Environment Matting

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Blue Screen Matting

- Composite images with novel backgrounds
- Eliminate outlines around composited objects (think the original Superman movie)

Yes, I’m really in front of a city...
Blue Screen Matting Procedure

Blue Screen Matting is fairly straightforward:

\[ C = F + (1 - \alpha)B \]

- \( C \) – final color
- \( F \) – color of the object
- \( B \) – color of the new background pixel
- \( \alpha \) – amount of background light that filters through
Blue Screen Matte Pulling

- Must compute $F$ and $\alpha$

- First, take four pictures of the object:

- Solve for $F$ and $\alpha$
Enter Environment Matting

Environment Matting addresses the problem of translucent and reflective objects.

Check it out:

More pictures...
Environment Matting Overview

\[ C = F + (1 - \alpha)B + R_1 \mathcal{M}(T_1, A_1) \]

- Goal the same — calculate \( C \)
- \( \alpha \) and \( B \) same as before
- Model transmission with axis-aligned box, \( A_1 \)
- \( R_1 \) represents the transmission coefficients
- Demo...
Remember Blue Screen Matting?

Two relatively orthogonal backgrounds give us formulas for \( R_1(\alpha) \) and \( F(\alpha) \). This is a similar step as in Blue Screen Matting.

\[
R_1(\alpha) = \frac{(C - C')}{(B - B')} - (1 - \alpha) \\
F(\alpha) = C' - (1 - \alpha + R_1(\alpha))B
\]
Environment Matting Setup

- Capture object on series of structured backgrounds
Environment Matte Pulling

• Goal now to find axis-aligned box, $A_1$

• Choose $A_1$ to minimize error between captured and generated values

• Use a *multi-resolution search*
  – Search first at course intervals
  – Refine the search

• Must also search for best $\alpha$ at boundary pixels

• Note $\alpha = 1$ for internal (covered) pixels
The Hard Part

- Real Photographs = Noise
- Compositing in real time is tricky
- Multi-resolution search is subtle

Demo...