

Fog

**CSCI 4229/5229
Computer Graphics
Summer 2025**

Justification

- Light is distorted with distance
 - Fog, haze, smoke, snow, dust, suspended particles and pollution limits visibility
 - Turbulence and other thermally driven effects cause refraction and distortion
- Primarily applies to outside scenes
 - Critical under water and during precipitation
 - Smoke filled room indoor example

Implementation in Computer Graphics

- Blend object color with background color
 - More of background with greater distance
 - Distance measured from observer
 - Transition with distance generally nonlinear
 - Cutoff distance – objects beyond this are obscured
- Background color typically should match fog color (unless completely covered by objects)

Fog Equations in OpenGL

- $C = f C_{\text{obj}} + (1-f) C_{\text{fog}}$
- $f = (d_{\text{end}} - d) / (d_{\text{end}} - d_{\text{start}})$ [limited to 0-1]
- $f = \exp(-\gamma d)$
- $f = \exp(-\gamma^2 d^2)$
 - d is the distance from the observer
 - d_{start} and d_{end} is the range of linear fog
 - γ is the fog density

Fog in OpenGL

- glEnable(GL_FOG)
- glFog*
 - GL_FOG_MODE
 - GL_LINEAR, GL_EXP, GL_EXP2
 - GL_FOG_COLOR (C_{fog})
 - GL_FOG_DENSITY (γ in GL_EXP & GL_EXP2)
 - GL_FOG_START (d_{start} in GL_LINEAR)
 - GL_FOG_END (d_{end} in GL_LINEAR)