Lecture 3 Graphics 101

Why are things the way they are?

Review

How are we going to learn graphics?

- Class Organization
- Web Programming Basics

Today

Some basic background

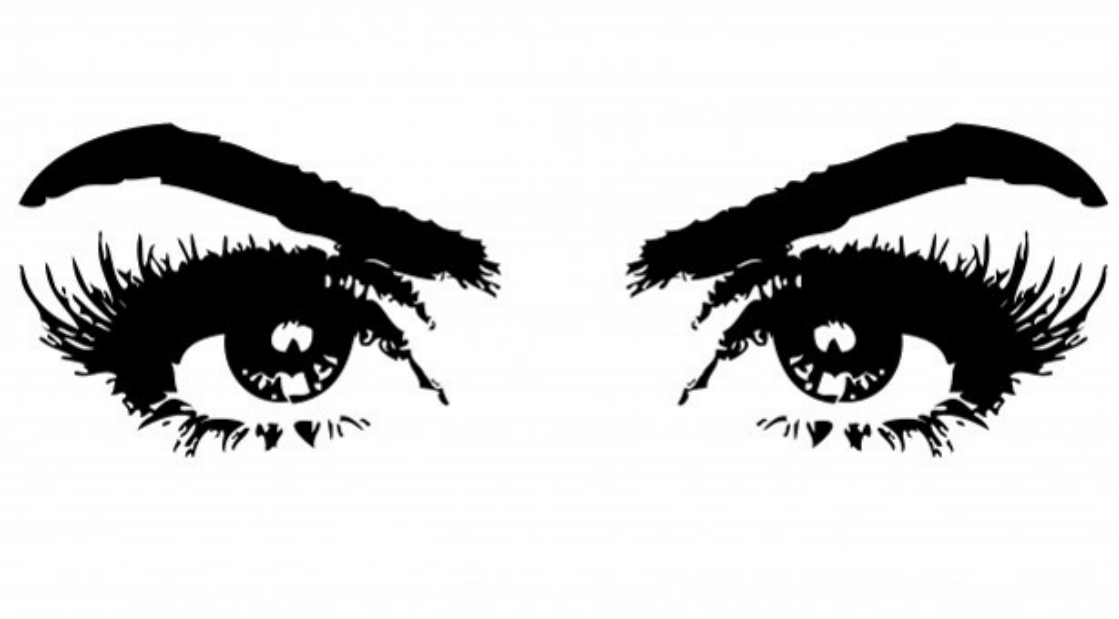
The workbook is pretty self-explanatory (a good intro to Canvas programming)

Computer graphics (the field) is the study of

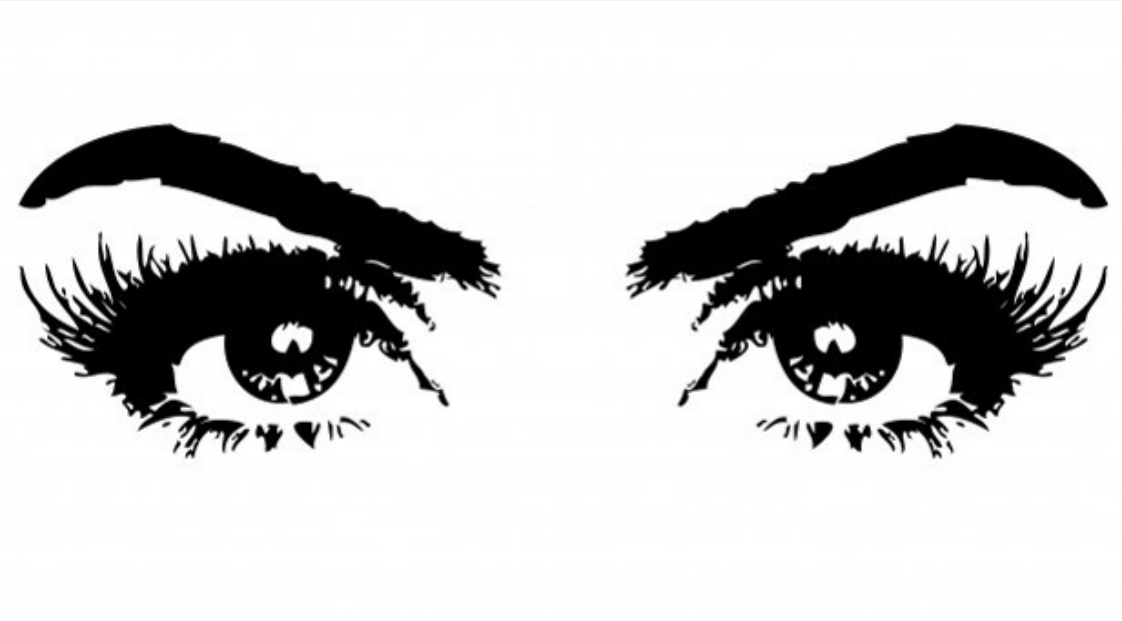
How computers create things we see

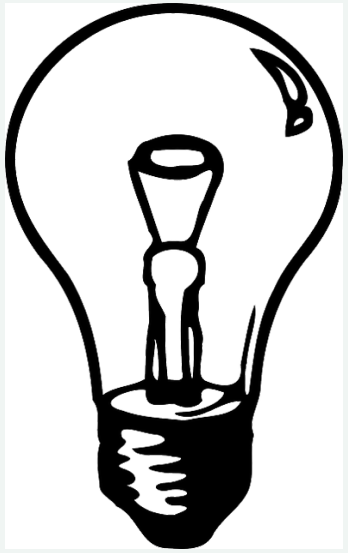
How do we see?

How do we see?

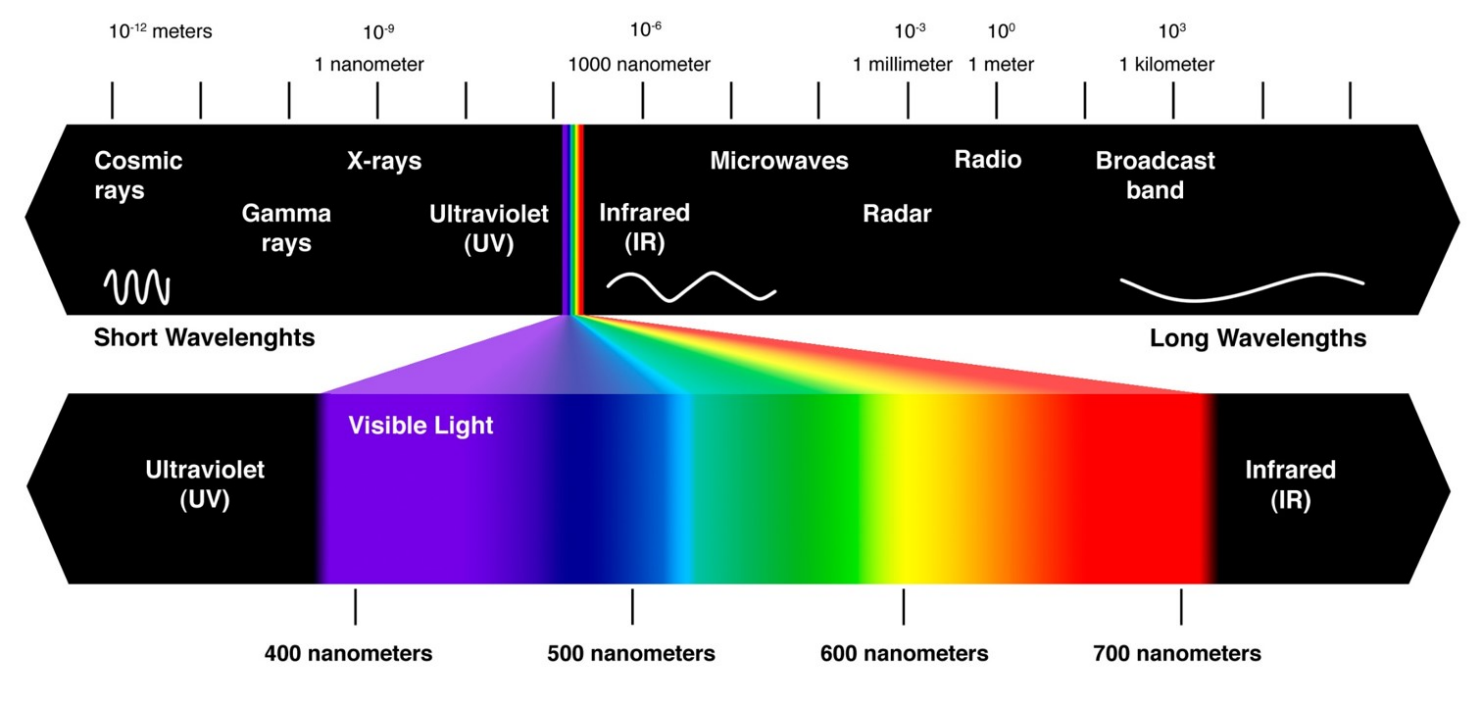


How do we see? (What do we see?)



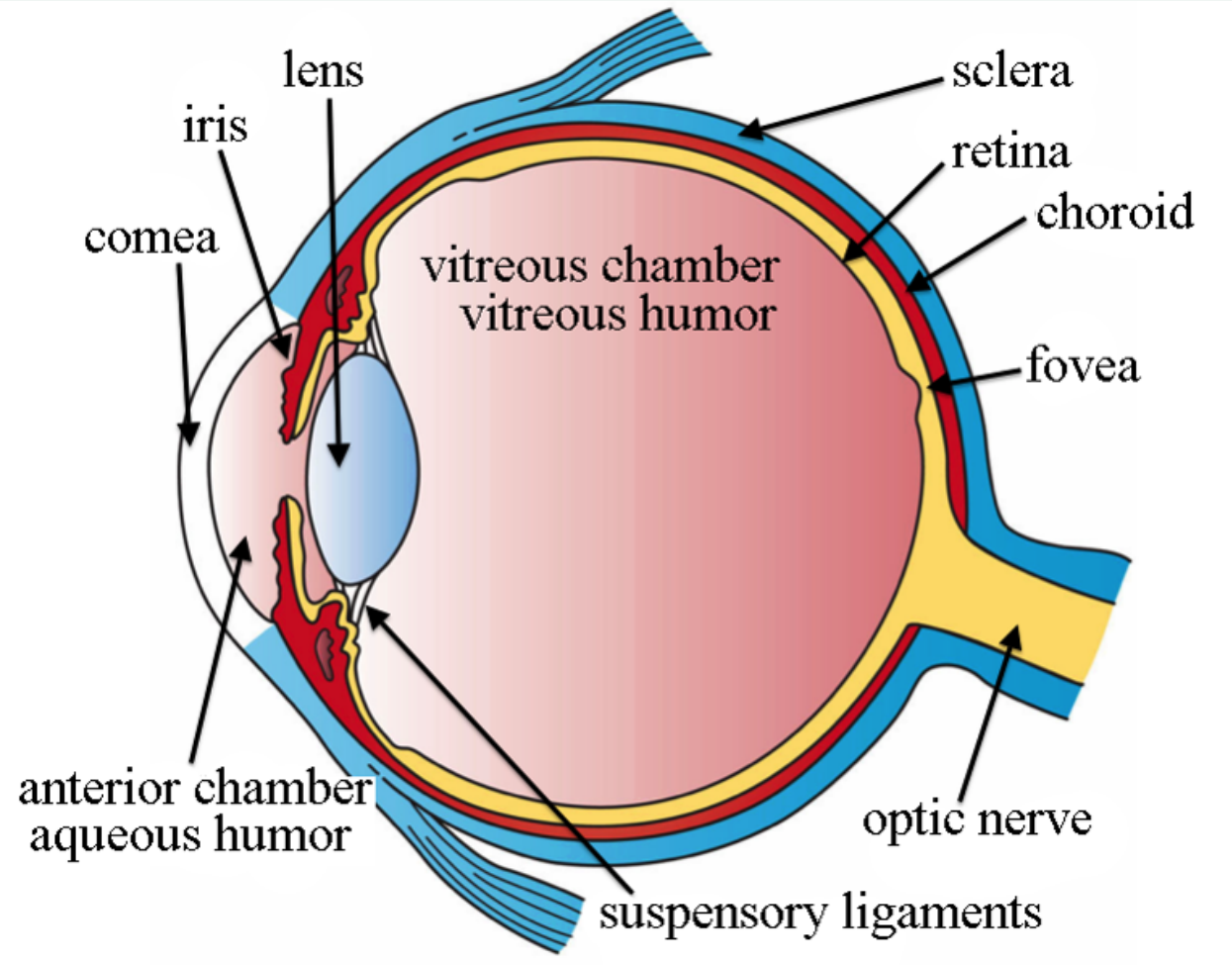


A little about light

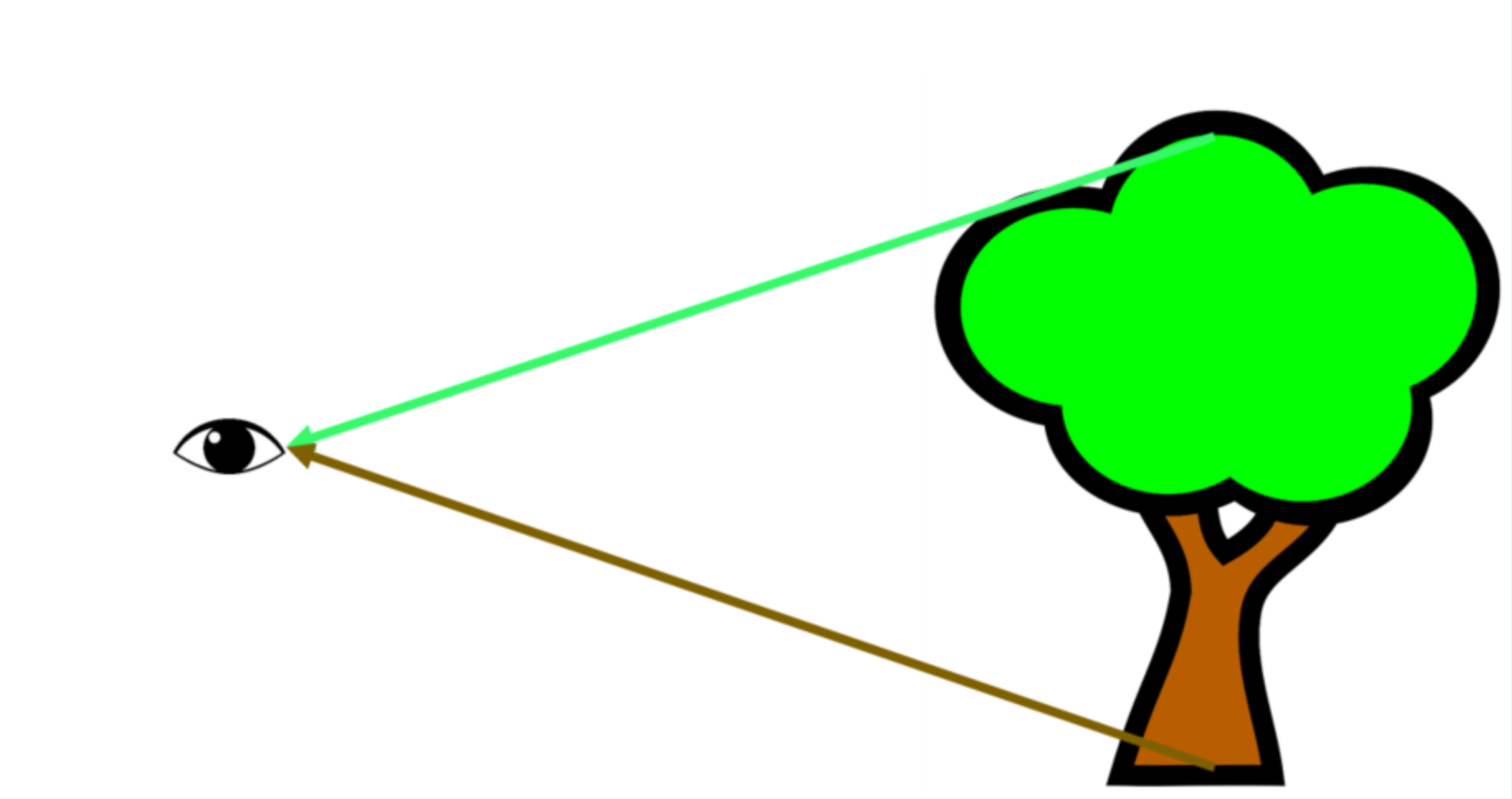


- travels in straight lines
- hits things
  - absorbed
  - bounces
- has color (wavelengths)
  - Why 3 numbers?

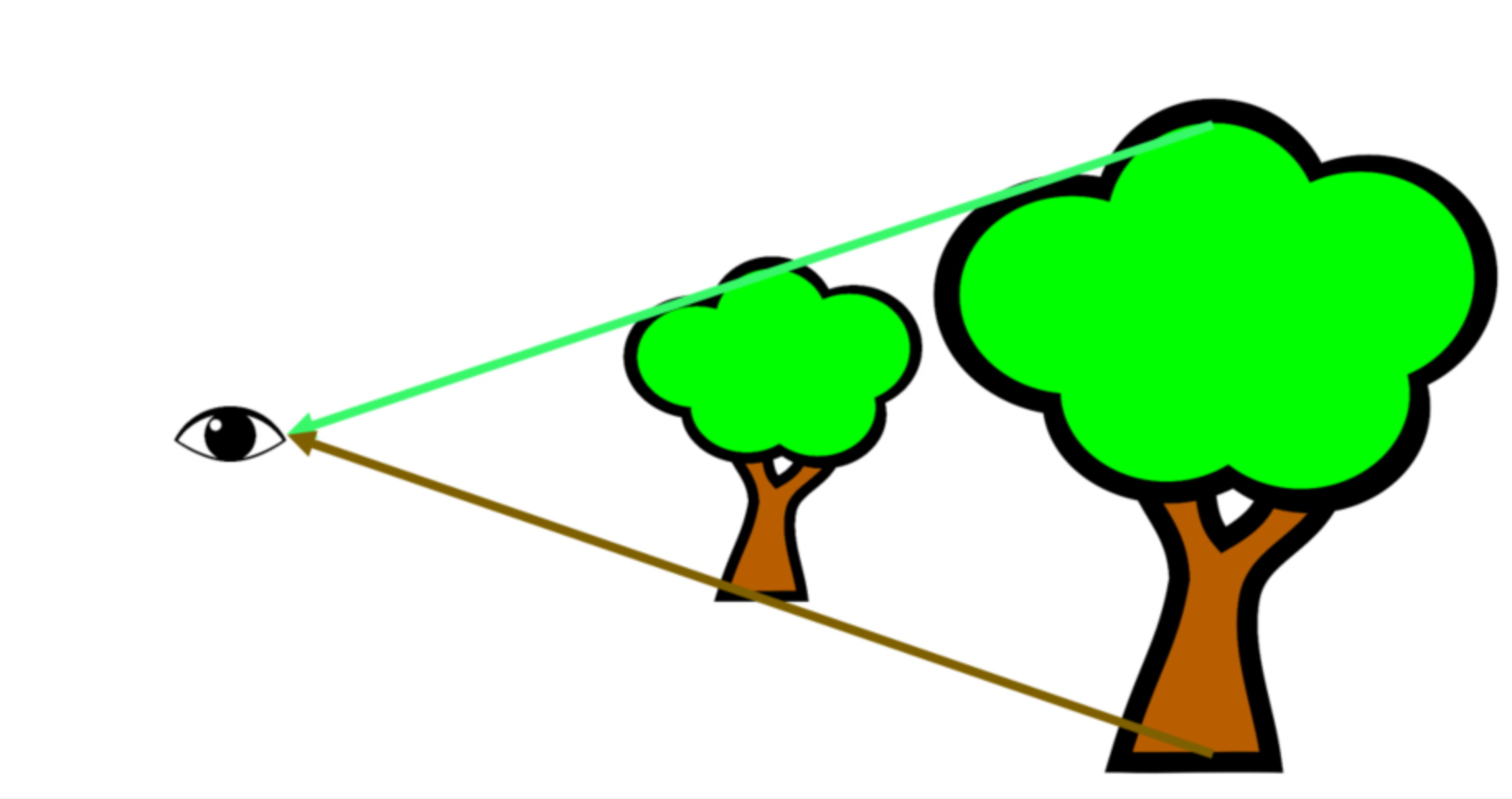
Where (some) light ends up



Looking at things: Depth and Distance



Looking at things: Depth and Distance



Looking at things: Depth and Distance

Can a Picture Fake Us Out?


https://www.turneadv.it/wp-content/uploads/2017/10/3D-pedestrian-crossing-island-2-59f03455342f2__880.jpg
GUSTI


Horn


Hótel
SUZUKI


PURE

The artist is Julien Beever - you can look him up on the web

We sense 2D

(actually, a little more than that)

We infer 3D

Images

Creating Images

- simulate **photons**
- simulate **painting**
- just draw in 2D

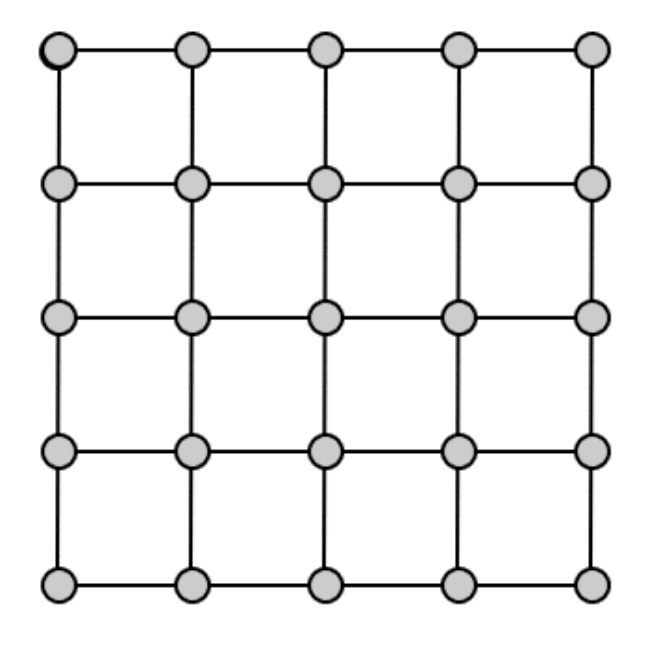
Physically-Based

vs.

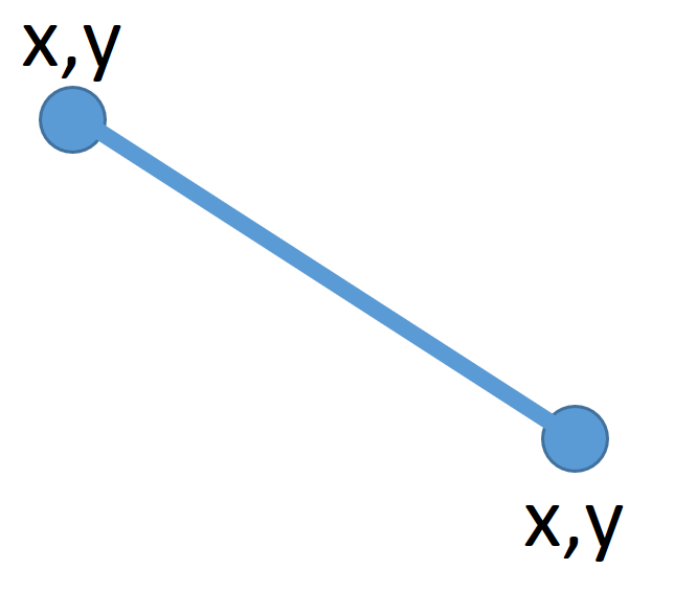
Primitive-Based

Representing Images

Sampled (Raster)



Geometric (Primitives)



Displays

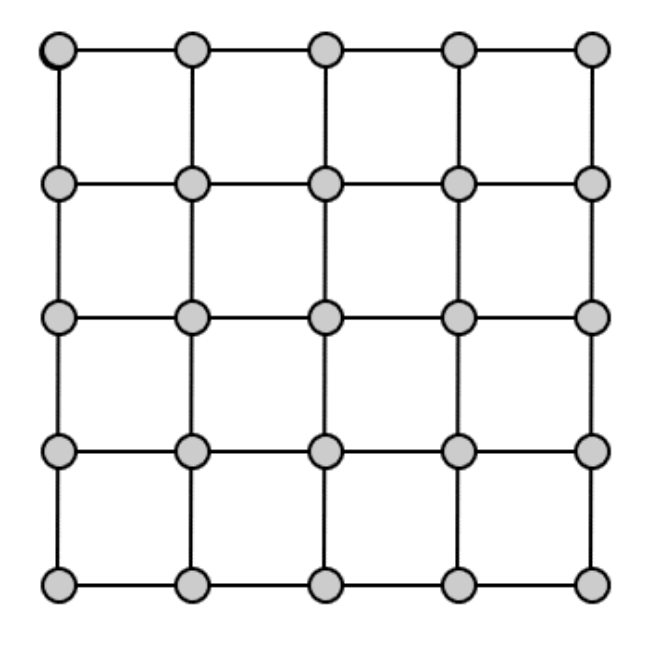
How we **show** images

Sometimes the output is 3D (e.g. a 3D printer)

- we need to represent **shapes**
- similar problem to making pictures

Types of Displays

Sampled (Raster)



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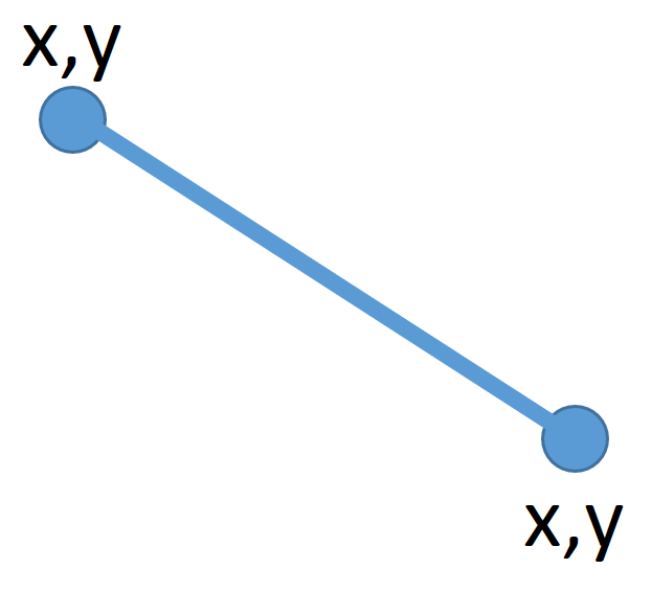

Examples of Displays

Sampled (Raster)

- LCD/LED/CRT
- Laser printer, inkjet printer, ...
- 3D printer (most)
- Projectors
- Film (irregular grid of crystals)

(just about anything you encounter)

Geometric (Primitives)

- Pen plotters
- Laser light shows
- Old fashioned vector displays

(nothing that is common today)

Buffers

Frame Buffer / Color Buffer

(and many more to come)

Another Important Distinction in Displays

Continuous vs. Flicker/Strobe

Appearing Continuous

Flicker Fusion

not persistence of vision

Important Issues in Flicker Fusion

Frame Rate

Consistency

How a movie projector works

Lumiere brothers, 1894 (not Edison!)

Most computer displays are Flicker-Based

Animation and Redraw

Erase and start over

Display Synchronization (Buffering))

Buffering

What if you draw too slowly? or too fast?

Double Buffering

Why double buffer?

- only show finished images
- frame rate constancy

Buffering and Web Graphics?

The web browser takes care of this

(we lose control)

`window.requestAnimationFrame` waits until after a buffer swap

(in simplified theory)