formats / MATLAB

- Binary Images
  - Single matrix
  - Each value is either 0 or 1
- RGB Images
  - Red / Green / Blue
  - M x N x 3 (3D) matrix
  - Pixel colour determined by combination of RGB values in each "colour plane"

Image Transformations

- Many operations can be performed on image data
  - Crops
  - Rotations
  - Contrast enhancements
  - Scaling
    - Vector vs Raster
- All are used to make the information in an image easier to comprehend

Sound Data

- What is sound?
  - A vibration in a medium
- A waveform
- Analogue
- Sampled vs synthesised
  - .wav vs .mid
  - Which is larger?

Sampling

- Sound is digitised via sampling
- Quality of sample is determined by
  - Rate of sampling
    - Hertz (HZ)
  - Bits per sample
    - Resolution

Sound Formats

- Sampled sound files
- What're the advantages of each?
  - AIFF
  - WAV
  - MPEG Layer 2 and 3
    - .mp2 / .mp3
- Synthesised sound files
  - MIDI

Summary

- Images represent data in a visual medium
- How data is represented depends on application
  - Tolerance to loss of data
- Sound data represents analogue waveforms
- Can be sampled or synthesised
  - Tolerance to loss of data
  - Music vs speech