

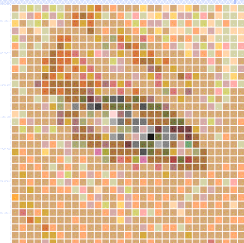
## The Science of Images: B&W Image Representation

- ◆ An image is simply a 2D array of pixels
  - Its dimensions: say,  $w$  pixels wide by  $h$  pixels high
- ◆ Each **pixel** is a small square on the screen
- ◆ Each pixel has a **color** associated with it
- ◆ If the color can be either **black or white**, then one needs only 1 bit per pixel
- ◆ **Size** of a BW image:  $w * h * 1 \text{ bits} = (w * h)/8 \text{ B}$ 
  - A  $640 \times 480$  BW image takes  $38,400 \text{ B} = 37.5 \text{ KB}$   
( $1\text{KB} = 1024 \text{ B}$ )




## The Science of Images: Color Image Representation

- ◆ We can represent every visible color by its **RGB** percentage composition
  - $(R, G, B) = (100\%, 0\%, 0\%)$  is a fully saturated **red**
  - $(R, G, B) = (0\%, 50\%, 0\%)$  is a half-saturated **green**
  - $(R, G, B) = (50\%, 50\%, 50\%)$  is a medium **gray**
- ◆ We can also represent it by its 3 actual RGB **values**
  - The value **scale** has 256 different values
- ◆ Each value is a number between 0 and 255 and one needs 8 bits to represent such a number therefore  $8+8+8=24$  bits to fully represent an RGB color
- ◆ **Size** of a color image:  $w * h * 24 \text{ bits} = (w * h * 24)/8 \text{ B}$ 
  - A  $640 \times 480$  color image takes  $921,600 \text{ B} = 900 \text{ KB}$ !



## The Technology of Images: Compression formats

- ◆ 24 bits (bit-depth) are enough to represent up to 16 million different colors
- ◆ A particular photograph, even though it may be very colorful, it may not need all 24 bits to be represented because it will likely not use all of them
- ◆ **JPG** is a **compression** format that allows the image to be stored using far fewer than 24 bits/pixel
- ◆ When we save an image "as jpg" we actually compress it.
- ◆ As a result, the **quality** of the image will **degrade** so that the compression image may lose some of its quality
- ◆ There are several **levels** of jpg compression and most people may not be able to tell the difference (see <http://www.wellesley.edu/Chemistry/Flick/jpgquality.html> )

## The Technology of Images: limited Palette Image Representation

- ◆ If we use fireworks or director to create a drawing, we likely are going to use far fewer than 16 million colors
- ◆ **GIF** is a image format that uses only 256 colors (it determines the best 256 colors for the image)
- ◆ A gif image uses only 1byte/pixel, plus the table to remember which particular 256 colors it uses (its "**palette**")
- ◆ When **importing** a gif image in Director, we are also importing its palette - which goes into the palette channel
- ◆ See [http://cs.wellesley.edu/~cs215/Lectures/L07-ImagesColorTheory/cfan2\\_digicolor.html](http://cs.wellesley.edu/~cs215/Lectures/L07-ImagesColorTheory/cfan2_digicolor.html)

