



How does Superman fly?





Super-human powers? OR Image Matting and Compositing?

"Pulling a Matte"

Problem Definition:

- The separation of an image C into
 - A foreground object image C_o,
 - a background image C_b,
 - and an alpha matte α
- C_{o} and α can then be used to composite the foreground object into a different image

Hard problem

- Even if alpha is binary, this is hard to do automatically (image segmentation problem)
- For movies/TV, manual segmentation of each frame is infeasible
- Need to make a simplifying assumption...



Blue Screen matting

Most common form of matting in TV studios & movies

Petros Vlahos invented blue screen matting in the 50s. His Ultimatte® is still the most popular equipment. He won an Oscar for lifetime achievement.

A form of background subtraction:

- · Need a known background
- Compute alpha as SSD(C,Cb) > threshold - Or use Vlahos' formula: $\alpha = 1 - p_1(B - p_2G)$
- · Hope that foreground object doesn't look like background - no blue ties!
- Why blue?
- Why uniform?









Why is general matting hard?	
Matting Equation: $C = C_{o} + (1 - \alpha_{o}) C_{k}$	

Matting Equation: $C = C_{o} + ($	$1 - \alpha_{c}$ C _k
 If we know that the for have B_a = 0 	eground contains no blue, we
• This leaves us with 3 e	equations and 3 unknowns, which ha
exactly one solution	$R = \alpha_0 R_0 + (1 - \alpha_0) R_k \leftarrow 3. \text{ Solve for } R_0$ $G = \alpha_0 G_0 + (1 - \alpha_0) G_k \leftarrow 2. \text{ Solve for } G_0$
Main difficulty:	$B = B_k - \alpha_0 B_k \qquad \leftarrow 1. \text{ Solve for } \alpha_0$













Problems with Matting

Images do not look realistic Lack of Refracted Light Lack of Reflected Light

Solution: Modify the Matting Equation











Performance

Calibration

Matting: 10-20 minutes extraction time for each texture map (Pentium II 400Mhz)

Compositing: 4-40 frames per second

Real-Time?





<image>