Extended Toon Shader

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(Slides mostly based on paper “X-Toon: An Extended Toon Shader” by Barla, Thollot, and Markosian at NPR 2006)

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Toon Shader

• You implemented in a previous assignment
Toon Shader

- Maps \((n \cdot l)\) to colormap such as:
X-Toon Shader

- Extend 1D colormap to 2D color map such as:

- Use one of several ways to compute “D”...
Depth-based “D” Attribute

• D can be computed as
  – the “depth” of a point in 3D, or
  – the distance along the focal axis

Figure 2: The depth of a point $p$ relative to the eye can be calculated in two ways: (a) The distance between the eye and $p$ or (b) the distance along the focal axis.
Depth-based “D” Attribute

• D can be computed as
  – the “depth” of a point in 3D, or

  \[ D = 1 - \log \left( \frac{z}{z_{\text{min}}} \right) \]

  – the distance along the focal axis

\[
D = \begin{cases} 
1 - \frac{\log \left( \frac{z}{z_{\text{min}}} \right)}{\log \left( \frac{z_{\text{max}}}{z_{\text{min}}} \right)}, & z < z_c \\
\frac{\log \left( \frac{z}{z_{\text{mn}}} \right)}{\log \left( \frac{z_{\text{mn}}}{z_{\text{mx}}} \right)}, & z > z_c 
\end{cases}
\]
Orientation-based “D” Attribute

• Consider the orientation of the surface with respect to the observer
  – e.g., $D = ||n \cdot v||^r$
Results

Figure 9: Aerial perspective effects. In (a) we show the two textures used to render the images in (b) and (c): the first one blends from a green-to-brown color ramp to a more uniform one consisting of brown tones; the second one applies a desaturation and shift toward blue. In (d) we show the two textures used to render the images in (e) and (f): the first one tends to a pink hue, with darker tones modified prior to lighter ones. The second texture decreases alpha and saturation, keeping only light gray shadows in the background.
Figure 10: Near-silhouette abstraction and backlighting: (a) shows the textures used in (b), (c) and (d). In (b), we use a texture where intermediate tones are blurred prior to dark or light ones; this has the effect of smoothing out the shading in near-silhouette regions so that hard boundaries are only visible in regions facing the camera. In (c), the same approach is applied, this time to decrease opacity of the shading except for dark tones; this gives a fuzzy rendering of the model. In (d), we apply a simple white backlight that grows thinner in darker tones; we can thus control the thickness of the backlighting by moving the light.
Figure 11: Plastic and metal highlights: (a) shows the textures used in (b), (c) and (d). In (b), we use a highlight texture that decreases in width, but is static with respect to color (white) and profile (hard boundaries); this gives a plastic toon highlight that varies in size depending on the viewing configuration. In (c), we use a texture that creates a “glowing” highlight, resembling a metallic material; this highlight is only present when the view direction is close to the reflected light direction, making the highlight appear suddenly, like a flare. In (d), we modify the color of the highlight, making it redder near its boundaries when it reaches a given scale.