Color Alignment in Texturing 3D Geometric Model
under General Lighting Condition

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We propose a novel method for color alignment in texturing 3D geometric model by utilizing images measured by a digital camera. Our method eliminates the color discontinuities between input images. We approximate the illumination distribution on the scene by a series of distant point light sources on a sphere (illumination sphere). And by utilizing the fact that surface reflectance of the object is invariant to the illumination distribution, illumination images under two different illuminating conditions and pseudo-albedo images are estimated. By mapping the pseudo-albedo images onto the 3D geometric model, 3D model with color-consistent texture are generated.

Publication

![Illustration of illumination distribution and albedo estimation](image)

\[ I(x) = S(x)(a_1A_1(x) + \cdots + a_nA_n(x)) \]

\[ k(x) = \frac{I(x)}{I_T(x)} = a_1A_1(x) + \cdots + a_nA_n(x) \]

\[
\begin{pmatrix}
A_1(x_1) & \cdots & A_1(x_k) & -k(x_1)d_1(x_1) & \cdots & -k(x_k)d_1(x_k) \\
\vdots & \ddots & \vdots & \vdots & \ddots & \vdots \\
A_n(x_1) & \cdots & A_n(x_k) & -k(x_1)d_n(x_1) & \cdots & -k(x_k)d_n(x_k) \\
\end{pmatrix}
\begin{pmatrix}
a_1 \\
a_2 \\
\vdots \\
a_n \\
\end{pmatrix} = 0
\]

Canceling albedo (ratio image)

\[ Ta = 0 \]

Input Images and 3D geometric model.

Textured 3D geometric model: (a) image1, (b) both, (c) image2.