Formats for Digital images and movies

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Image file formats

- There are many image formats
  - .ppm/pgm (generic unix)
  - .bmp, wmf (PC)
  - .pict (Mac)
  - .tiff (scanned)
  - .psd (Photoshop)
  - .gif, jpg, .png (Web)
- To deliver images over network, we need
  - cross-platform formats
  - compression

PPM Portable Pixmap

- Simple uncompressed family of formats
- Four basic types (I know, maybe more?):
1. P1: Ascii black and white
2. P3: Ascii color
3. P5: Binary BW
4. P6: Binary Color

PPM file layout

1. Magic number P1-P6
2. <width> <height> as ascii numbers
3. 255 (Max pixel value)
4. # <Comments>
5. <image data> ie lines of ascii numbers for P1-P3 or binary data for P5-P6

Matlab routine

```
• % writeppm         Writes image files in the ppm format
  %
  %        function writeppm(fname,format,C);
  %
  % fname is a string with the filename
  % format is a string. Supported formats
  %    P2        BW ascii
  %    P3        Color ascii
  %    P5        BW binary
  %    P6        Color binary
  % C is an image generated with ppmpack

  function writeppm(fname,format,C);

   last = length(C);
   fid = fopen(fname,'w');

   fprintf(fid,[format,'\n']);
   fprintf(fid,'#CREATOR: Jags matlab routines, U of Rochester Rev Nov 93\n');
   fprintf(fid,'%3.0f %3.0f \n',C(1),C(2));   % Size
   fprintf(fid,'%3.0f\n',max(C(3:last)));    % Max intens
   if format=='P6' | format=='P5'
     fwrite(fid,C(3:last),'uint8');
   else
     if format=='P3'
       S = '%3.0f %3.0f %3.0f';
     elseif format=='P2'
       S = '%3.0f';
     else
       error('writeppm: Unknown format');
     end
     fprintf(fid,[S,' \n'],C(3:last));
   end
   fclose(fid);
```

GIF
Graphics Interchange Format

- Two versions: 87a and 89a
  - 87a - interlacing, transparency
  - 89a - interlacing, transparency, animation
- Uses indexed color
  - computer uses an index to map the colors
- Invented by CompuServe for BBS download
  - based on patented Lempel Zev Welch (LZW) compression

Properties of GIF-encoded images

- Lossless compression scheme
- 8-bit, 256 colors maximum
- Compression sensitive to large blocks of the same color
- Reducing the number of colors is a major issue in reducing file size

GIF comparison

JPEG (JPG)

Joint Photographic Experts Group

- "Lossy" compression
  - Some information is lost during compression
  - When saving, you can set the quality (ie. the amount of loss you are willing to accept)
  - Higher the quality, larger the file
  - jpg compression is best for images that are photorealistic
- True color (24-bit)
- Requires decompression to view
  - more CPU cycles to process than gif

JPG comparison

GIF/JPEG Comparison

GIF

- 256 colors
- Lossless compression
- Better for images with few different colors (illustrations, text, sharp lines, buttons, logos, clip art, etc.)
- Supports interlacing
- Supports transparency
- Supports animation

JPEG

- Millions of colors
- Lossy compression
- Better for true color photographic images
- Compression/quality options available
- 24-bit support still an issue

PNG

Portable Network Graphics

- Compuserve /Unisyss, demanded royalties in 1995
- WC3 PNG Specification published
- Combines 24-bit encoding of JPG with the lossless compression, transparency and interlacing features of GIF
- Still not widely supported on development side, although latest version of some browsers do