Lecture 8

More Imaging! and Compositing

What is a pixel:

1. a little region of the image? (square, circle)
2. a sample location?

#1 is an easy way to think about #2

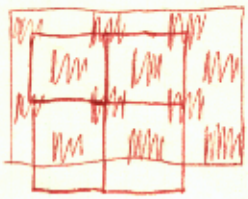
line drawing

partially filled squares

or

correctly filtered then point sampled

size reduction



new pixels cover larger area

or

point sample properly filtered

1	2	1
2	4	2
1	2	1

The Binomial Filter

1	1			
1	2	1		
1	4	6	4	1
1	5	10	10	5 1
1				

1 3 3 1

1	1
1	1

1	2	1
2	4	2
1	2	1

1	3	3	1
3	9	9	3
3	9	9	3
1	3	3	1

1 1 1 * 1 1 1

Compositing - layering images on top of one another

What happens to the unfilled area of each pixel?

half filled with white vs. all filled w/ gray

opacity / transparency

Compositing Pre-Computer

Photographic Printing - MATTE

Optical Printing

holdout matte (garbage matte)

traveling matte

How to get Matte?

- a story for later

WITH A COMPUTER

Each Pixel has : COLOR (RGB) + MATTE (A)

pixel appears $\alpha \cdot C$ — αC non-premult

or

$\alpha, \alpha C$ premult

Composite

2 half full pixels

Can't know!

threw away info

or, ditch "geometry"

Assumption: uncorrellated areas

proportion of A in any sub area is the same

so α of a in pixel = α of A in B

random scatter or 

Over operation

A over B

all of A $\alpha_A C_A$

B, except where covered by A $\alpha_B C_B (1-\alpha_A)$

NOTICE: Formulas simpler if premultiplied

NOTICE 2: Result is pre-multiplied

What is new α

$\alpha_A + \alpha_B - \alpha_A \alpha_B$

don't count this twice

Other Operators (Porter-Duff Algebra)

4 regions 

0	-	0
A	-	0 or A
B	-	0 or B
AB	-	0, A or B

$2 \cdot 2 \cdot 3 = 12$ possibilities

Clear	0,0,0,0	0	use pre-mult case	0	0
A	0,1,0,1	$\alpha_a A$	"blending function"	1	0
B	0,0,1,1	$\alpha_b B$		0	1
A over B	0,1,1,A	$\alpha_A A + (1-\alpha_A)\alpha_b B$		1	$(1-\alpha_a)$
in					
out					
atop					

What's with Alvy Ray's wierd approximations?

ignore them - do floats?

really worried about drops of performance - millions of pixels

divide by 255 is worrysome (slow on many computers)

divide by 256 is wrong

ANTI-ALIASING AS COMPOSITING