

CSc 110

Images, PPM

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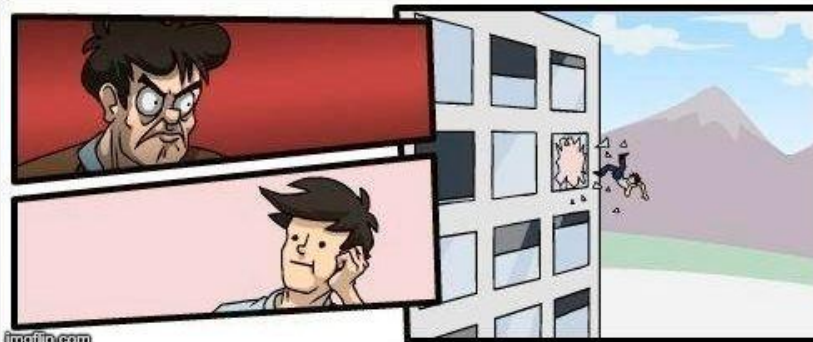


Image Files

- How do computers represent image files?
- There are lots of formats out there
 - .jpg .gif .bmp .png .psd etc...
- .jpg is one of the most common, but understanding the format is a complex because it uses ***compression***
- In this lecture, we'll talk about the simpler [.ppm](#) format
- First, let's talk about how computers display images

Image Representation

- You are tasked with coming up a way to represent images on a computer hard drive.
- How would you do it?
- **Recall:** If something is to be stored on a typical computer HDD or SSD, it should have a binary format

Image Files

- On a screen, each pixel has a red, green, and blue (RGB) component
- By varying the brightness of each color dot in a pixel, each pixel can be a different overall color
- When these pixels are combined, they create graphics and images

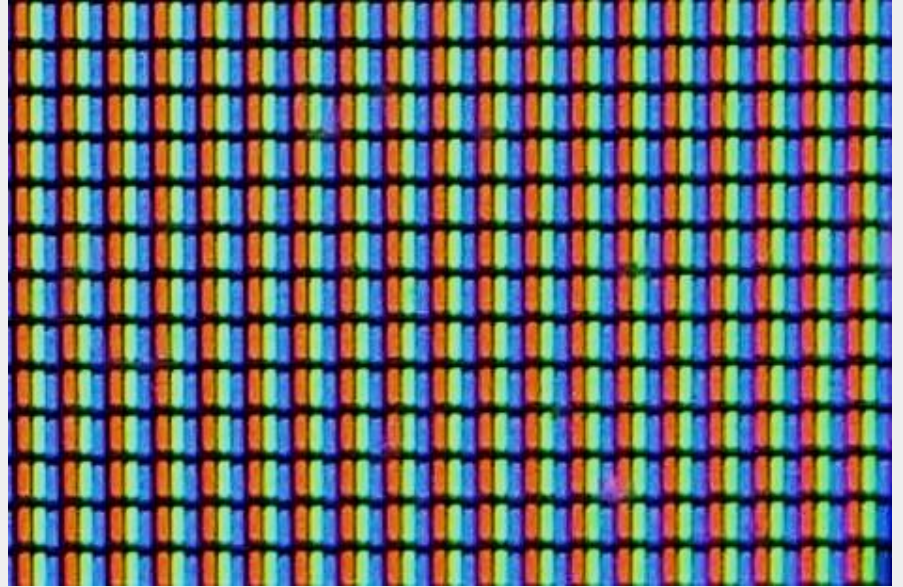


Image Files

- Common resolutions are
 - 1920 x 1080 (1080p)
 - 3840 x 2160 (4k)
 - 2880 x 1800 (13" Retina)



Image Files

- Images files come in many “flavors”
 - One thing most image formats have in common: They specify what each pixel of the image should look like
- A .ppm image specifies what the red, green, and blue value should be for each dot within each pixel for the entire image
- The specification starts from the top-left of the image, and goes across

PPM Image Format



PPM
Image
Format



PPM
Image
Format



PPM Image Format



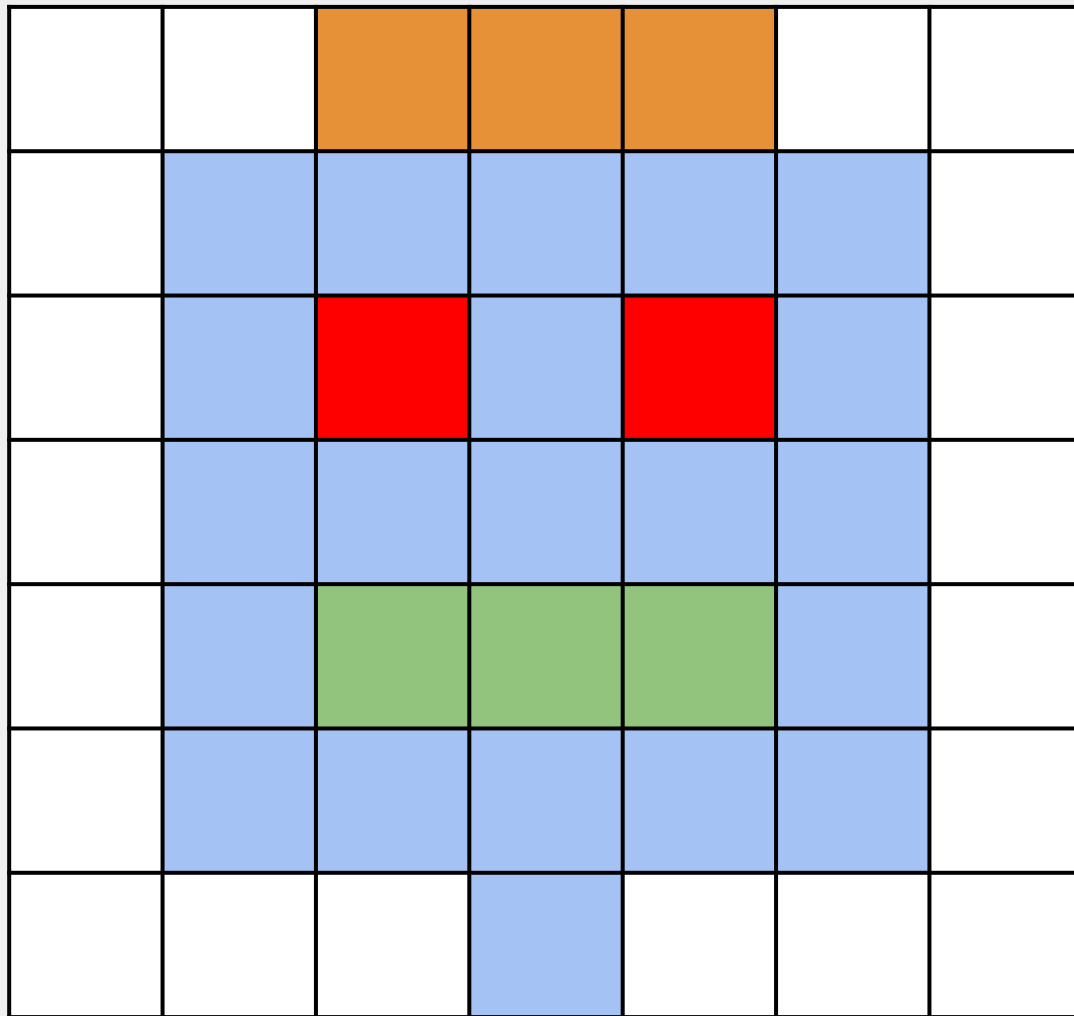
PPM Image Format



PPM
Image
Format

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49

PPM
Image
Format



PPM Image Format

255 255 255	255 255 255	230 145 56	230 145 56	230 145 56	255 255 255	255 255 255
255 255 255	164 194 244	164 194 244	164 194 244	164 194 244	164 194 244	255 255 255
255 255 255	50 50 255	255 0 0	164 194 244	255 0 0	164 194 244	255 255 255
255 255 255	164 194 244	164 194 244	164 194 244	164 194 244	164 194 244	255 255 255
255 255 255	164 194 244	147 196 125	147 196 125	147 196 125	164 194 244	255 255 255
255 255 255	164 194 244	164 194 244	164 194 244	164 194 244	164 194 244	255 255 255
255 255 255	255 255 255	255 255 255	164 194 244	255 255 255	255 255 255	255 255 255

With
Red
Green
Blue
Decimal values

All of the pixels

```
11111111 11111111 11111111 11111111 11111111 11111111 11100110 10010001 00111000 11100110 10010001
00111000 11100110 10010001 00111000 11111111 11111111 11111111 11111111 11111111 11111111
11111111 11111111 11111111 10100100 11000010 11110100 10100100 11000010 11110100 10100100 11000010
11110100 10100100 11000010 11110100 10100100 11000010 11110100 11111111 11111111 11111111
11111111 11111111 11111111 10100100 11000010 11110100 11111111 00000000 00000000 10100100 11000010
11110100 11111111 00000000 00000000 10100100 11000010 11110100 11111111 11111111 11111111
11111111 11111111 11111111 10100100 11000010 11110100 10100100 11000010 11110100 10100100 11000010
11110100 10100100 11000010 11110100 10100100 11000010 11110100 11111111 11111111 11111111
11111111 11111111 11111111 10100100 11000010 11110100 10010011 11000100 01111101 10010011 11000100
01111101 10010011 11000100 01111101 10100100 11000010 11110100 11111111 11111111 11111111
11111111 11111111 11111111 10100100 11000010 11110100 10100100 11000010 11110100 10100100 11000010
11110100 10100100 11000010 11110100 10100100 11000010 11110100 11111111 11111111 11111111
11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 10100100 11000010
11110100 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111
```


PPM Image Files

- If writing a PPM file, specify four things
 - Image format
 - Width/Height
 - Max Color
 - The pixels!
- For example...

P3

3 3

255

255 255 255 255 255 255 200 100 100

255 255 255 200 100 100 200 100 100

200 100 100 200 100 100 255 255 255

“P3” is one of the standard types of PPM images. Don’t forget to make this the first line!

P3

3 3

255

255	255	255	255	255	255	200	100	100
255	255	255	200	100	100	200	100	100
200	100	100	200	100	100	255	255	255

The Width and Height
(in that order) of the
image file

The max color brightness.
Typically, you always want
this to be 255

The Red/Green/Blue values for
every pixel in the image

What image will this produce?

P3

3 3

255

255	255	255	255	255	255	200	100	100
255	255	255	200	100	100	200	100	100
200	100	100	200	100	100	255	255	255

What image will this produce?

P3

3 3

255

255 255 255

255 255 255

200 100 100

255 255 255

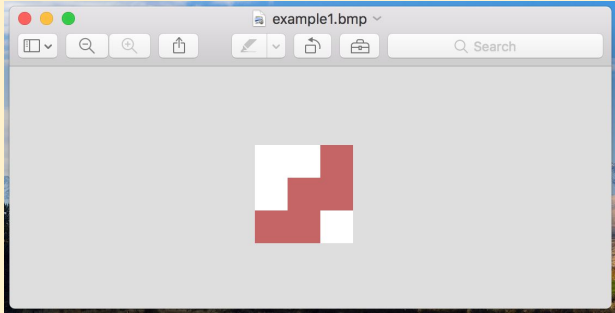
200 100 100

200 100 100

200 100 100

200 100 100

255 255 255



What image will this produce?

P3

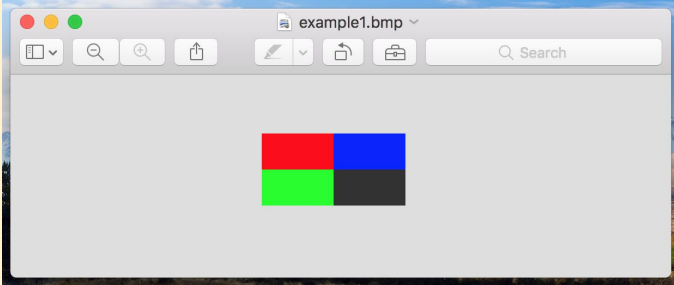
4 2

255

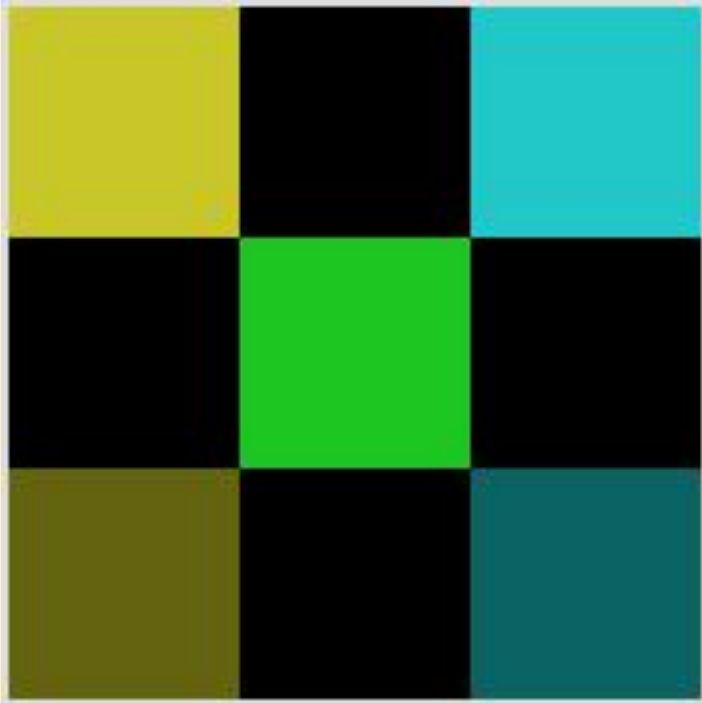
255 0 0	255 0 0	0 0 255	0 0 255
0 255 0	0 255 0	50 50 50	50 50 50

What image will this produce?

P3
4 2
255
255 0 0 255 0 0 0 0 255 0 0 255
0 255 0 0 255 0 50 50 50 50 50 50



What PPM content would produce this image?



What PPM content would produce this image?

```
P3
3 3
255
200 200 0    0 0 0    0 200 200
0 0 0        0 200 0    0 0 0
100 100 0    0 0 0    0 100 100
```

