Fog and Flight

CS 418: Interactive Computer Graphics

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Fog

Fog is an example of participating media

These are typically some sort of particulate

scatters and otherwise changes light

There are a number of sophisticated ways to render such phenomena
..we'll use a simple one

For something complex, check out

http://www.gdcvault.com/play/1023519/Fast-Flexible-Physically-Based-Volumetric

Distance Fog

Just mix a fragment color with a fog color

The farther the fragment from the viewer, more fog color

...and less original color

Fog in WebGL and GLSL

gl_FragCoord.xyz is the window-space position. gl_FragCoord.w contains the inverse of the clip-space w

- We implement fog in the fragment shader
- Compute the distance from fragment to camera

```
float fogCoord = (gl_FragCoord.z/gl_FragCoord.w);
```

- And define a fog color
  - White is a good choice…especially with a white background

```
vec4 fogColor = vec4(1.0, 1.0, 1.0, 1.0);
```

Mixing in Fog

Use linear interpolation to mix fog with the fragment color

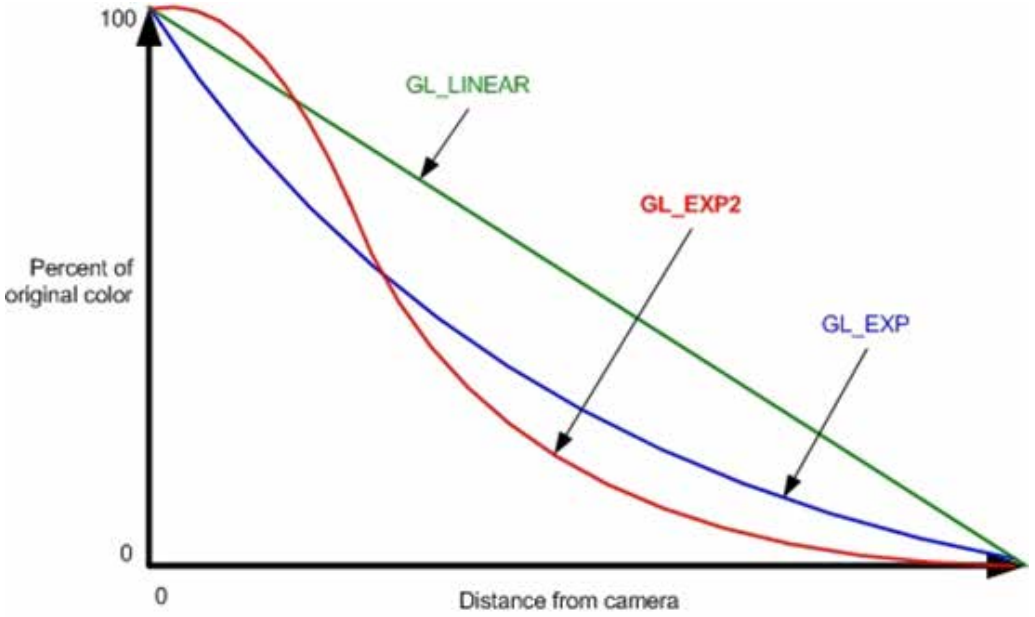
```
gl_FragColor = mix(fogColor, fragColor, fogFactor );
```

- `fragColor` is the color computed by your shading equation
  - Probably Blinn-Phong
- The `mix` function is built-in GLSL function that performs lerp
- But what is `fogFactor`?

Fog Factor

```
const float LOG2 = 1.442695;
float fogDensity = 0.0005
float fogFactor = exp2( -fogDensity * fogDensity * fogCoord * fogCoord * LOG2 );
fogFactor = clamp(fogFactor, 0.0, 1.0);
```

- Fog factor determines how much of the color is fog
  - A value of 1 means all fog in this case…a value of 0 means no fog
- You can see the curve below…we're computing GL_EXP2



On the next foggy day, you can try to verify by eyesight if fog works this way…

Fog Factor Debugging

- In case you have trouble,
  try just implementing the linear curve for the fogFactor…see if that works.

- Can also render your fogCoord values
  - Compute z=fogCoord/farClipDistance;
  - Set gl_FragColor to (z,z,z, 1.0)
  - See if the image makes sense

Flight: Orientation

- Lots of ways to implement flight…
- MP requires the use of quaternions
- One option to change orientation:
  - Set up an initial view using mat4.lookat
  - Keep a quaternion that records current orientation
  - Each frame:
    - Capture key presses as Euler angles
    - Construct a temporary quaternion based on the Euler angles.
      - **quat.fromEuler in glMatrix library…get current release!**
    - Update the orientation quaternion using the temp
      - How?
    - Update the view matrix using the orientation quaternion
      - How?

Flight: Moving Forward

- Keep a user set speed factor
  - User can adjust
- Move in the direction of the current orientation
  - By speedFactor*directionVector
  - You'll need to experiment to find appropriate speedFactor
- What's the current directionVector?
  - Think about how you could compute it….