

Final Exam Review



CS 148, Summer 2012

Introduction to Computer Graphics and Imaging

Justin Solomon

Last Steps of CS 148

Homework 6

Due ... yesterday

Will **not** be accepted after Friday

Last Steps of CS 148

Final Exam

Saturday 8/18/12, 12:15pm-3:15pm

**Make-up (if you already signed up)
Thursday 8/16/12, 1pm-4pm**

TWO PAGES

OF NOTES

memegenerator.net

“What Does the Final Cover?”

Everything.

Format

**13 questions,
skip one.**

Reminder

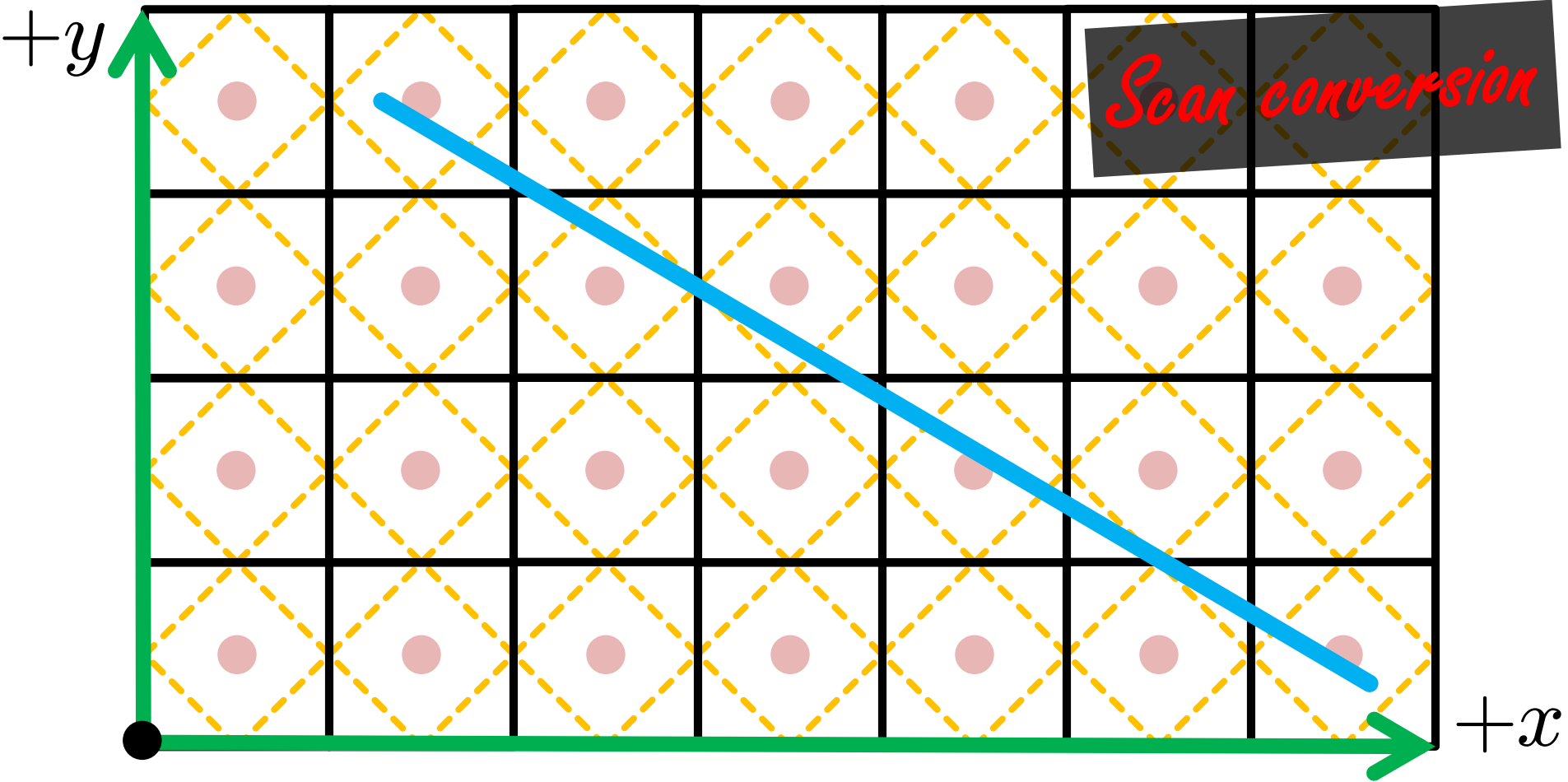
Course Review

Link to Google survey on Piazza.

Recall:

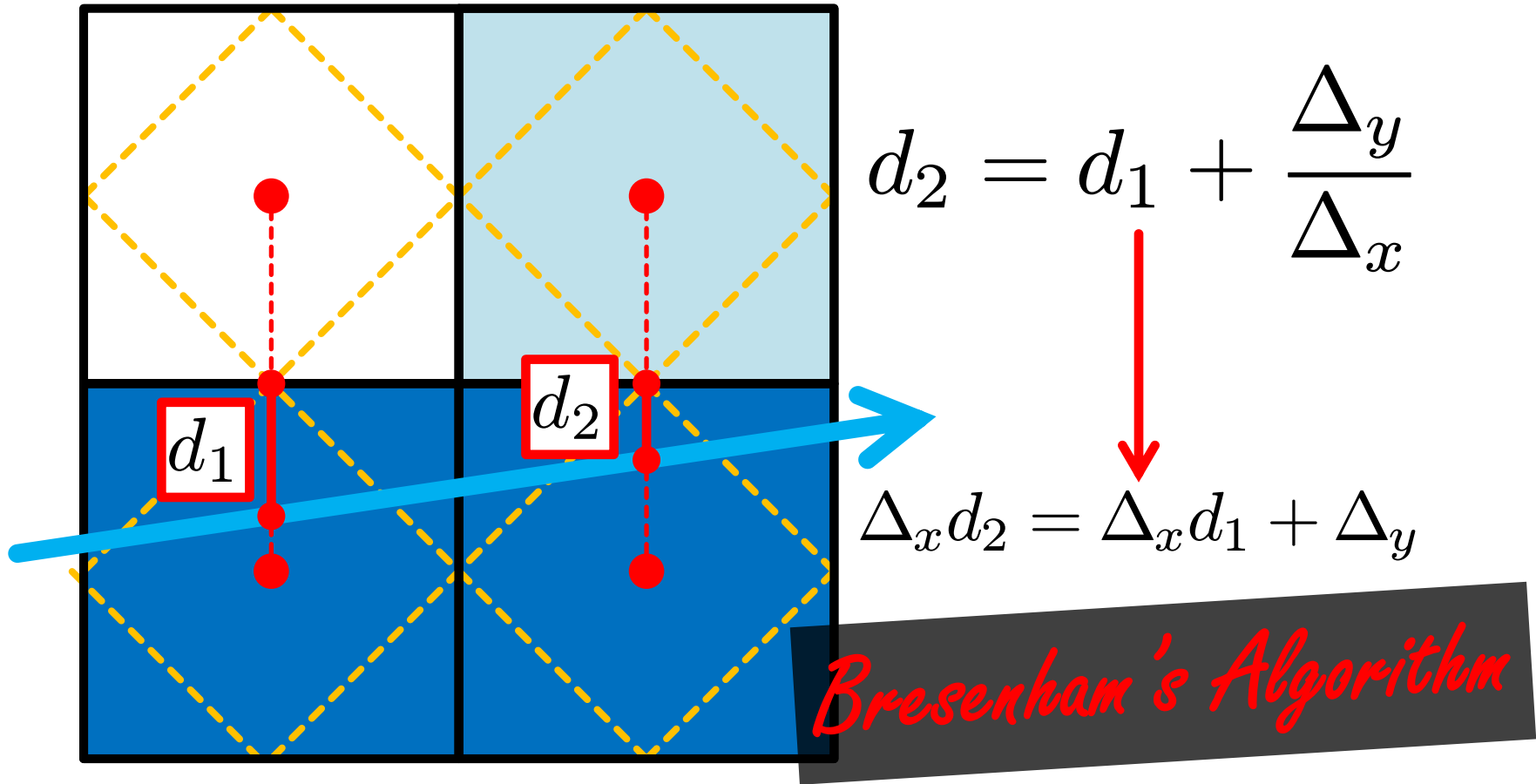
Computer graphics is a
humongous
field.

The Big Ideas



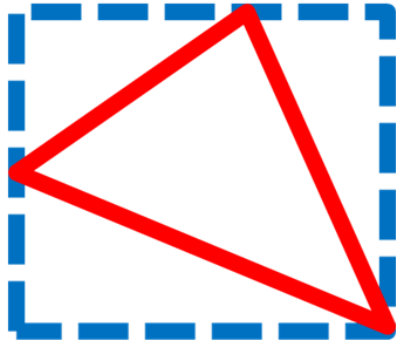
Act I: Real-time graphics

The Big Ideas



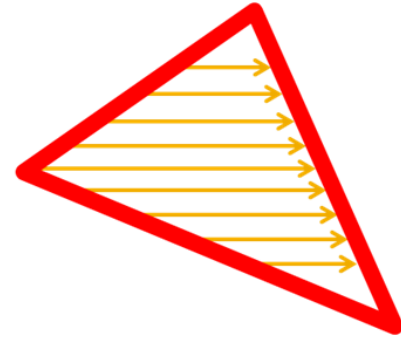
Act I: Real-time graphics

The Big Ideas



Check if each pixel in
bounding box is
inside the triangle.

Parallelizable



Rasterize border;
sweep from
left to right.

Less math

Act I: Real-time graphics

The Big Ideas

All points of the form

$$(x, y; w)$$

where we identify

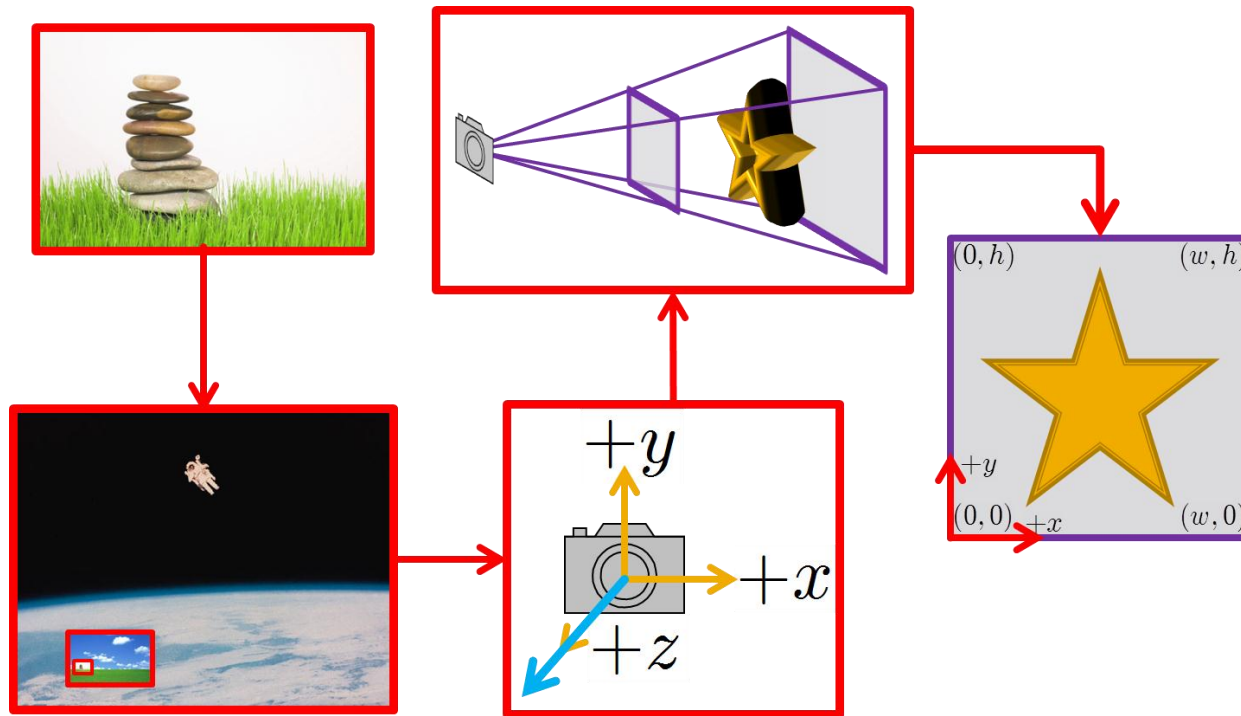
$$(x, y; w) \equiv (cx, cy; cw)$$

for all nonzero c .

*Homogeneous
coordinates*

Act I: Real-time graphics

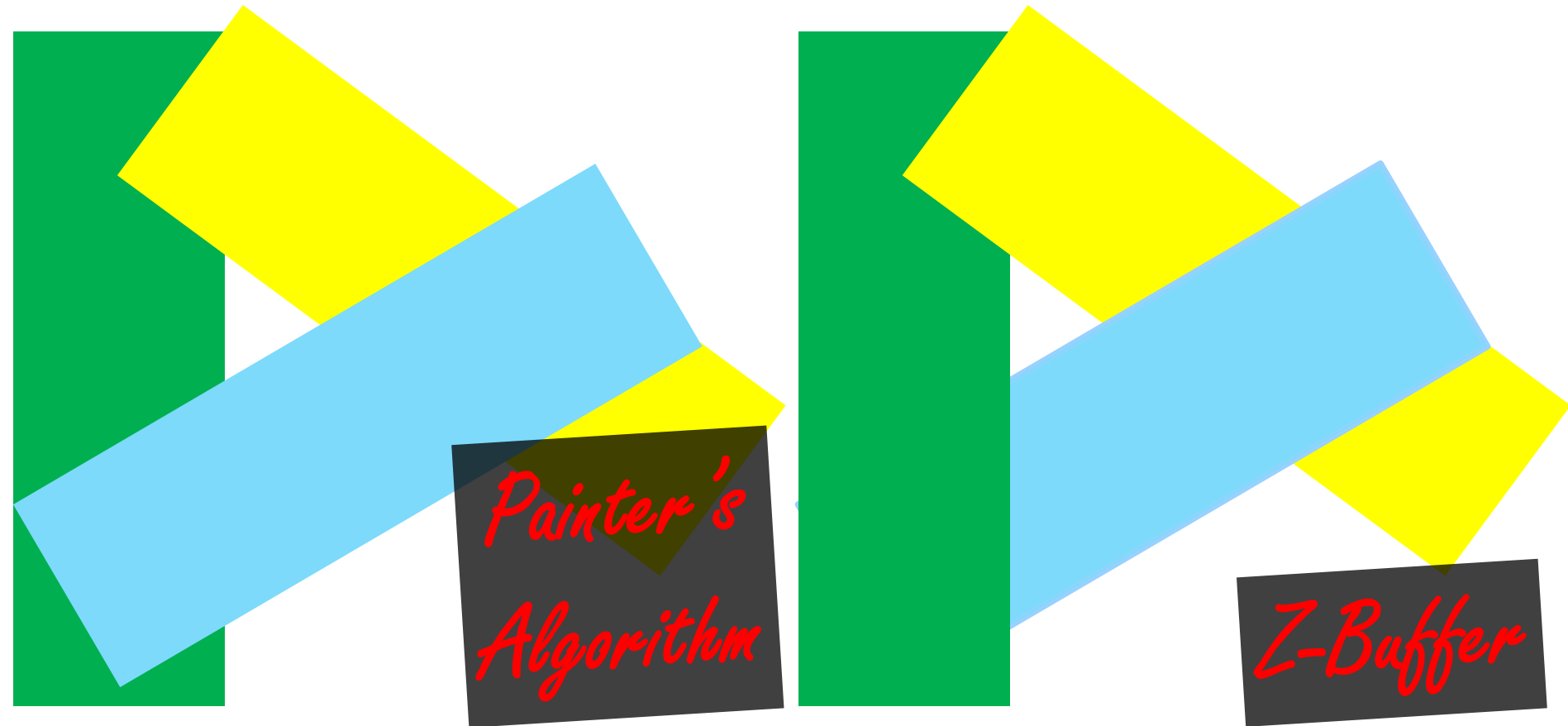
The Big Ideas



1. Object
2. World
3. Camera
4. Frustum
5. Viewport

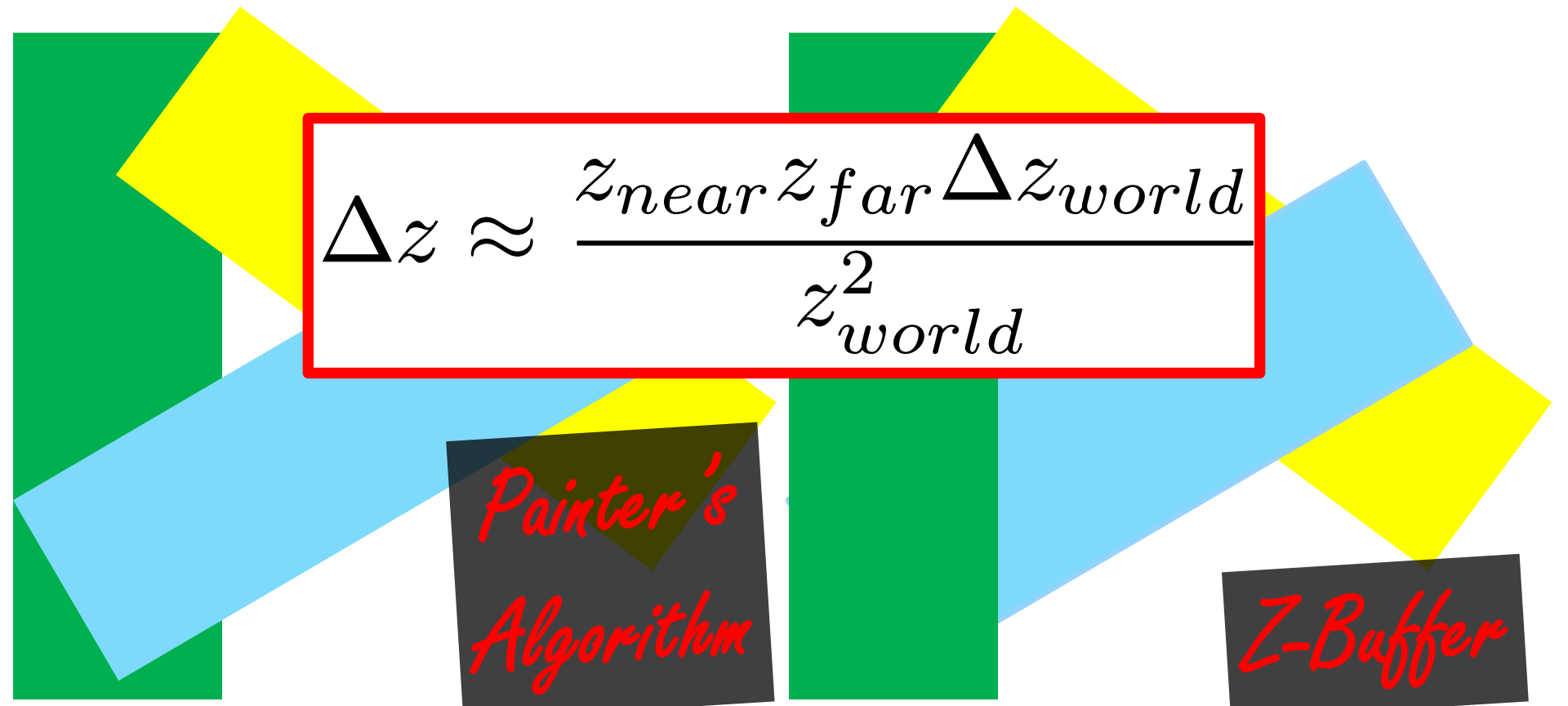
Act I: Real-time graphics

The Big Ideas



Act I: Real-time graphics

The Big Ideas

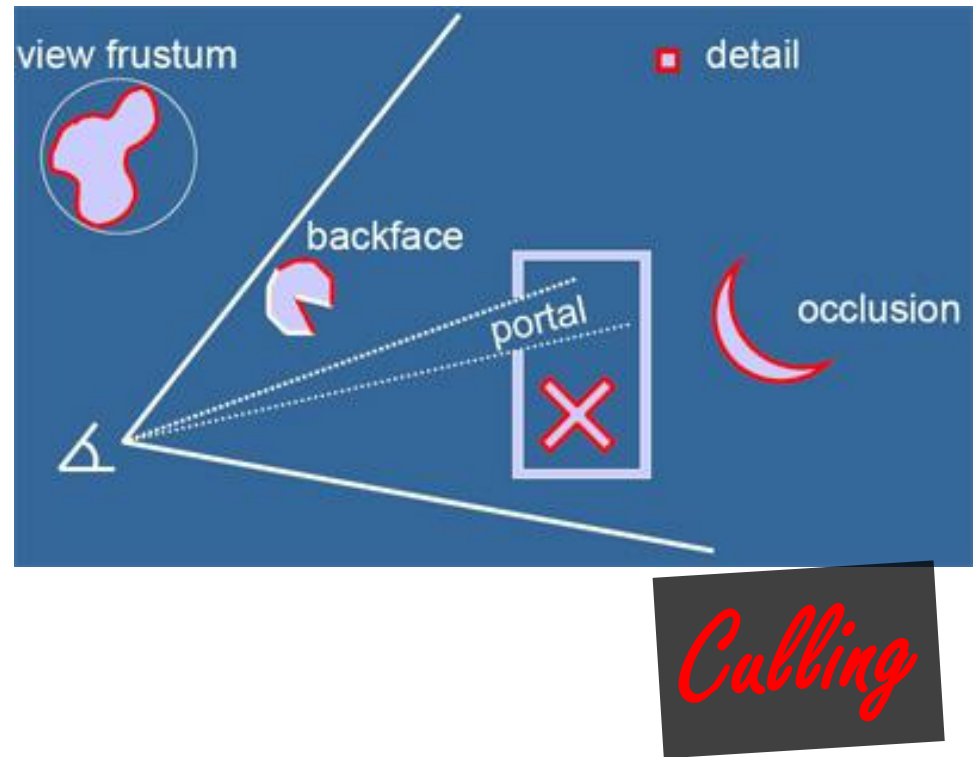
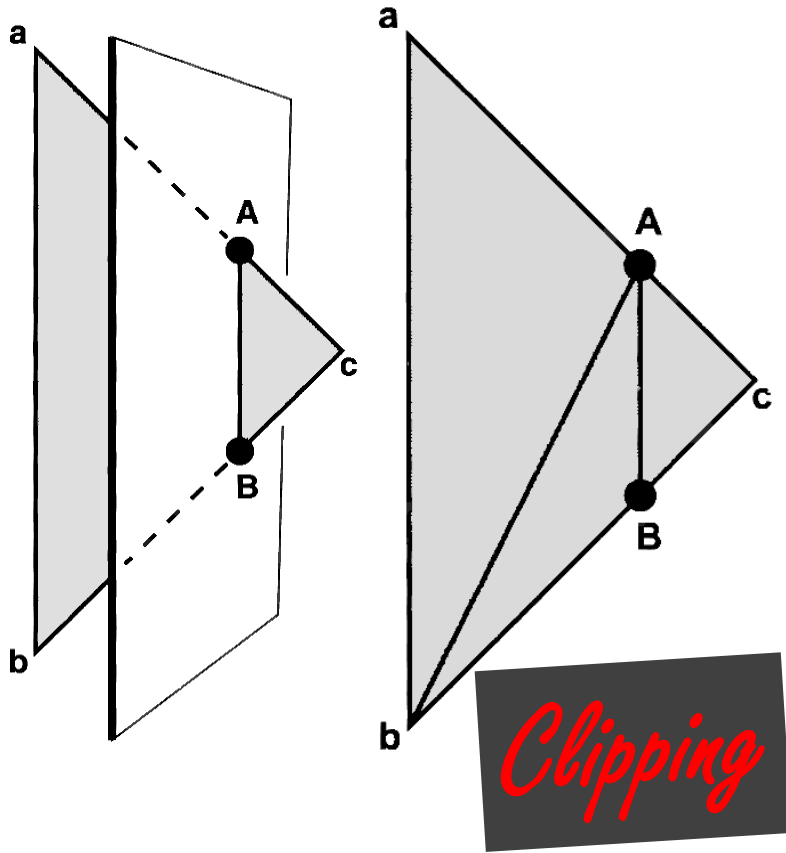

$$\Delta z \approx \frac{z_{near} z_{far} \Delta z_{world}}{z_{world}^2}$$

*Painter's
Algorithm*

Z-Buffer

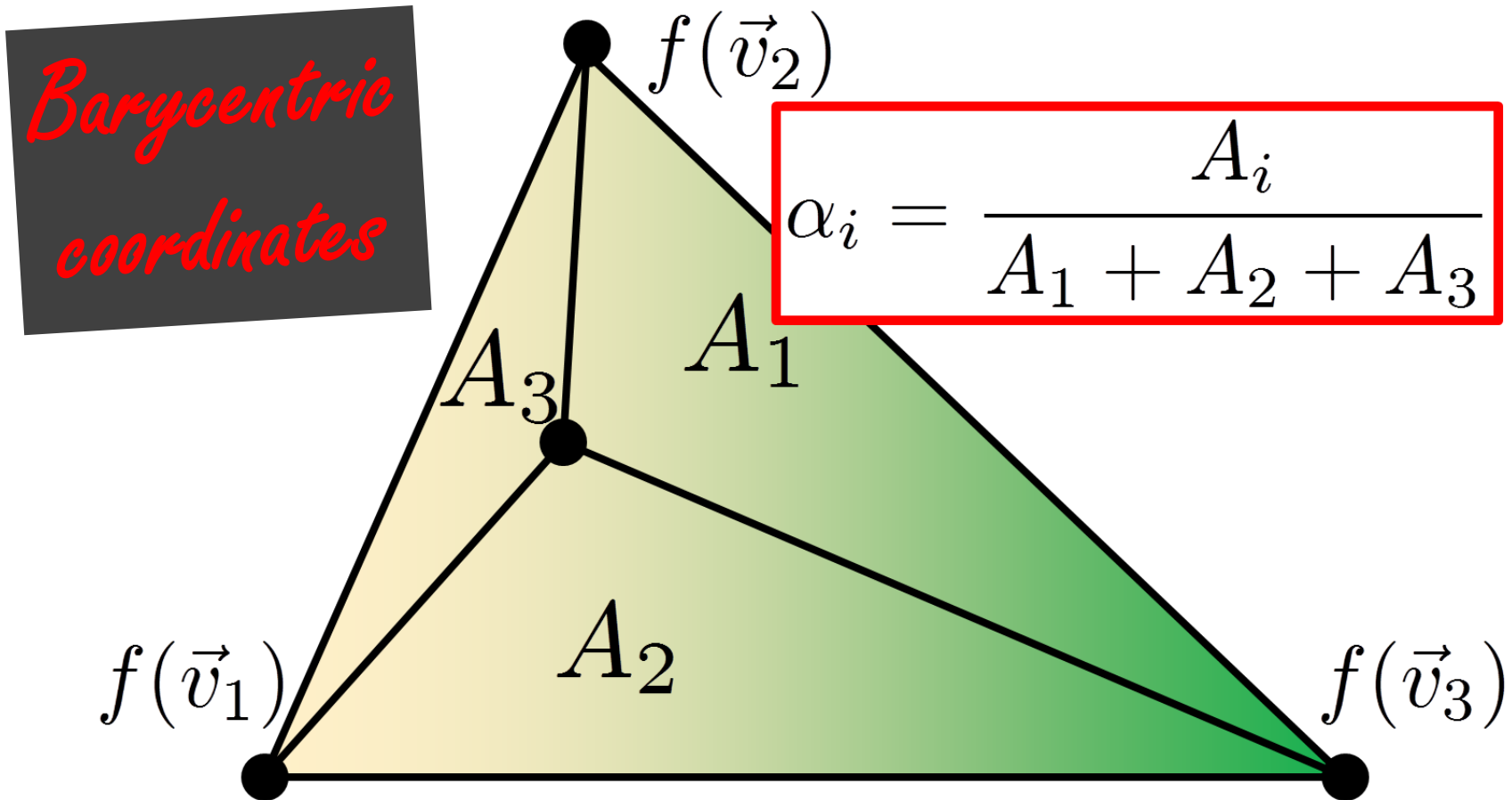
Act I: Real-time graphics

The Big Ideas



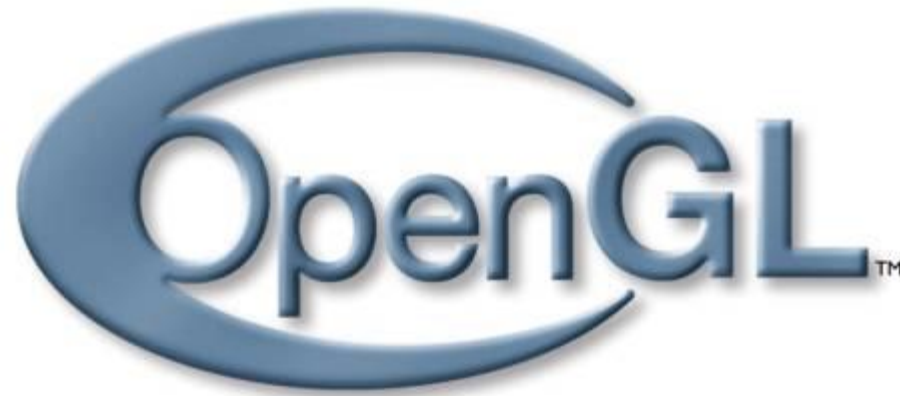
Act I: Real-time graphics

The Big Ideas



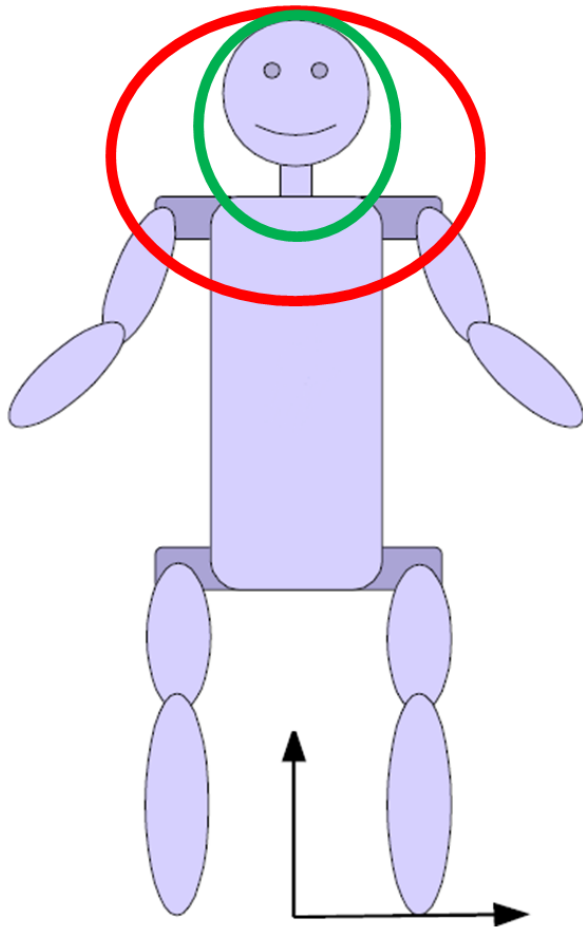
Act I: Real-time graphics

The Big Ideas



Act I: Real-time graphics

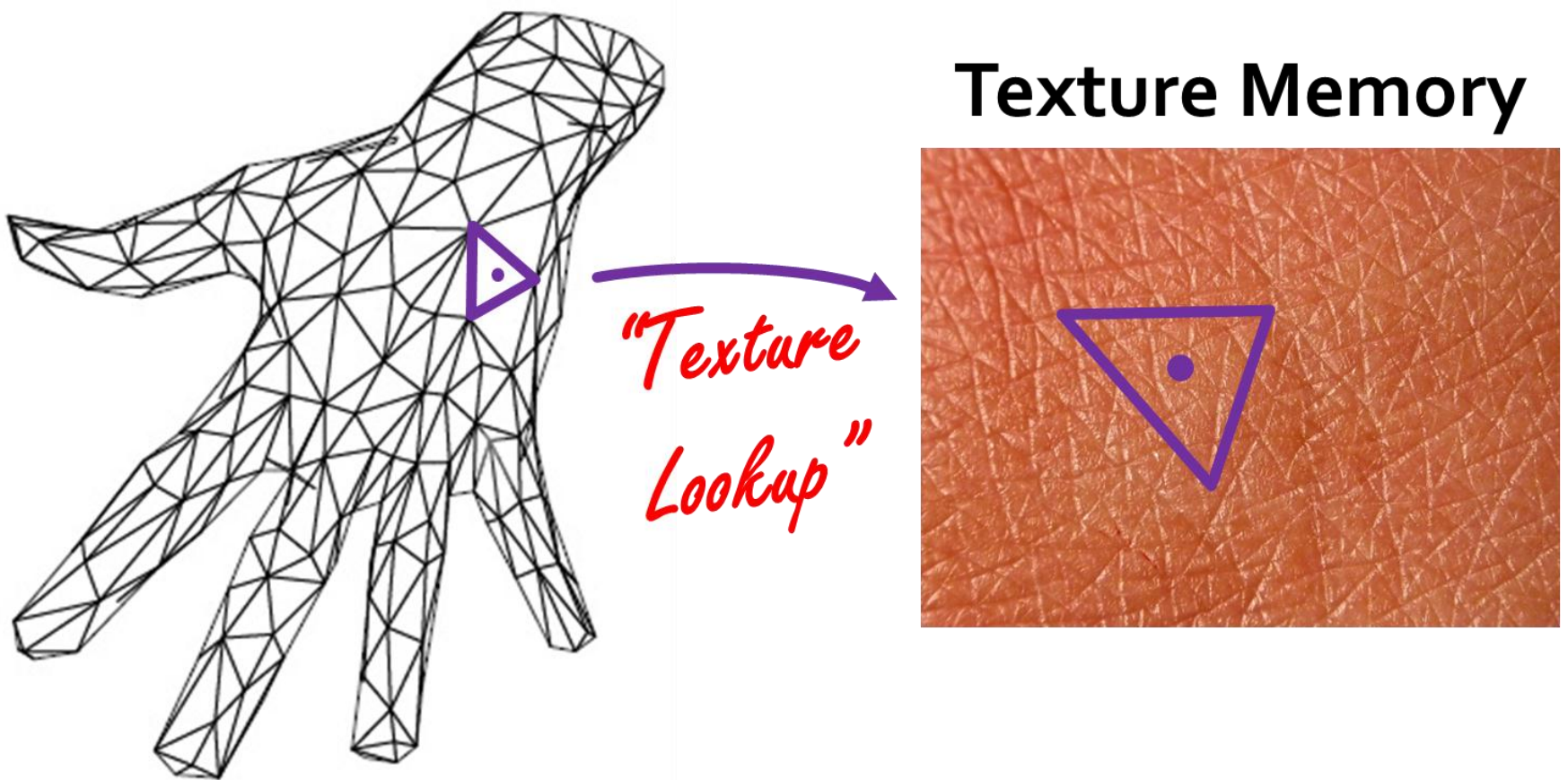
The Big Ideas



```
glTranslatef(0,1.5,0);  
drawTorso();  
glPushMatrix();  
glTranslatef(0,5,0);  
drawShoulder();  
glPushMatrix();  
glRotatef(neck_y,0,1,0);  
glRotatef(neck_x,1,0,0);  
drawHead();  
glPopMatrix();  
glPushMatrix();  
glTranslatef(1.5,0,0);  
glRotatef(l_shoulder_x);  
drawUpperArm(); ...
```

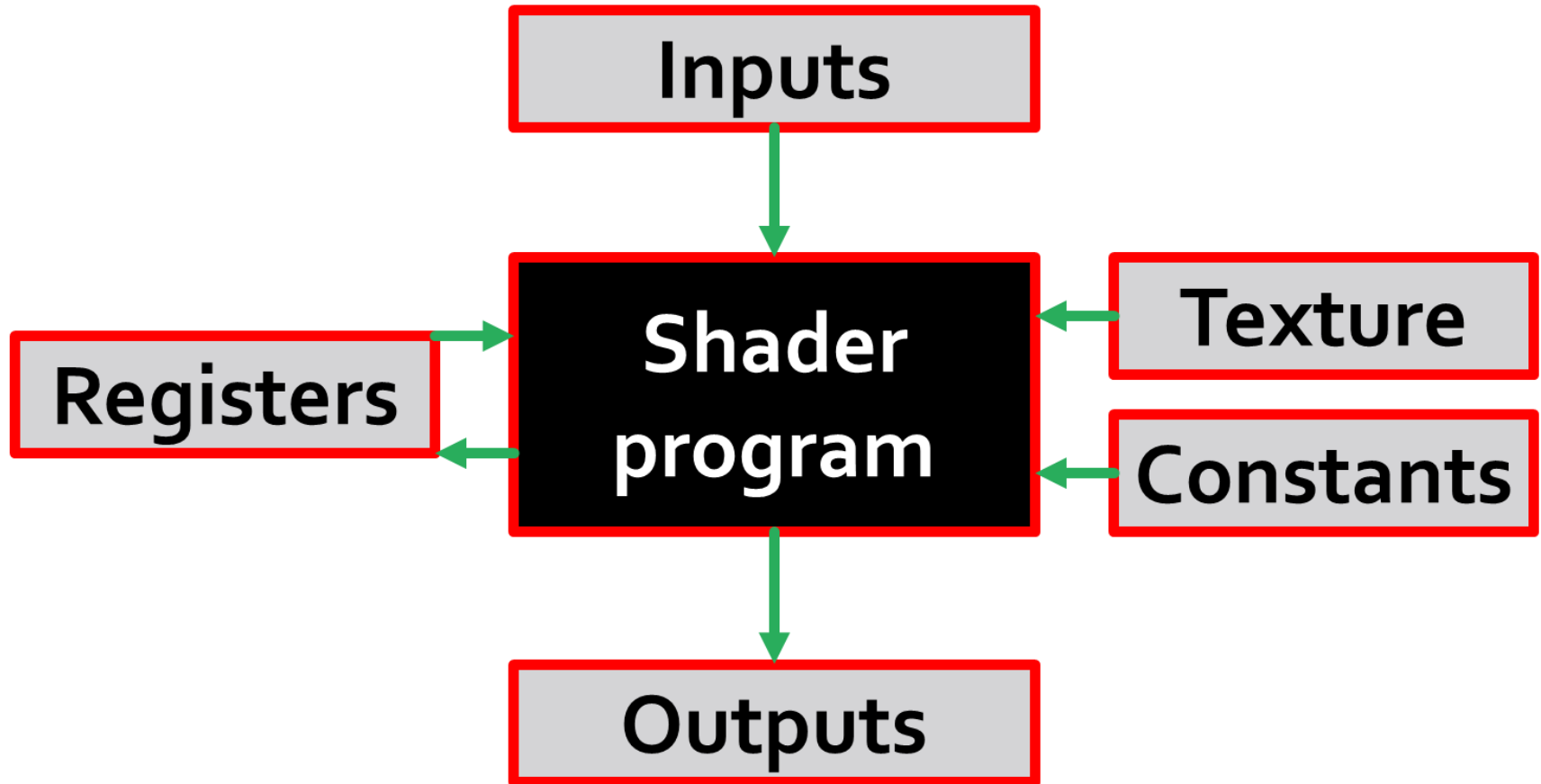
Act I: Real-time graphics

The Big Ideas



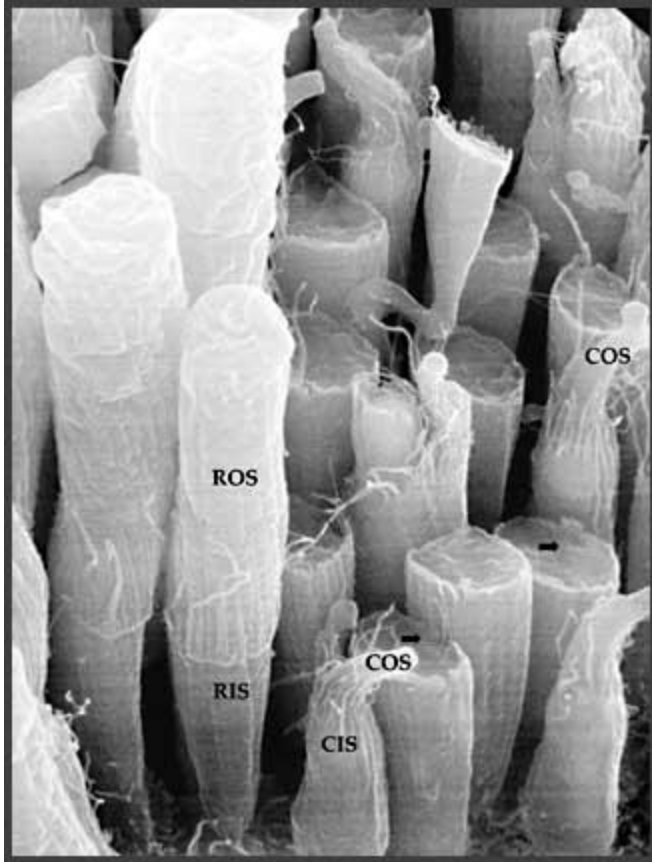
Act I: Real-time graphics

The Big Ideas



Act I: Real-time graphics

The Big Ideas



Rods:

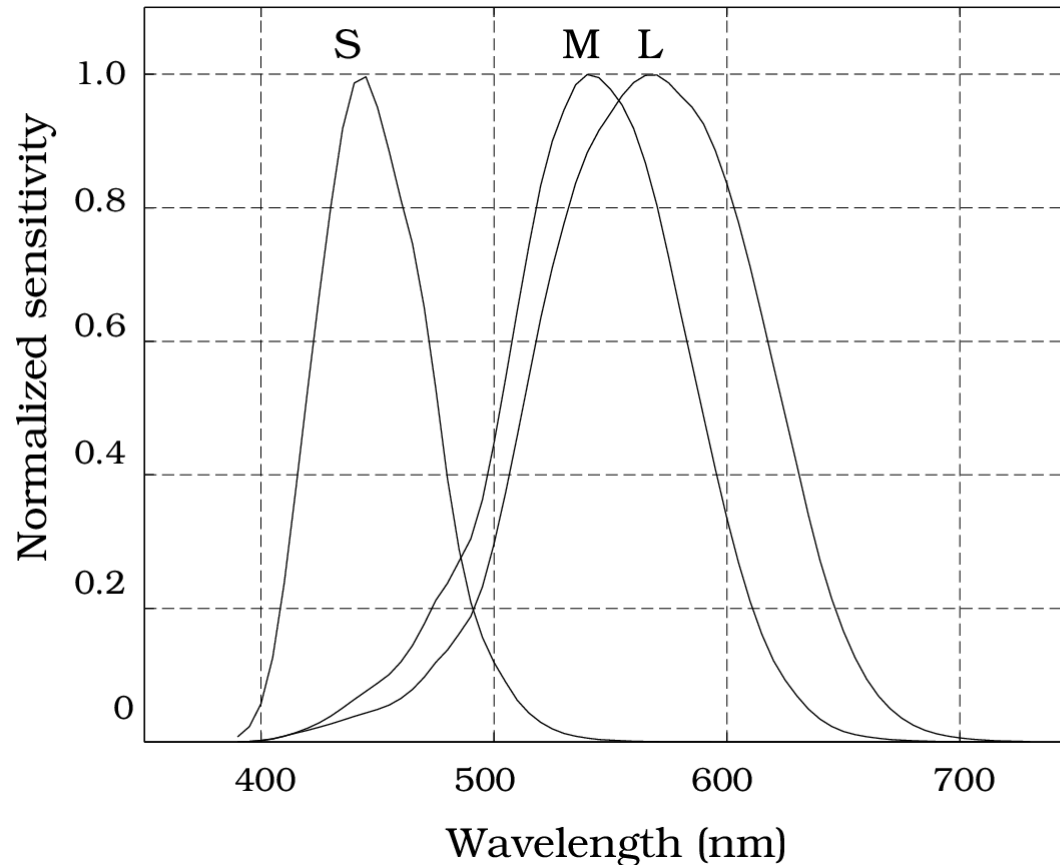
Sensitive to light energy

Cones:

Sensitive to color

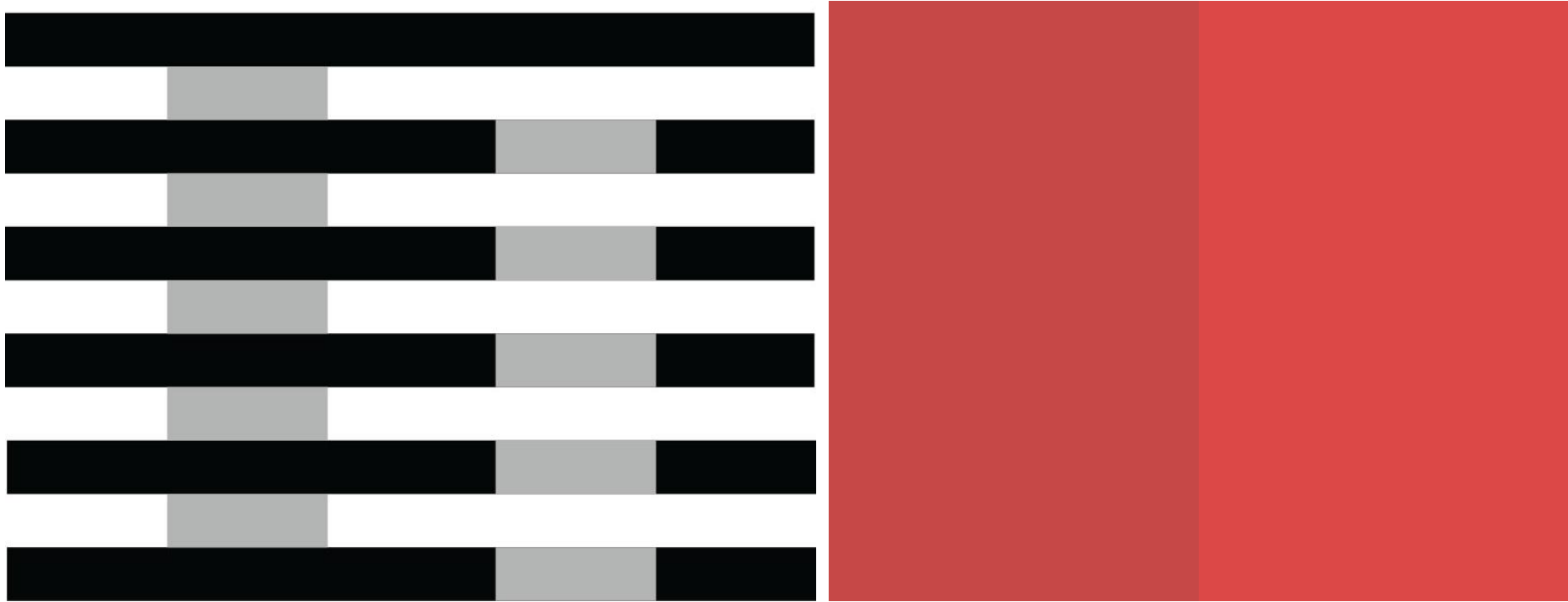
Act II: Real-world considerations

The Big Ideas



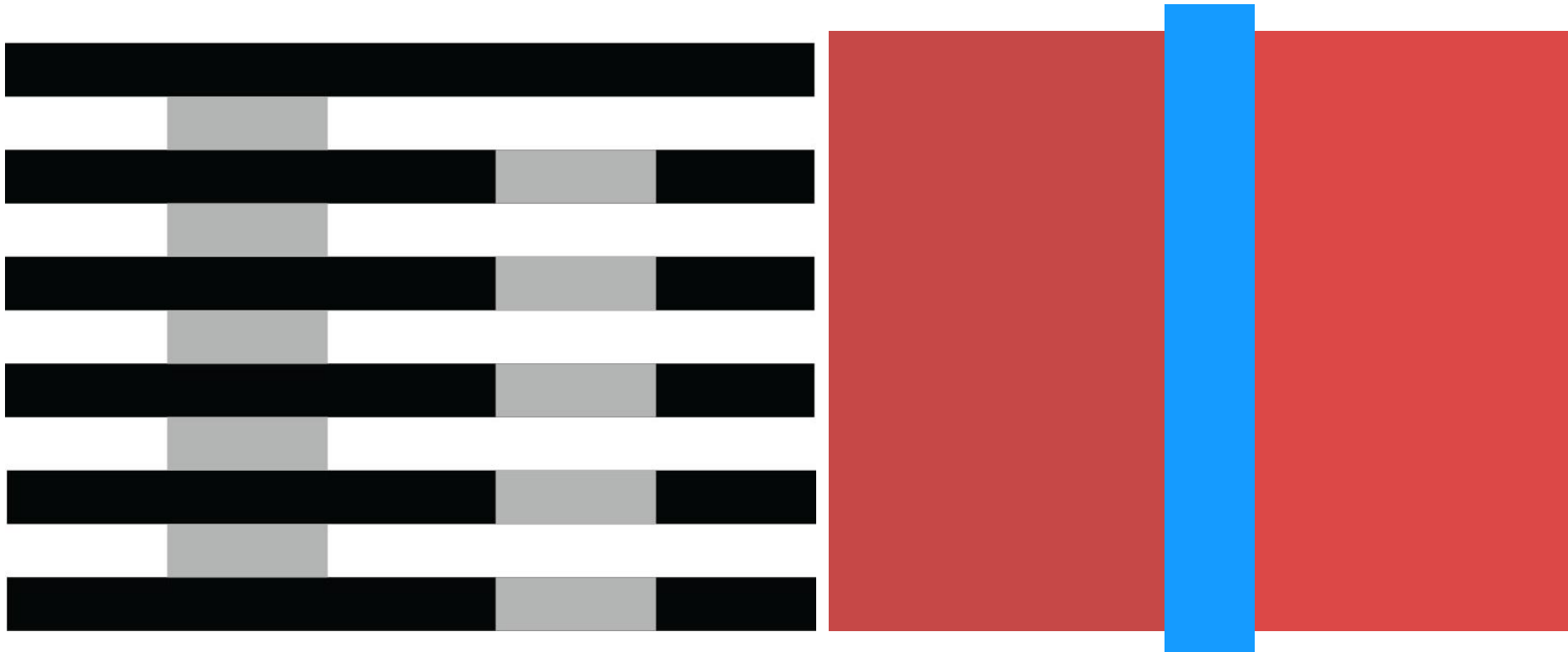
Act II: Real-world considerations

The Big Ideas



Act II: Real-world considerations

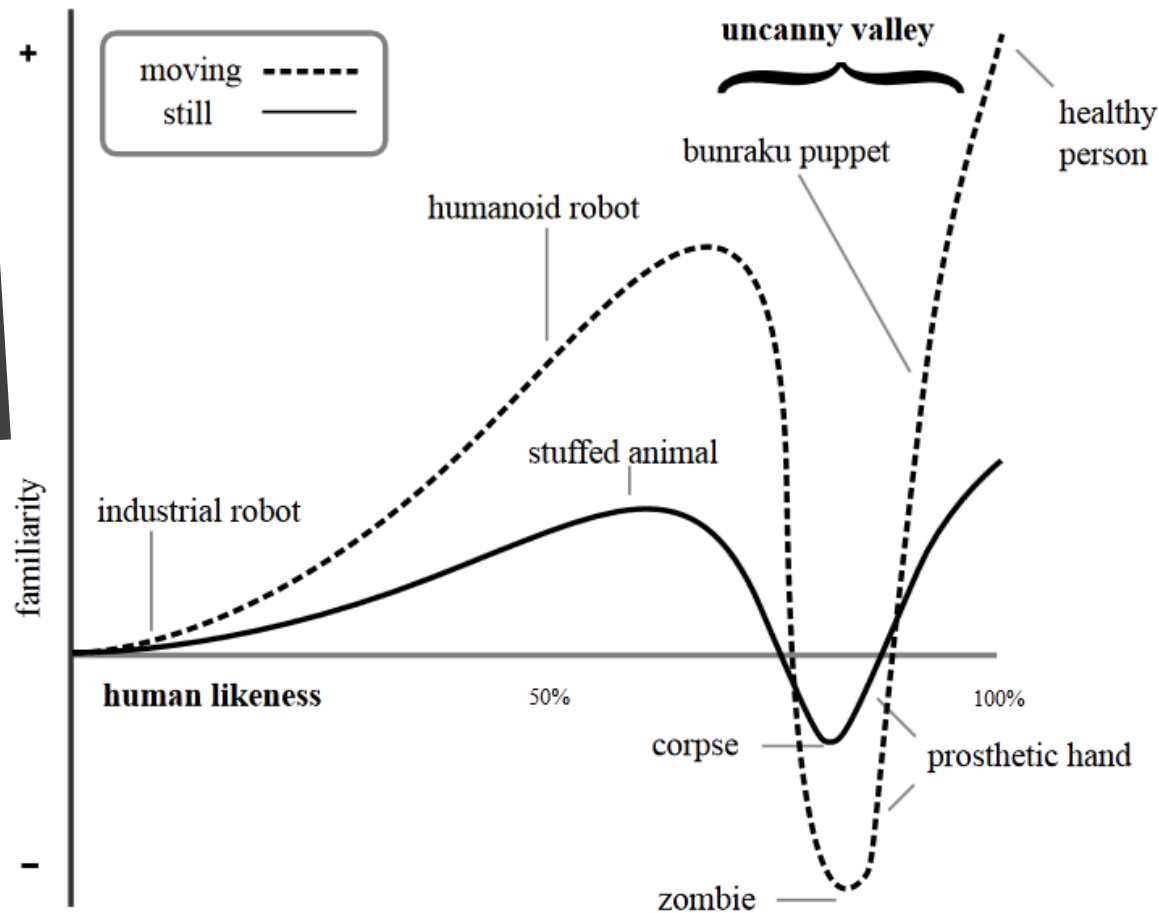
The Big Ideas



Act II: Real-world considerations

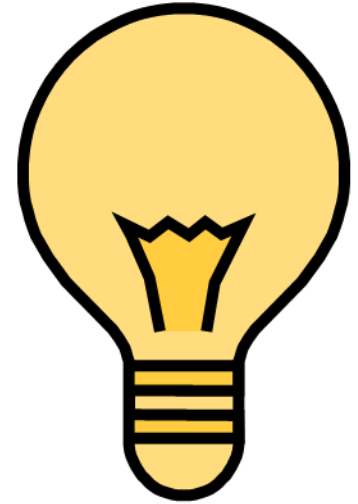
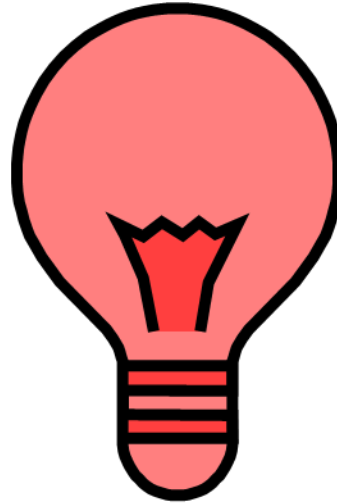
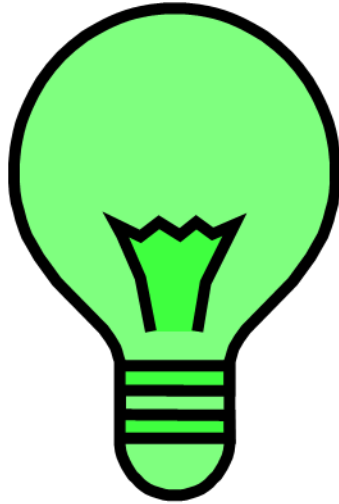
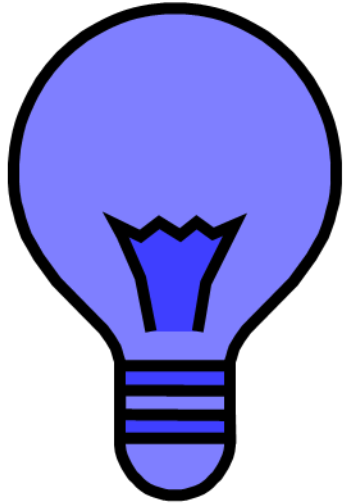
The Big Ideas

Uncanny Valley



Act II: Real-world considerations

The Big Ideas



**“Match this
color.”**

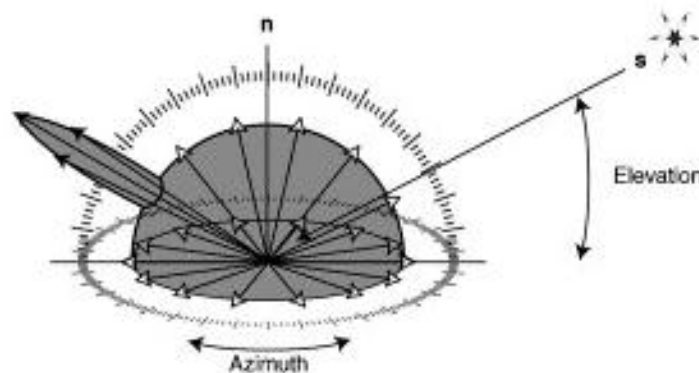
Act II: Real-world considerations

The Big Ideas

BRDF

$$\rho(\vec{k}_i, \vec{k}_o; \vec{N})$$

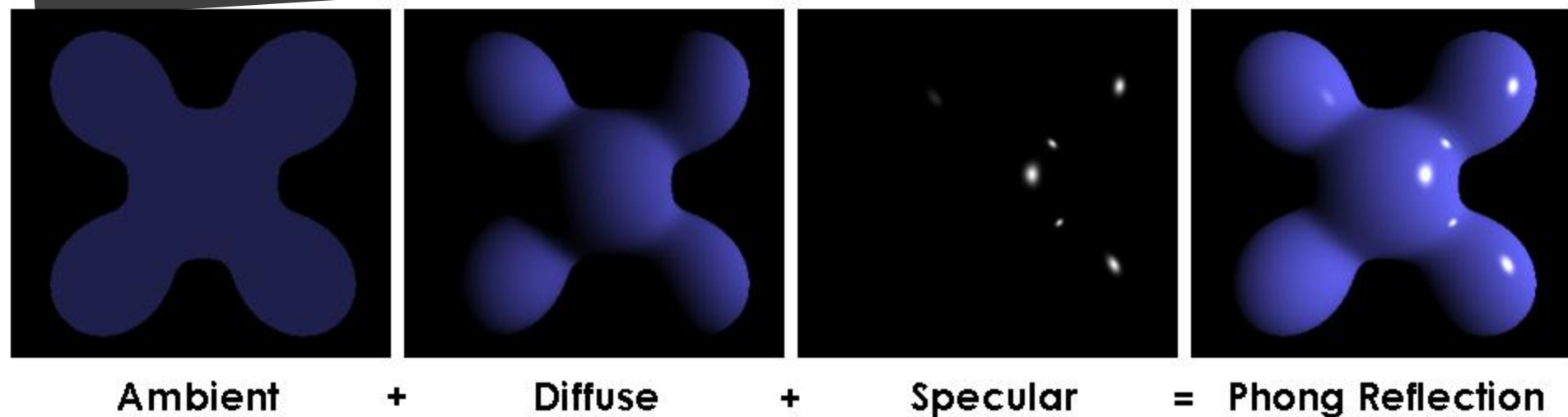
Amount of light leaving the surface in each direction given input direction



Act II: Real-world considerations

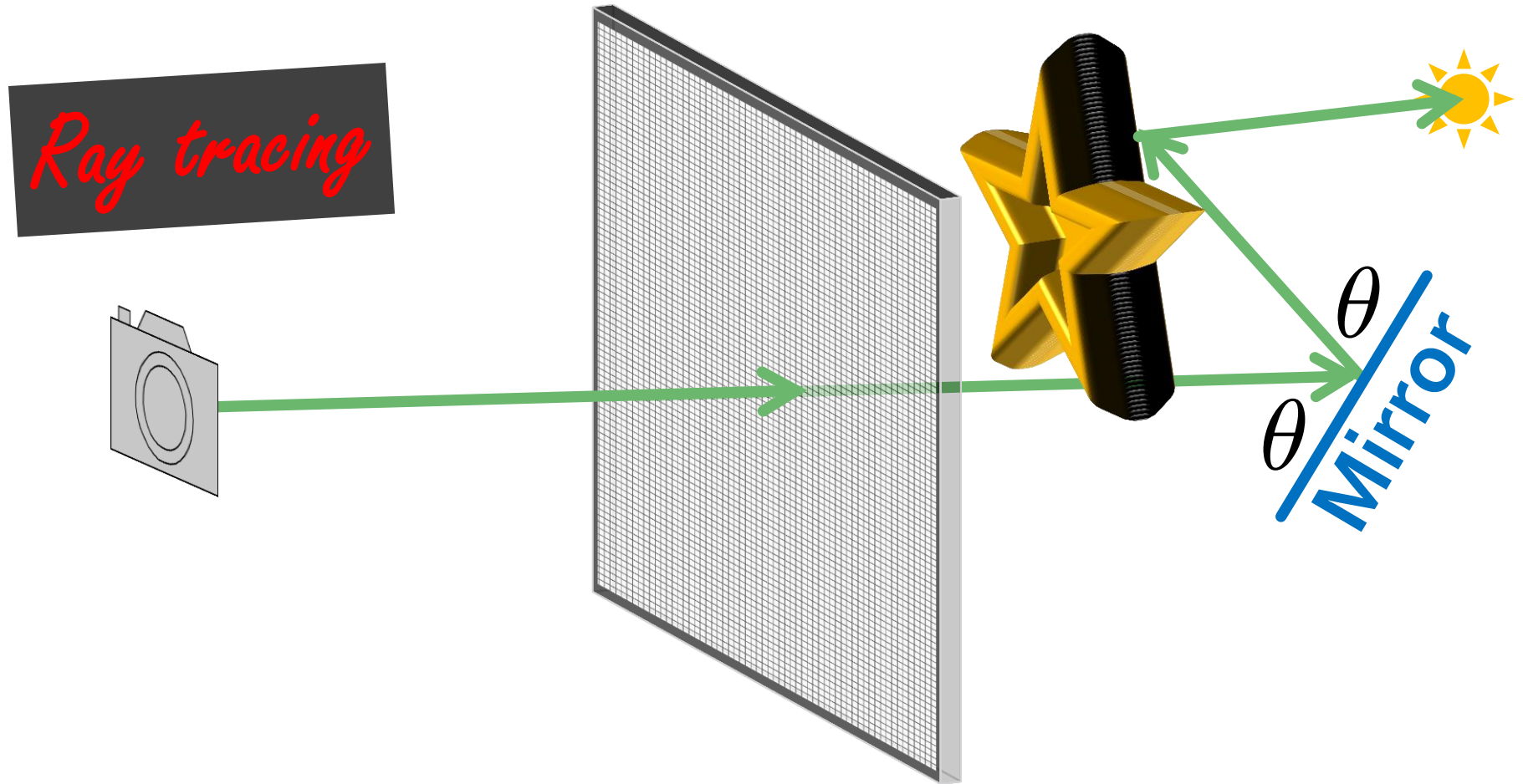
The Big Ideas

Phong shading



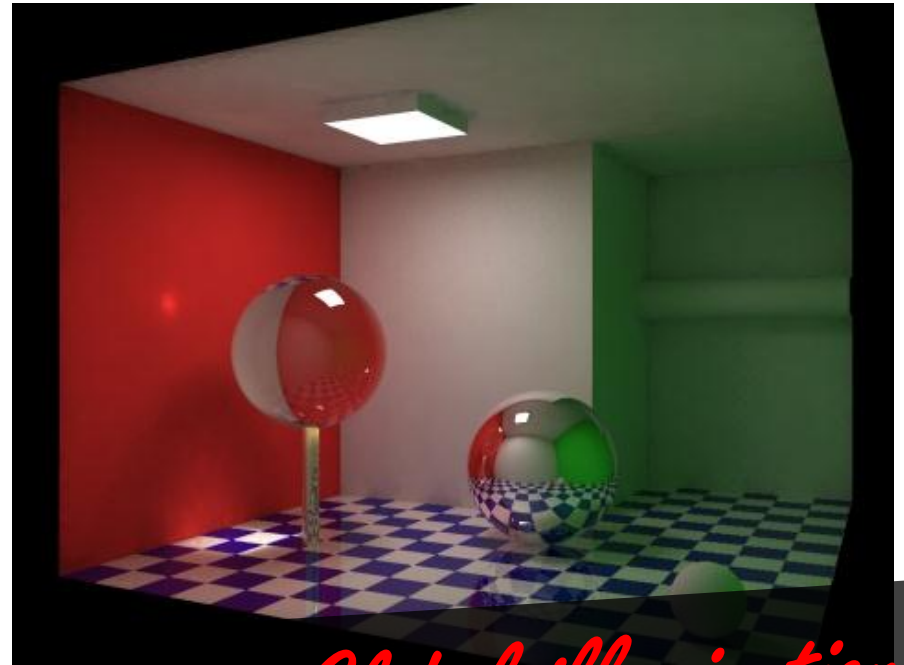
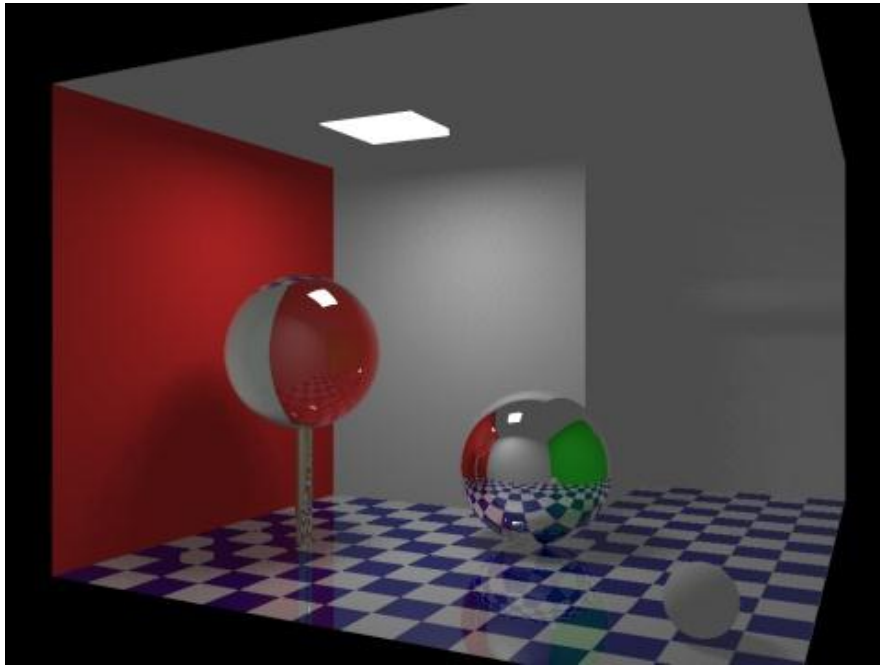
Act II: Real-world considerations

The Big Ideas



Act II: Real-world considerations

The Big Ideas

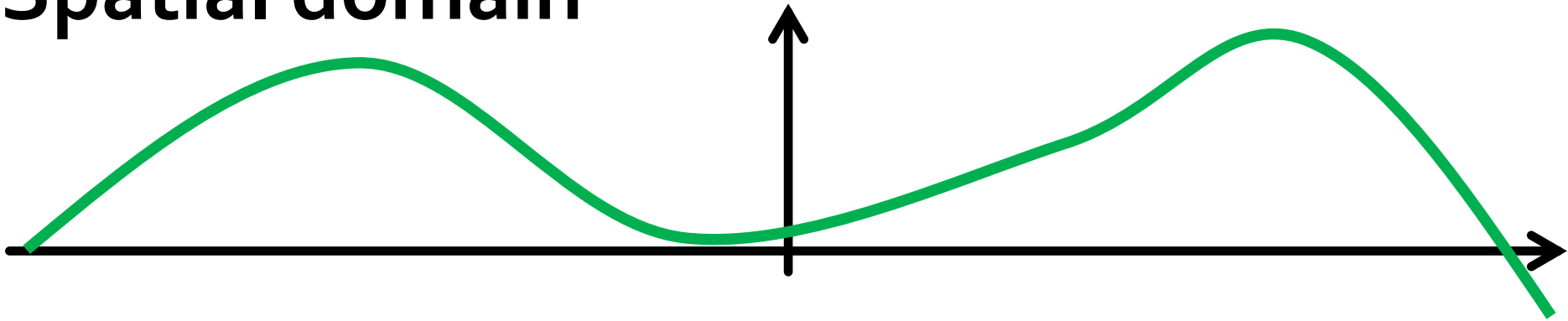


Global illumination

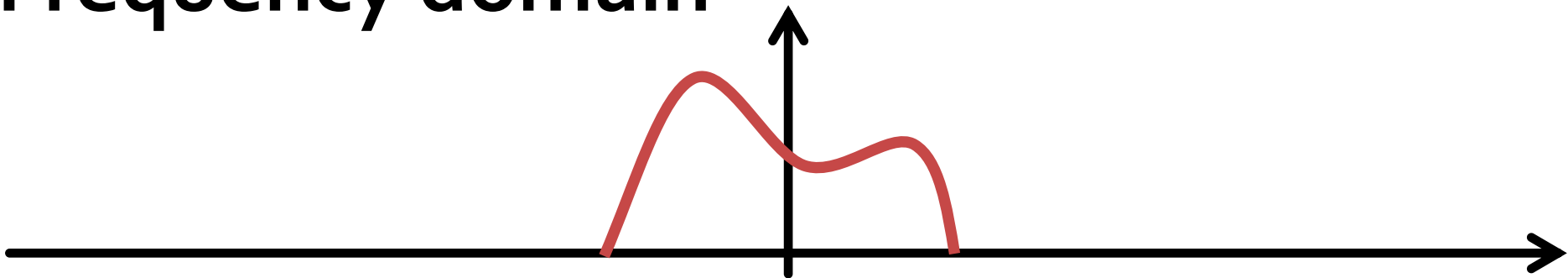
Act II: Real-world considerations

The Big Ideas

Spatial domain



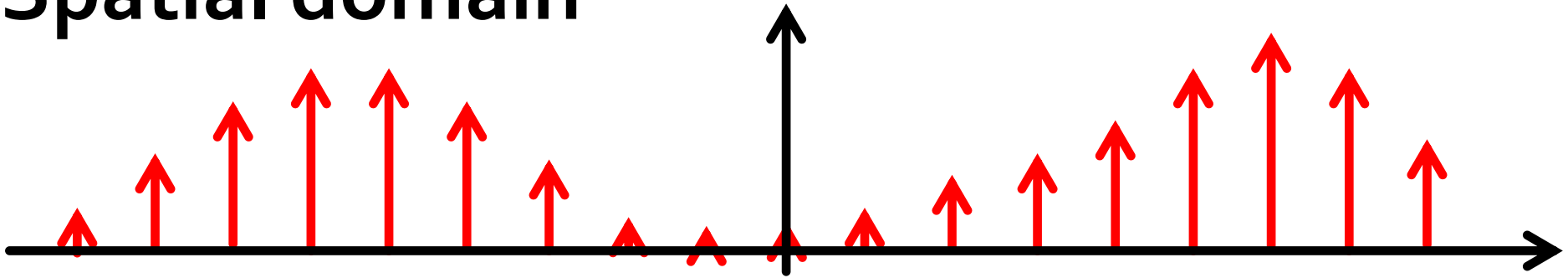
Frequency domain



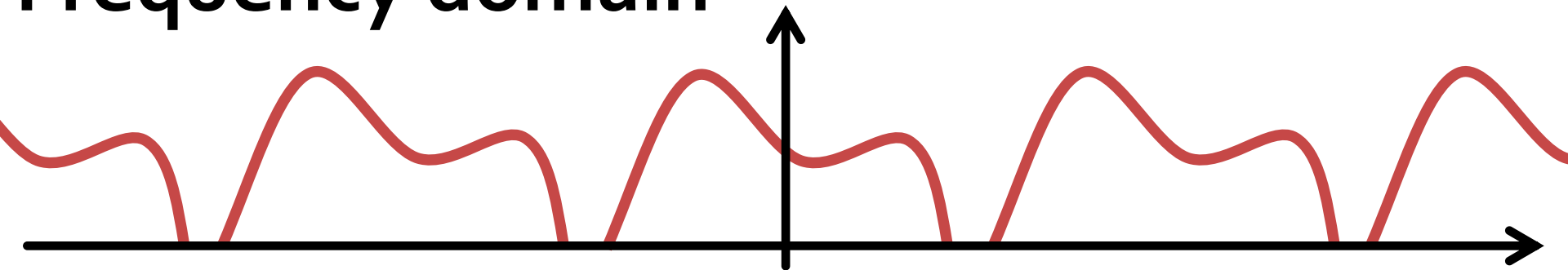
Act III: Geometry and sampling

The Big Ideas

Spatial domain



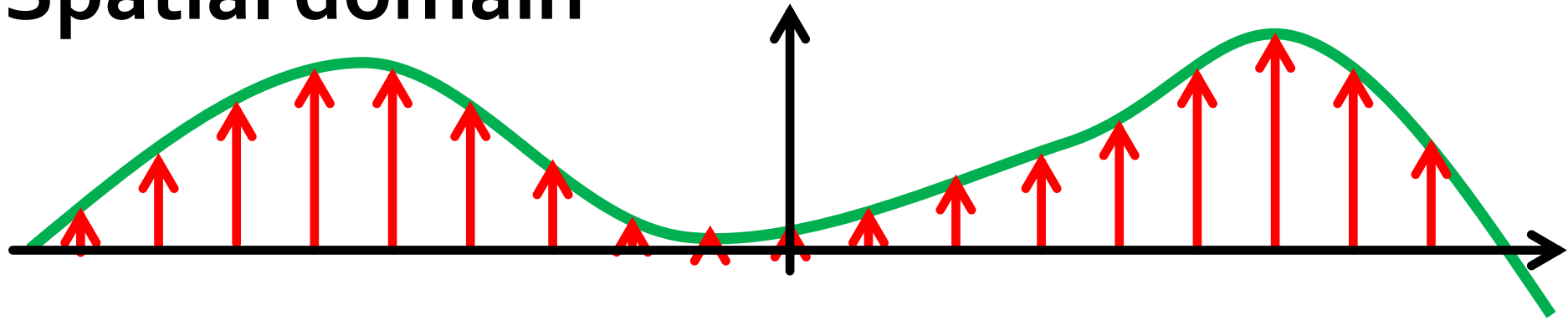
Frequency domain



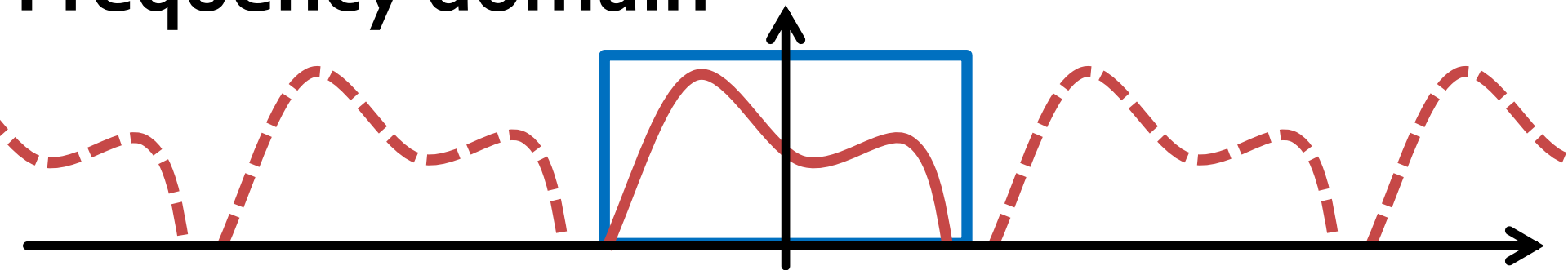
Act III: Geometry and sampling

The Big Ideas

Spatial domain

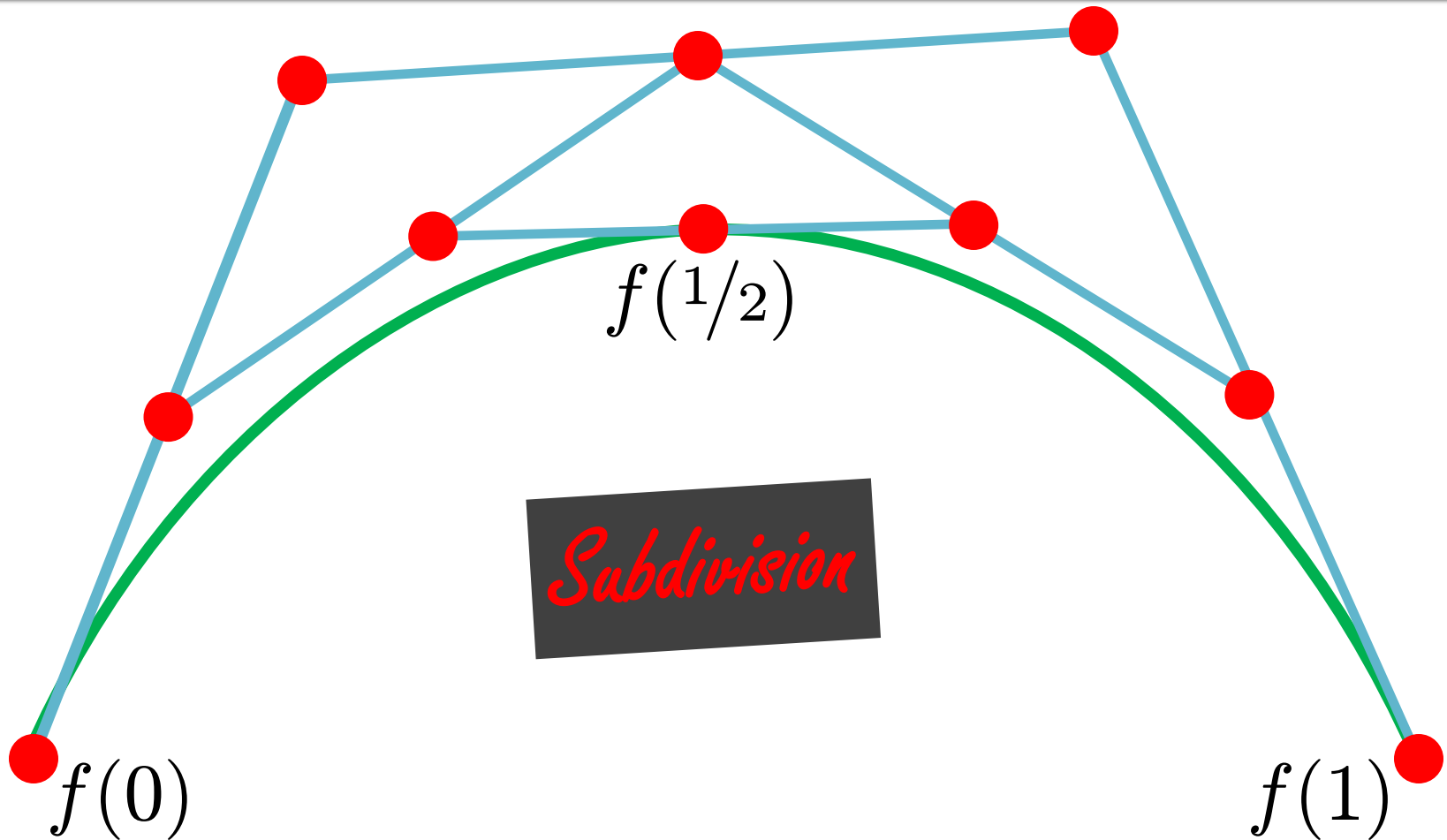


Frequency domain



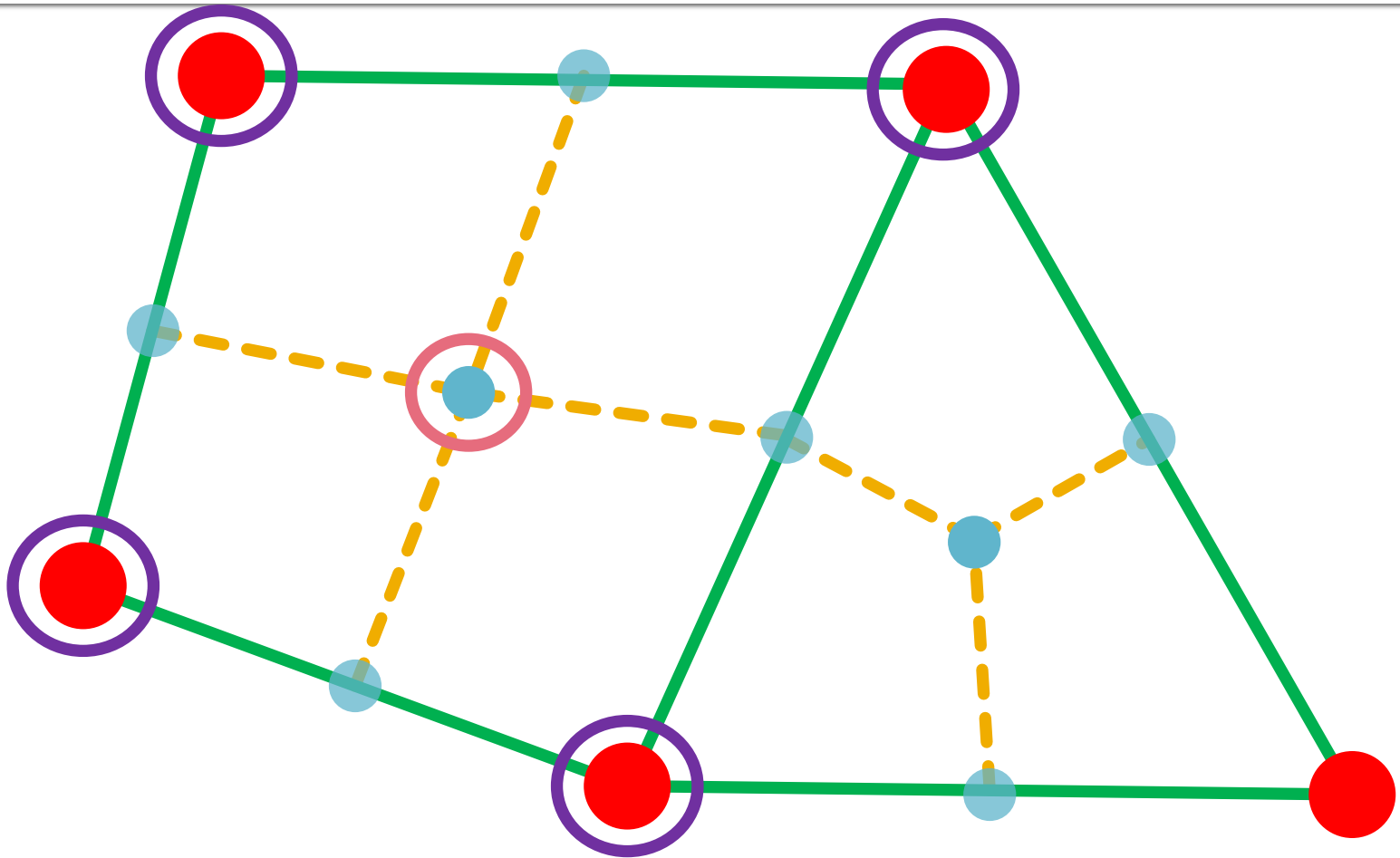
Act III: Geometry and sampling

The Big Ideas



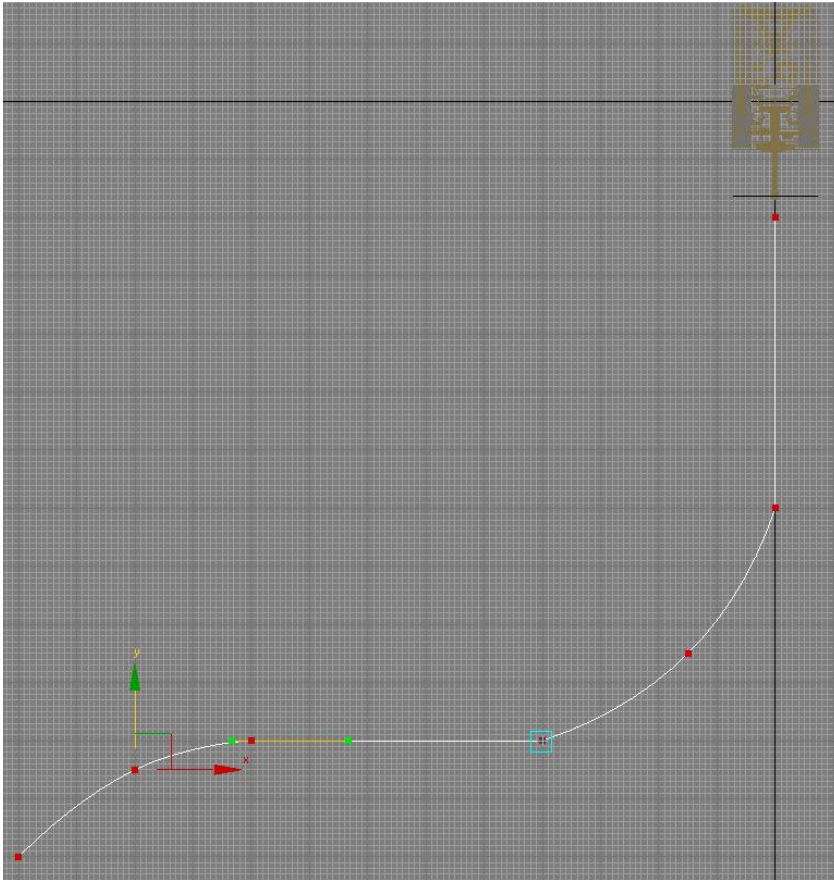
Act III: Geometry and sampling

The Big Ideas



Act III: Geometry and sampling

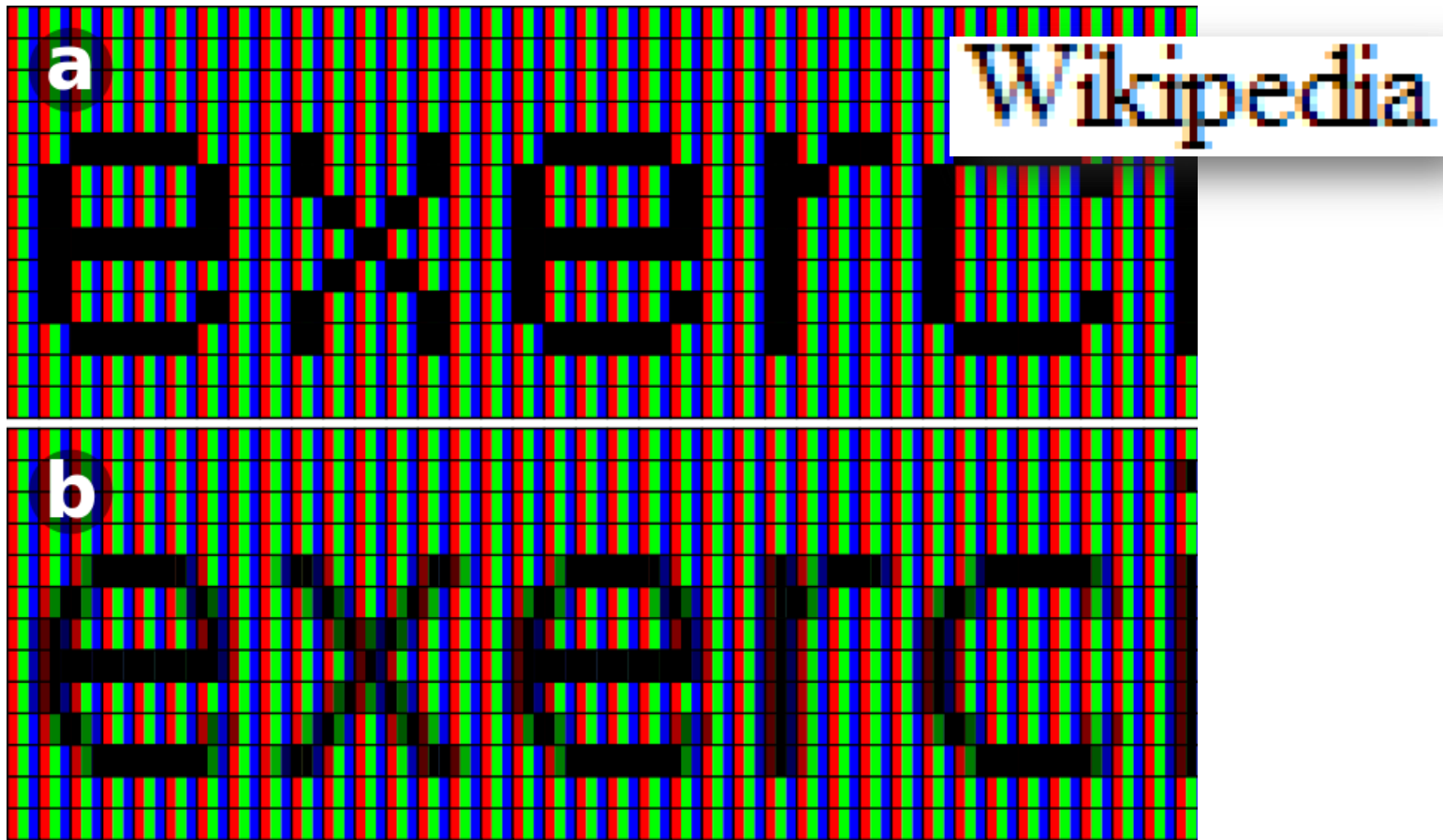
The Big Ideas



Curves specify
paths that
objects take
over time.

Act III: Geometry and sampling

The Big Ideas



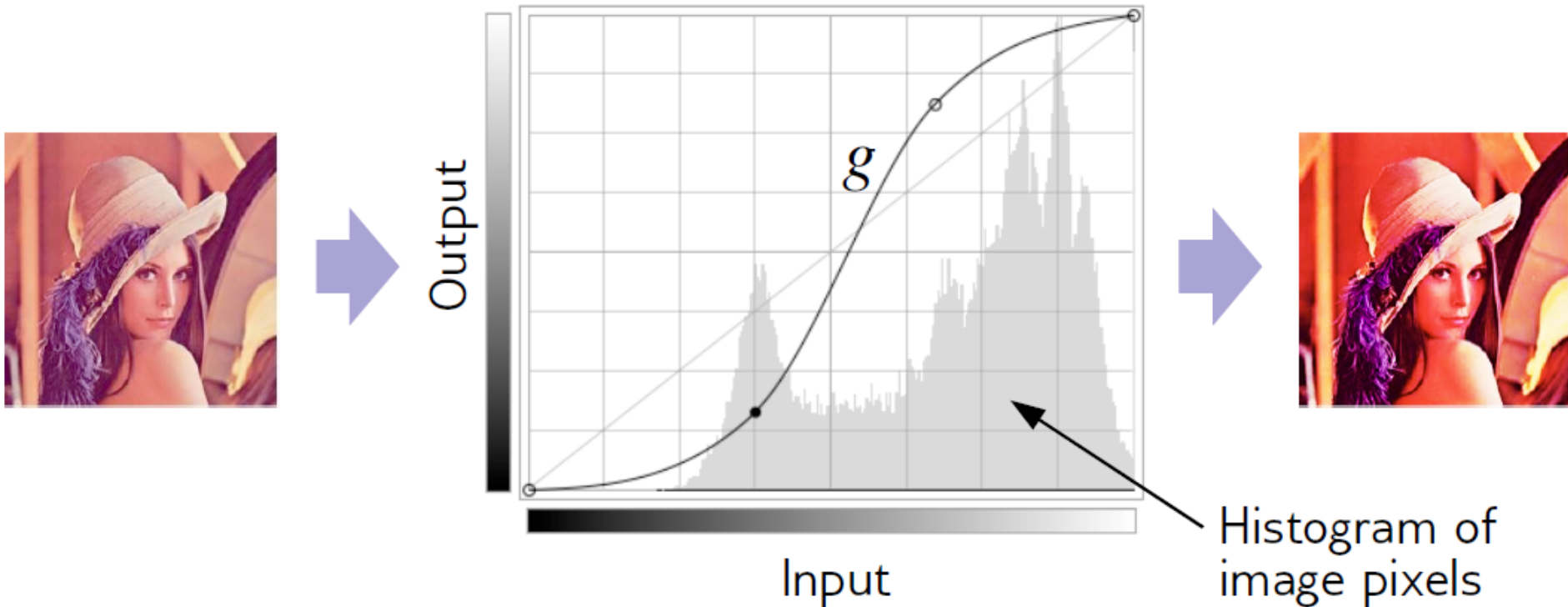
Act IV: Images and video

The Big Ideas



Act IV: Images and video

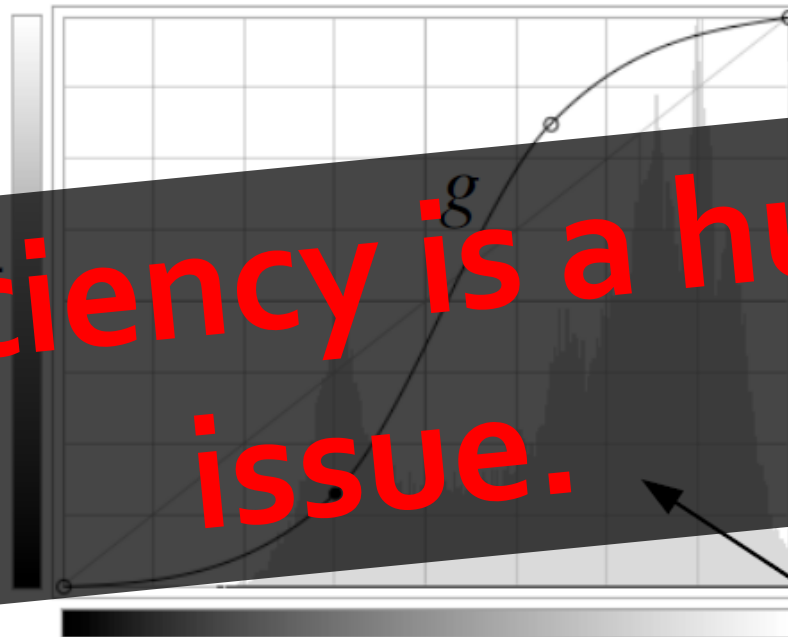
The Big Ideas



Act IV: Images and video

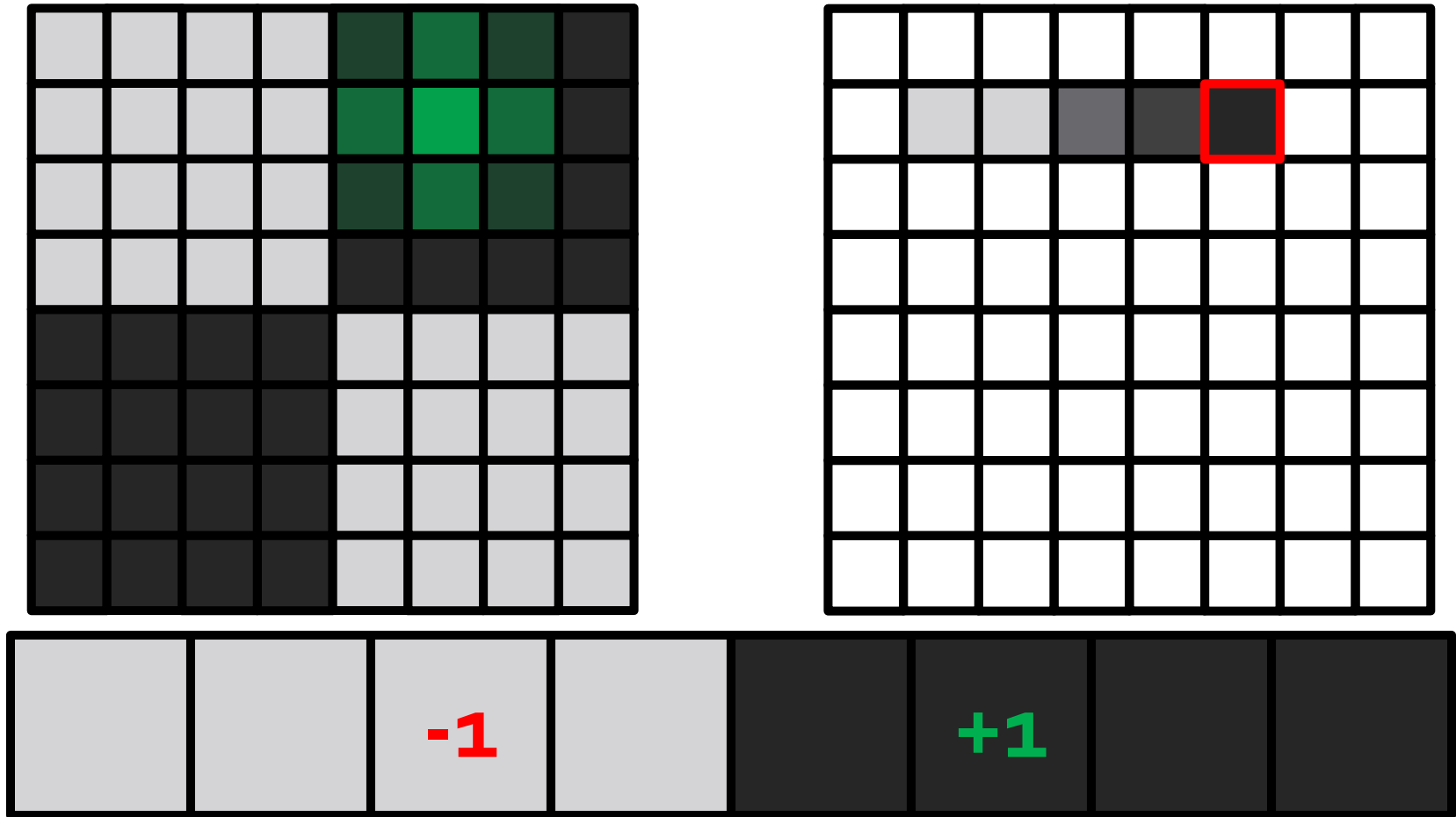
The Big Ideas

Efficiency is a huge issue.



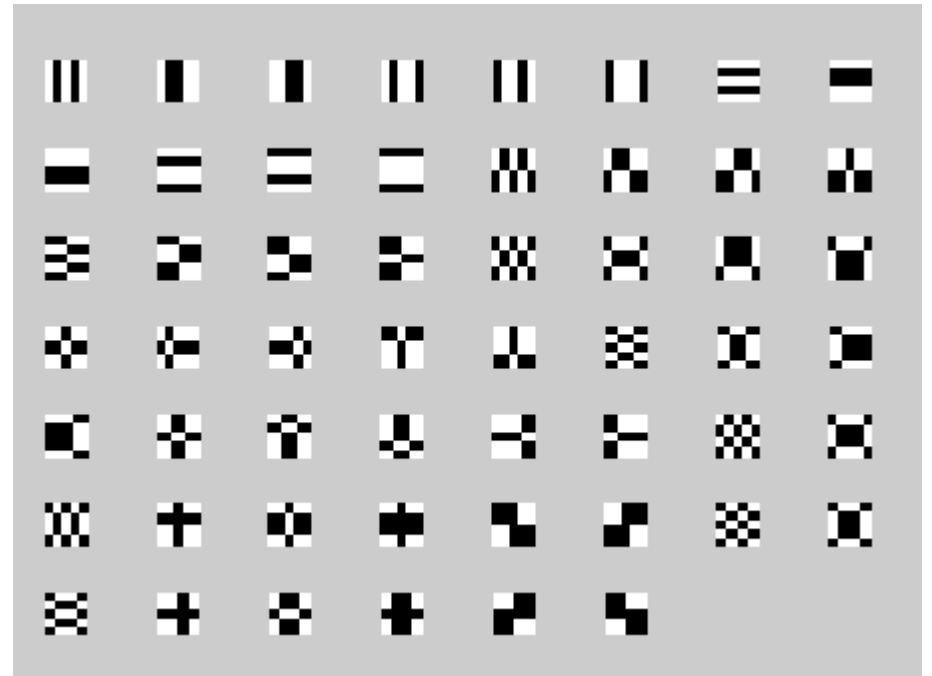
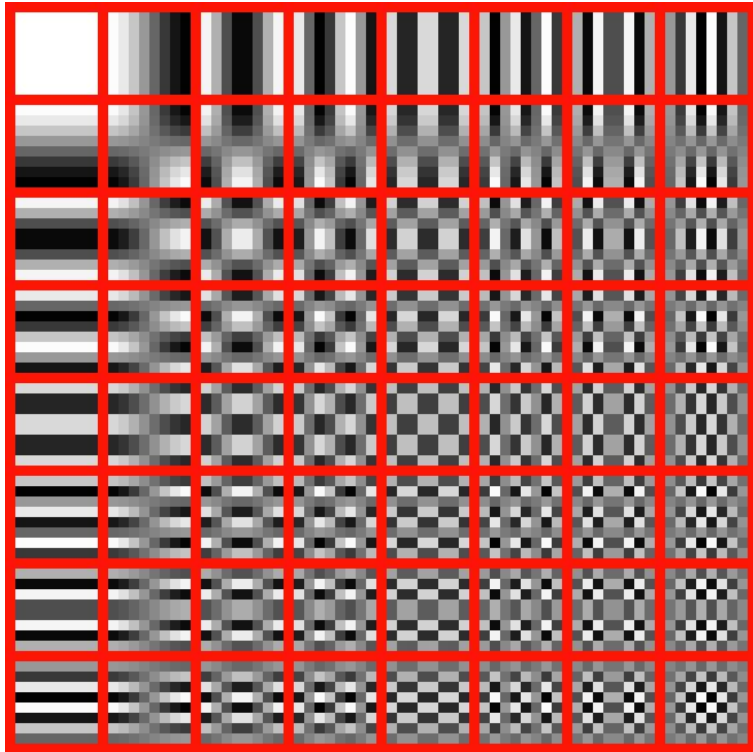
Act IV: Images and video

The Big Ideas



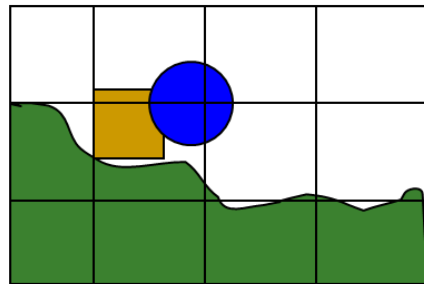
Act IV: Images and video

The Big Ideas



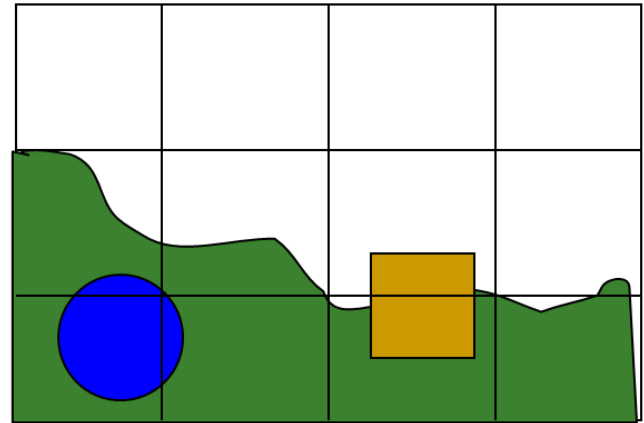
Act IV: Images and video

The Big Ideas

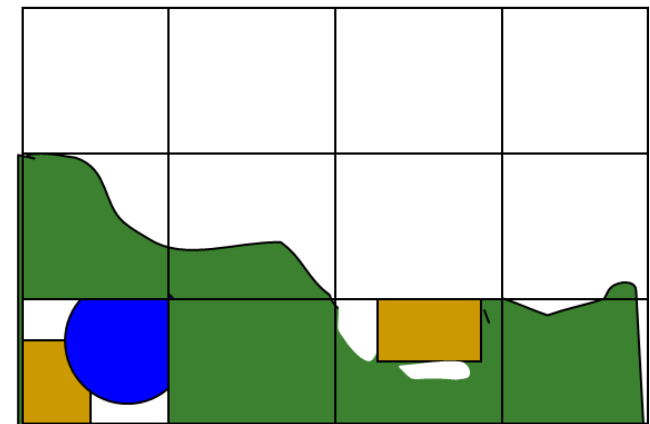


Previous
frame

Next frame



Predicted



Act IV: Images and video

The Big Ideas

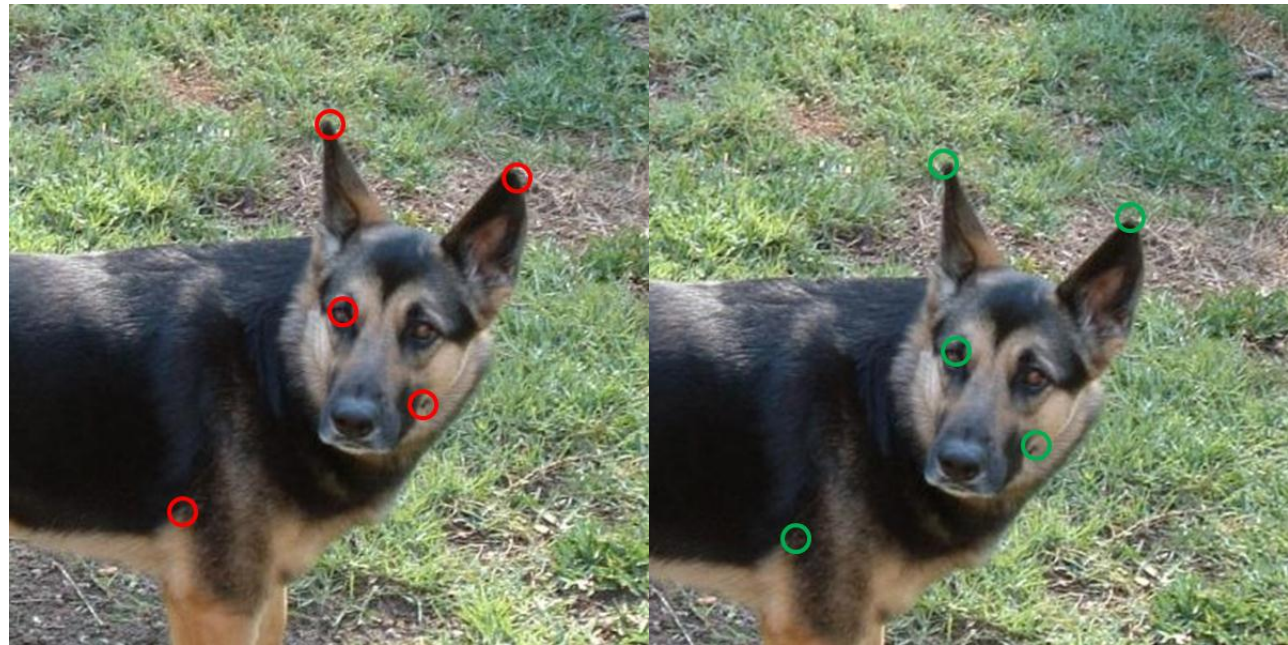
$$\vec{p}_1 \mapsto \vec{q}_1$$

$$\vec{p}_2 \mapsto \vec{q}_2$$

$$\vec{p}_3 \mapsto \vec{q}_3$$

$$\dots \mapsto \dots$$

$$\vec{p}_n \mapsto \vec{q}_n$$



Act IV: Images and video

Software Systems



<http://www.ps3vault.com/wp-content/uploads/2010/07/lbp2-announce-screenshot4.jpg>
<http://tips.webdesign10.com/games/call-of-duty>

Real-time graphics

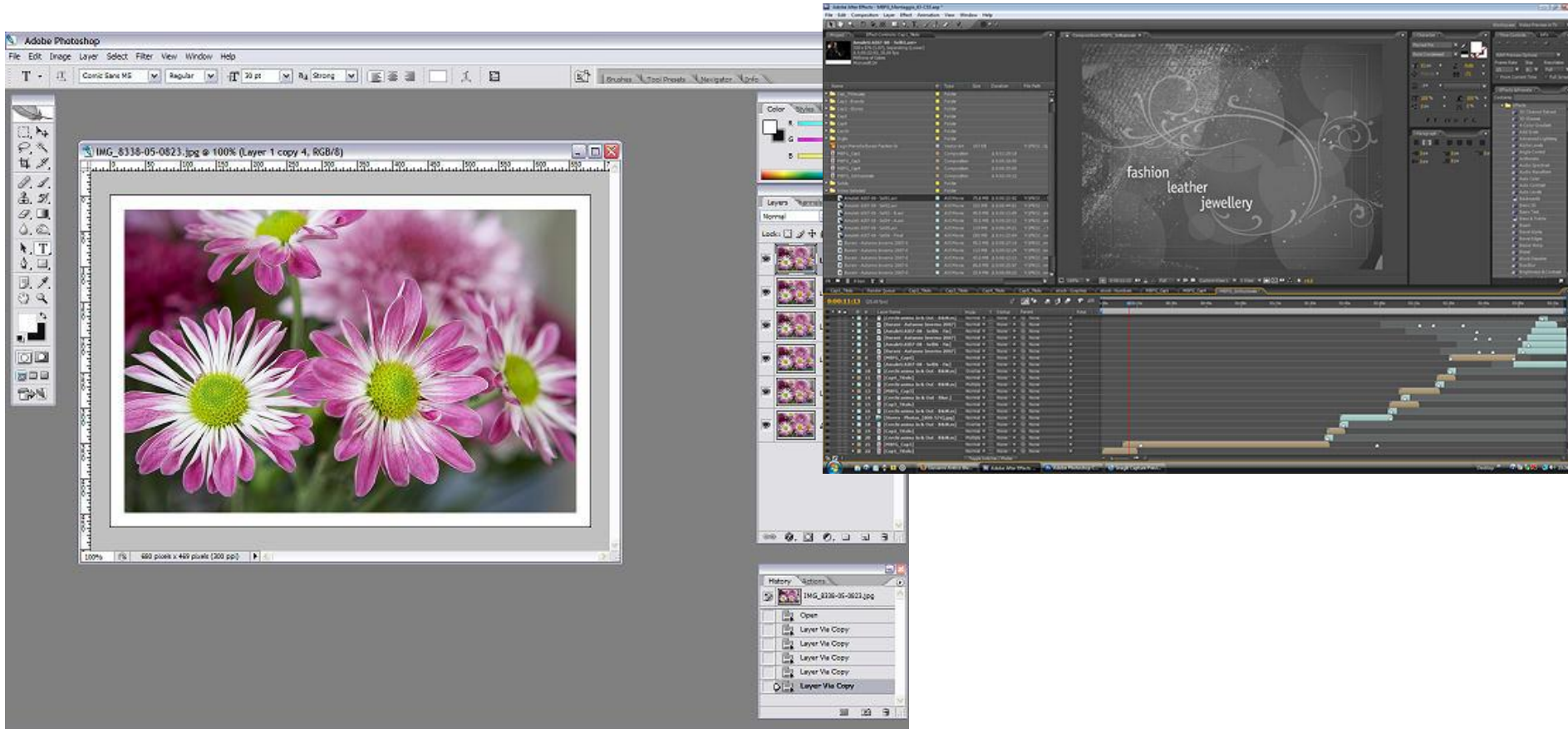
Software Systems



<http://down.cd/images/apps/Autodesk-Maya-2013-for-Mac-7393.jpg>

High-end graphics

Software Systems



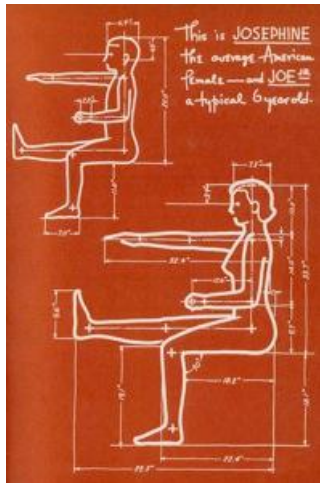
http://4.bp.blogspot.com/_V6vOFw32ngE/S-GBwRPnA2I/AAAAAAAAAOA/O3PSX1FC1ZM/s1600/adobe.jpg
<http://www.gantico.com/en/media/2008/02/mbfg-2007-ae-screenshot-01.jpg>

Digital photography and video

What Next?

CS 147:

Introduction to Human-Computer Interaction Design

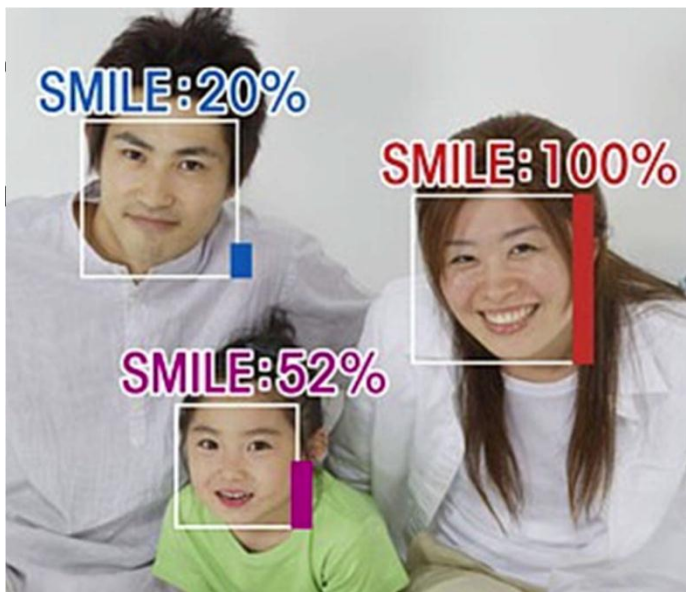


Fall 2012-2013

What Next?

CS 231A:

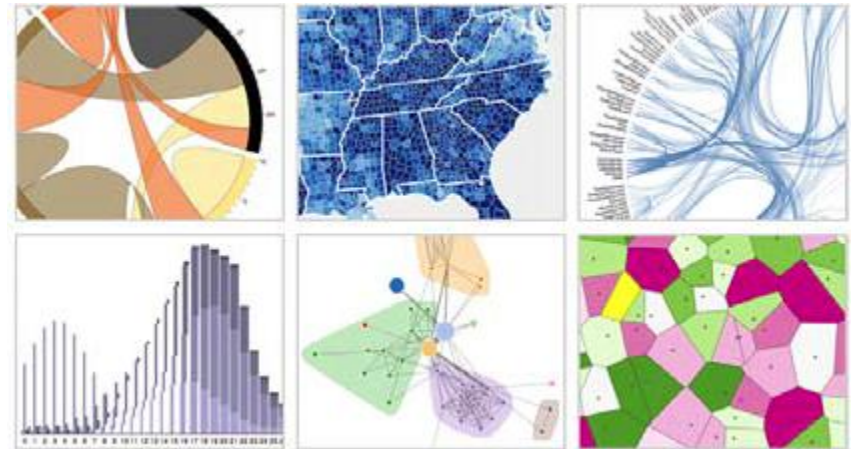
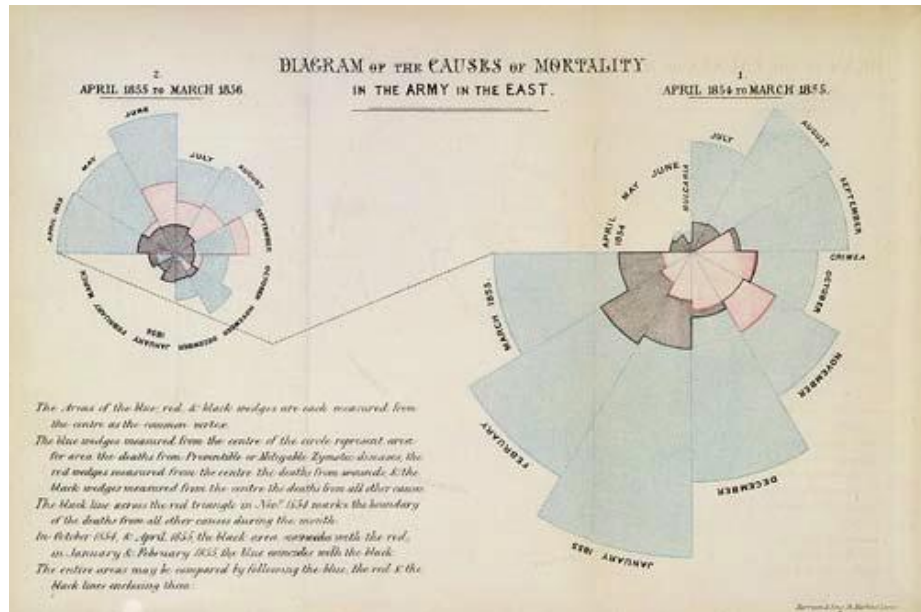
Introduction to Computer Vision



Fall 2012-2013

What Next?

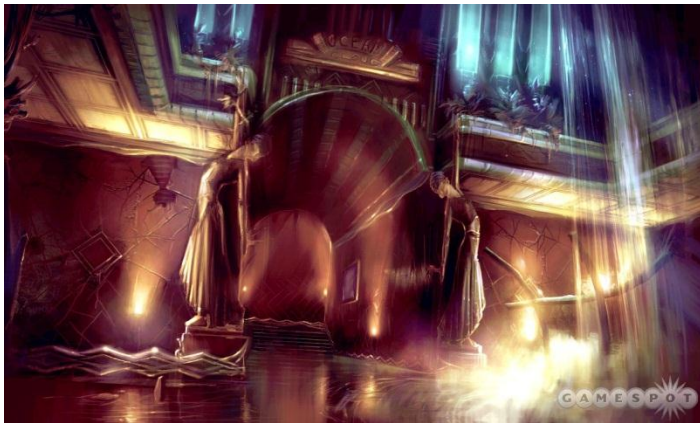
CS 448B: Data Visualization



Fall 2012-2013

What Next?

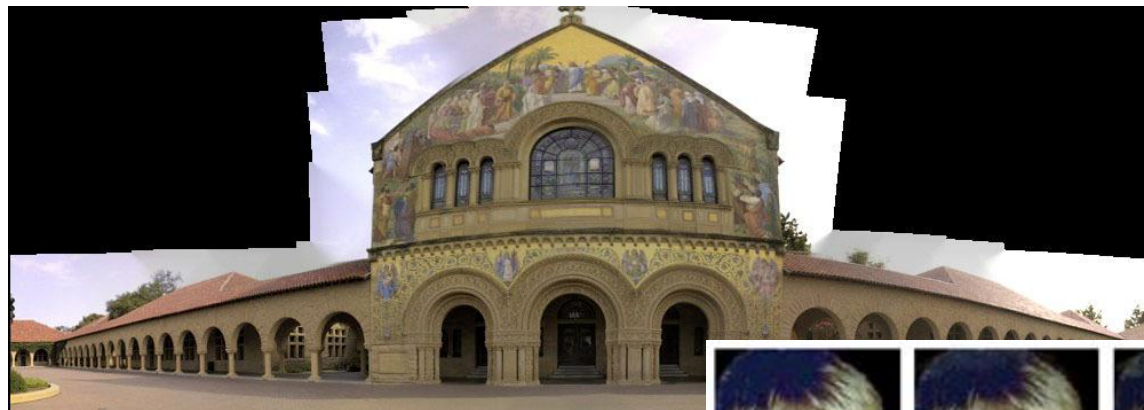
CS 248: Interactive Computer Graphics



Winter 2012-2013

What Next?

CS 232: Digital Image Processing

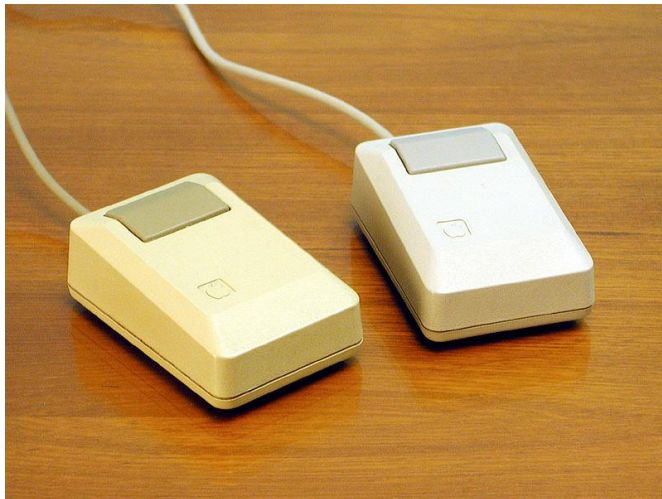


Winter 2012-2013

What Next?

CS 247:

Human-Computer Interaction Design Studio



Winter 2012-2013

What Next?

CS 277: Experimental Haptics

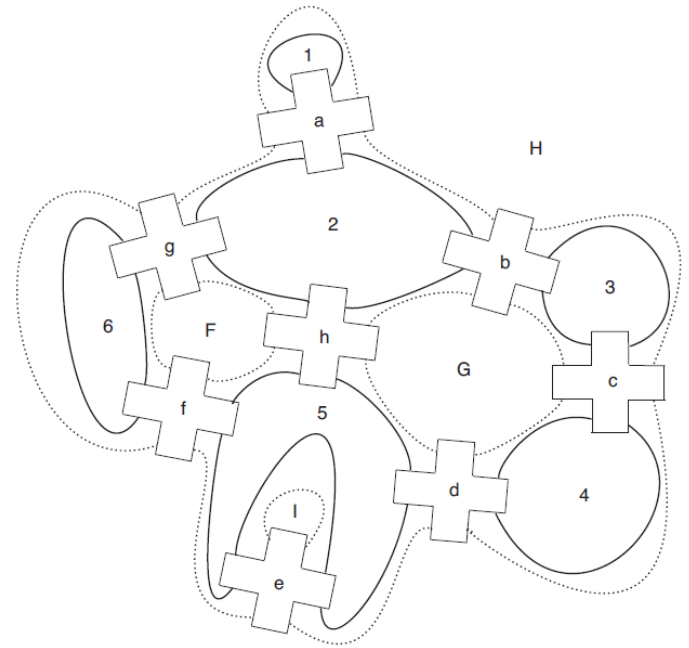
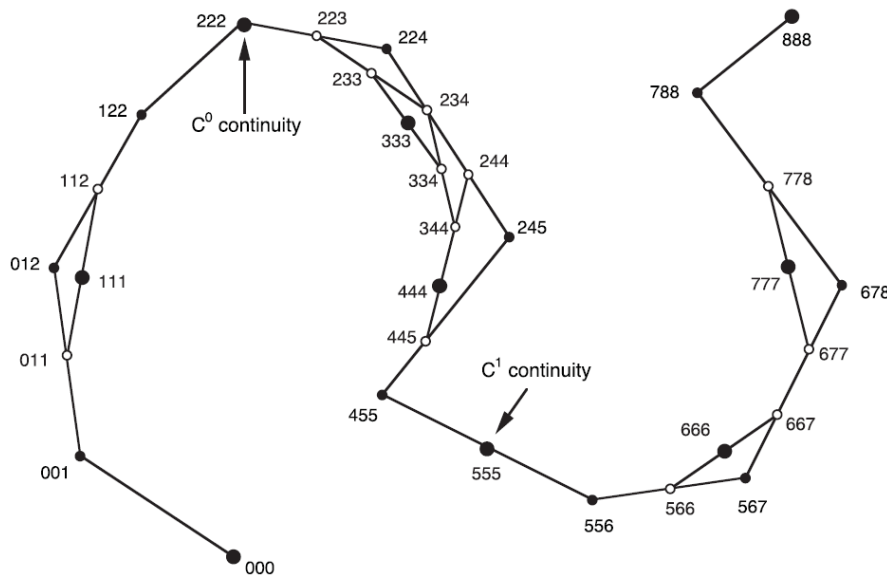


Winter 2012-2013

What Next?

CS 348A:

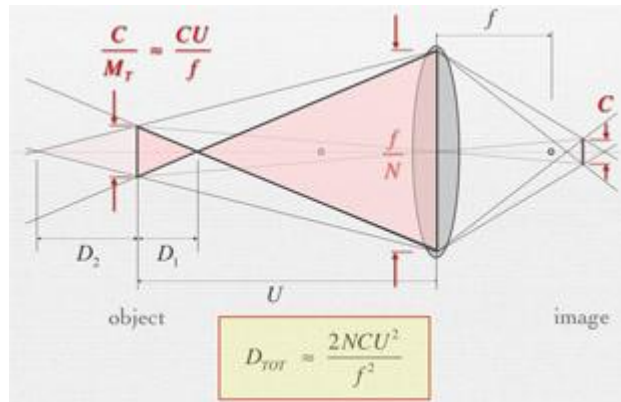
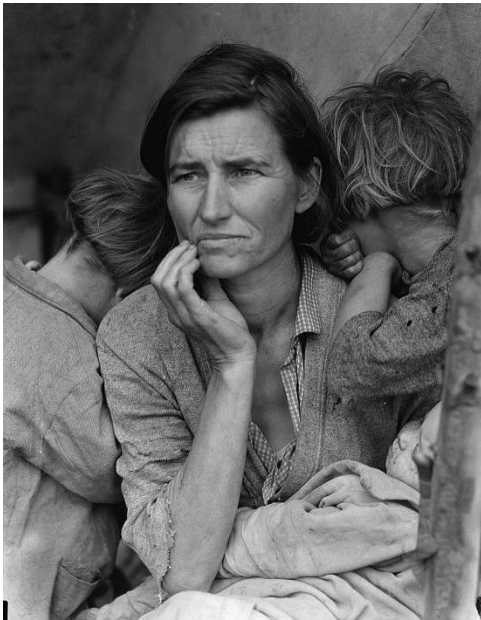
Computer Graphics: Geometric Modeling



Winter 2012-2013

What Next?

CS 178: Digital Photography

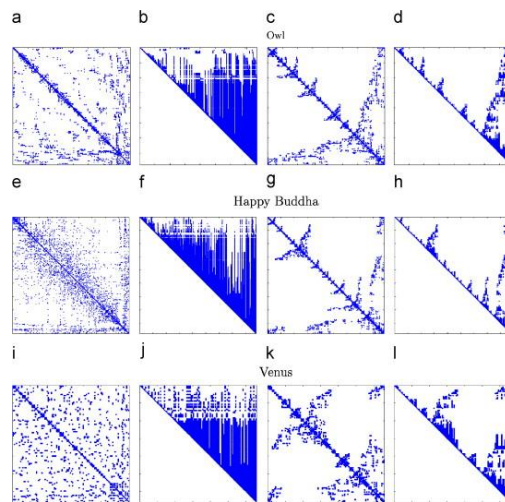


Spring 2012-2013

What Next?

CS 205A:

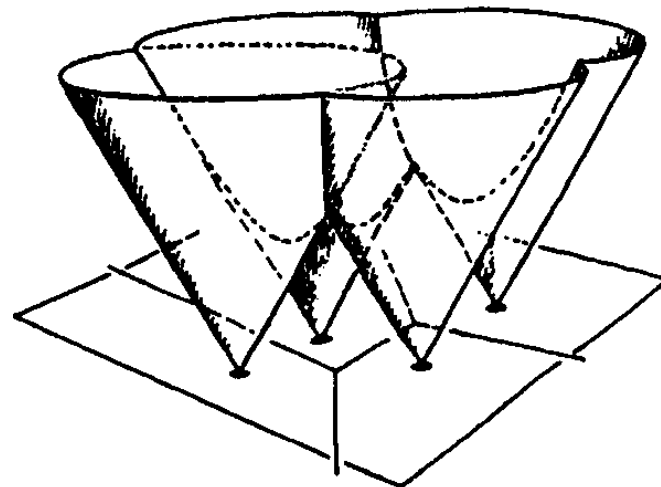
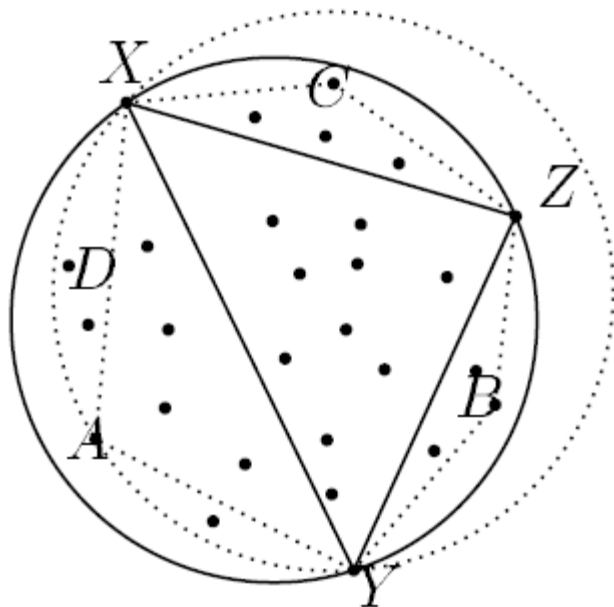
Mathematical Methods for Computer Vision, Robotics, and Graphics



Spring 2012-2013

What Next?

CS 268: Geometric Algorithms



Spring 2012-2013

What Next?

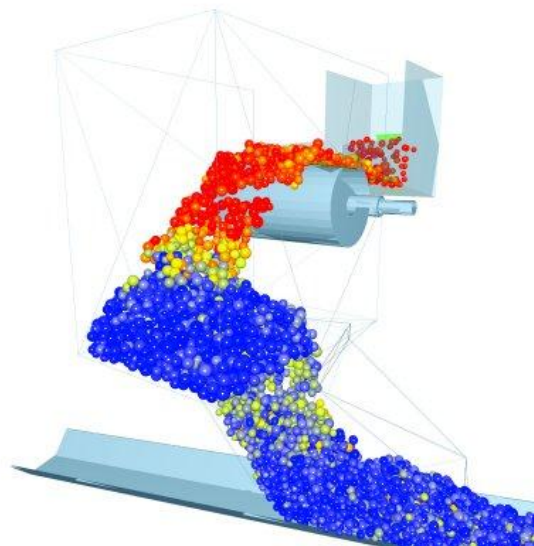
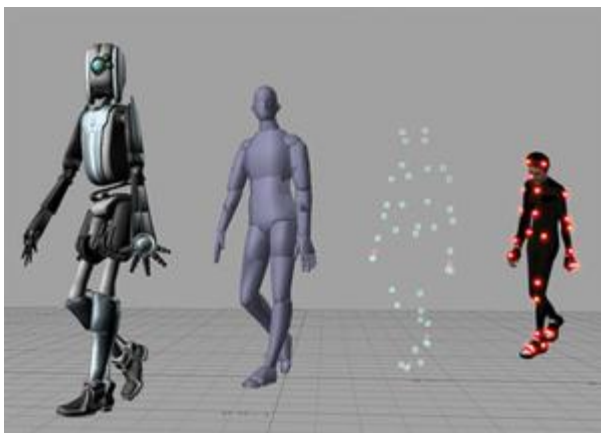
CS 348B: Image Synthesis



Spring 2012-2013

What Next?

CS 348C: Computer Animation



Spring 2012-2013

What Next?

CS 468:

Discrete Differential Geometry



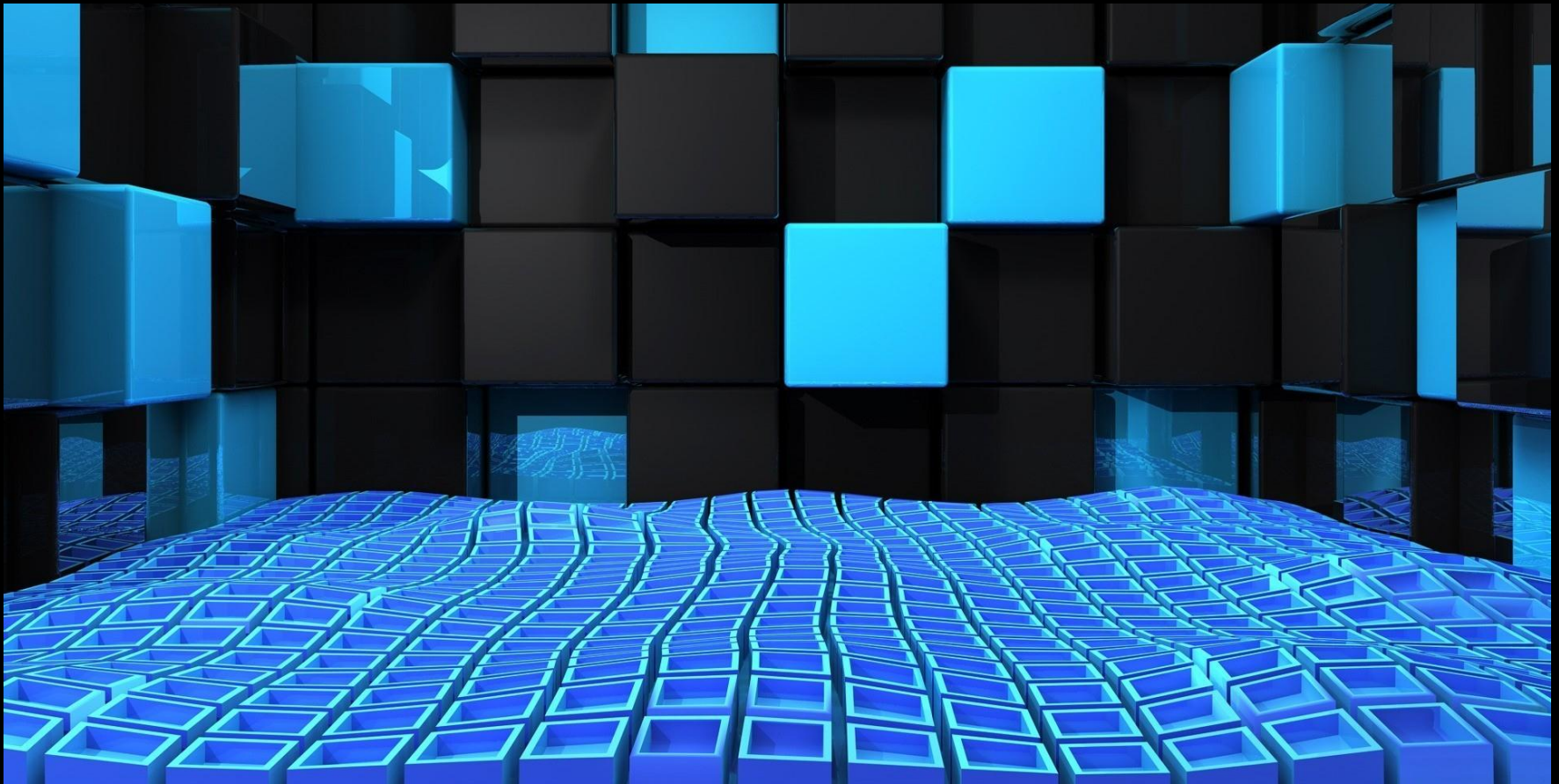
Spring 2012-2013

Again...

Course Review

Link to Google survey on Piazza.

Please!



Final Exam Review

Thanks!



CS 148, Summer 2012

Introduction to Computer Graphics and Imaging

Justin Solomon