

Gouraud Shading & Phong Shading

COMPUTER GRAPHICS

ILLUMINATION MODEL

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GOURAUD SHADING

Intensity Interpolation Method

Advantage - Remove discontinuity

Disadvantage - Stack-line Ma

Steps of Gouraud Shading

- 1) Determine the Average Unit Normal Vector at each Polygon Vertex
- 2) Apply Illumination Model to each Polygon Vertex to determine Polygon Vertex intensity
- 3) Linearly interpolate the Vertex intensities over the Surface of Polygon.

1) $N_v = \frac{N_1 + N_2 + N_3}{|N_1 + N_2 + N_3|} = \frac{\sum_{i=1}^n N_i}{|\sum_{i=1}^n N_i|}$
 $n = \text{no. of Surfaces of Polygon Sharing that Vertex}$

2) By applying Illumination we get Intensity of each Vertex.

3) Intensity of a. $I_a = \frac{y_a - y_2}{y_1 - y_2} \cdot I_1 + \frac{y_1 - y_a}{y_1 - y_2} \cdot I_2$

Intensity of b. $I_b = \frac{y_b - y_2}{y_2 - y_3} \cdot I_3 + \frac{y_3 - y_b}{y_2 - y_3} \cdot I_2$

For point P. $I_p = \frac{x_b - x_a}{x_b - x_a} \cdot I_a + \frac{x_p - x_a}{x_b - x_a} \cdot I_b$

$I_c = I_a + \left[\frac{I_2 - I_1}{y_1 - y_2} \right] \cdot \frac{y_2 - y_a}{y_1 - y_2}$

Constant for edge (1,2)

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PHONG SHADING

Normal Vector Interpolation Shading

Adv. hidden & visible - & polygon filling more Realistic image highlight

No-Mach band accurate Result.

Disadv. Calculation Complex + time taking

Steps of Phong Shading

- 1) Determine the Average Unit Normal Vector at each Polygon Vertex
- 2) Linearly interpolate the vertex normals over the Surface of Polygon.
- 3) Apply the illumination model along each Scan to determine projected pixel intensities of Surface points.

1) $N_v = \frac{N_1 + N_2}{|N_1 + N_2|} = \frac{\sum_{i=1}^n N_i}{|\sum_{i=1}^n N_i|}$
 $n = \text{no. of Surfaces Sharing vertex}$

$N = \frac{y - y_2}{y_1 - y_2} \cdot N_1 + \frac{y_1 - y}{y_1 - y_2} \cdot N_2$