Lab 06 - Lighting (Chapter 17)

I. Setting up lights

A. Up to 8 lights supported (by default)

B. glLight*(*, *, *)
- light name: GL_LIGHT0 ... 8
- property name
- property value

C. Enable/disable individual lights w/ glEnable(*) glDisable(*) — light name

D. Properties

i. GL_POSITION → sets position + light type. 4 elem vector. 4th elem: 0 → directional (vector), 1 → point (position)
For directional lights position is -d.r for rays. Default (0, 0, 1) directional in -z.

ii. Colors.
- a. GL_AMBIENT - ambient color in RGBA
- b. GL_DIFFUSE - diffuse light color
- c. GL_SPECULAR - Specular light color

} realistically are color but allows full specification

- d. Default: black for ambient, white for diffuse/specular

iii. Attenuation constants (point light only)
- a. GL_CONSTANT_ATTENUATION - default: 1
- b. GL_LINEAR_ATTENUATION - default: 0
- c. GL_QUADRATIC_ATTENUATION - default: 0

iv. Spot lights
- a. GL_SPOT_DIRECTION - 3d vector — default: (0, 0, -1)
- b. GL_SPOT_CUTOFF - angle in degrees — default: 180°
- c. GL_SPOT_EXPONENT - value in [0, 128] — default: 0
  ↑ attenuation exponent

E. Global light properties: glLightModel*(param name, value)

i. GL_LIGHT_MODEL_AMBIENT - RGBA color — default: black

ii. To use actual viewing position for specular calculations
GL_LIGHT_MODEL_LOCAL_VIEWER to true: GL_TRUE default: false

iii. Separate texture from specular terms
GL_LIGHT_MODEL_COLOR_CONTROL to GL_SEPARATE_SPECULAR_COLOR

iv. To back of surfaces: GL_LIGHT_MODEL_TWO_SIDE to GL_TRUE

II. Surface Properties

A. glMaterial*(*, *, *)
- surface
- surf property
- value

GL_FRONT
GL_BACK
GL_FRONT_AND_BACK

B. Emission – GL_EMISSION : color default: (0,0,0,1) black

C. Ambient/Diffuse: GL_AMBIENT : k_a (separate per color) 4 elem vector default: (0.2, 0.2, 0.2, 1)

GL_DIFFUSE : k_d (separate per color) default (0.8, 0.8, 0.8, 1)

GL_AMBIENT_AND_DIFFUSE for setting both

D. Specular : GL_SPECULAR : k_s (separate color) default (1.0, 1.0, 1.0, 1.0)

E. Shininess : GL_SHININESS : n_s (exponent) in [0 to 128] default: 0

III. GL uses basic illumination model as discussed.

IV. Atmosphere

1. Enable/disable: glEnable(GL_FOG) / glDisable

B. Params: glFog*(*, *) (param, value)

C. Color: GL_FOG_COLOR – RGBA

D. mode: GL_FOG_MODE → GL_EXP or GL_EXP2 or GL_LINEAR default: GL_EXP

E. Density: GL_FOG_DENSITY → ρ

V. Transparency

A. Enable/Disable: glEnable(GL_BLEND) / glDisable

B. can set blend functions as well

C. To show properly: draw all opaque w/ no blend and then turn off depth test to read only, finally draw all transparent objects.

VI. Surface Rendering

A. glShadeModel(*)

GL_FLAT (flat) or GL_SMOOTH (Gouraud)

B. must specify normals of course