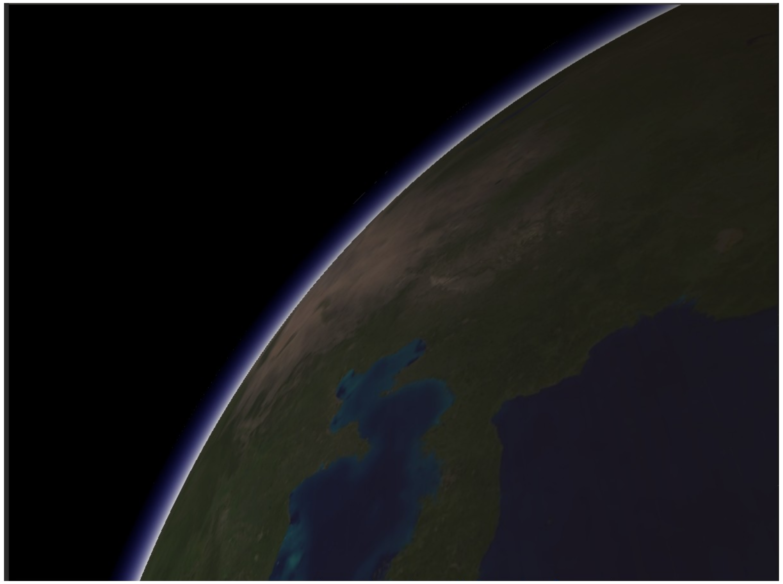
Universidad Católica San Pablo

Computer Graphics: Atmospheric Scattering



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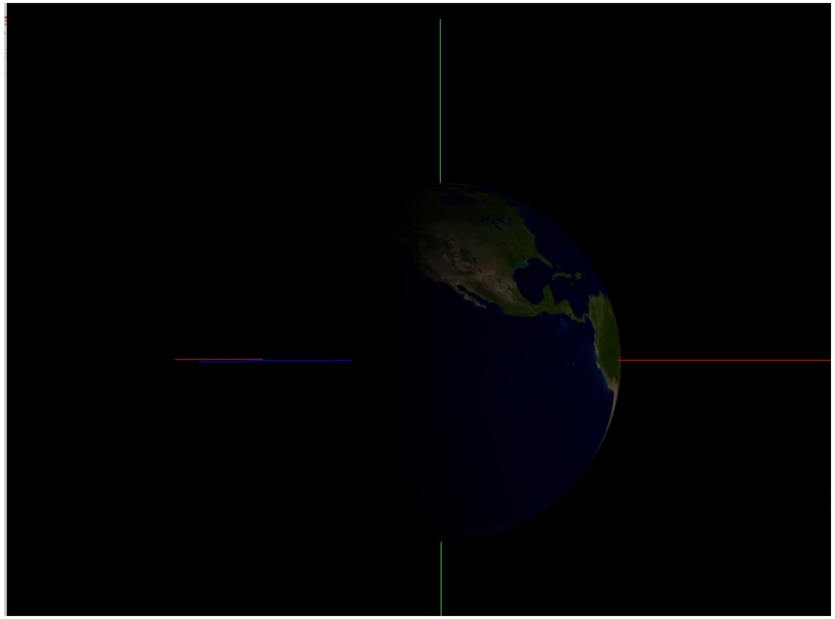
Implementation

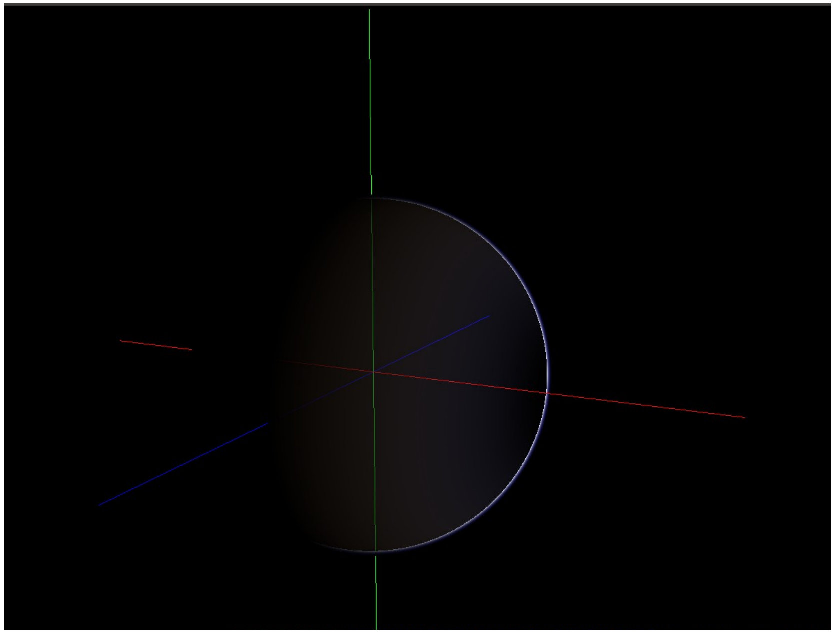
For Atmospheric Scattering from Space

Rendered Objects:

- Coordinate axes
- Surface of planet Earth
- Atmosphere as surface

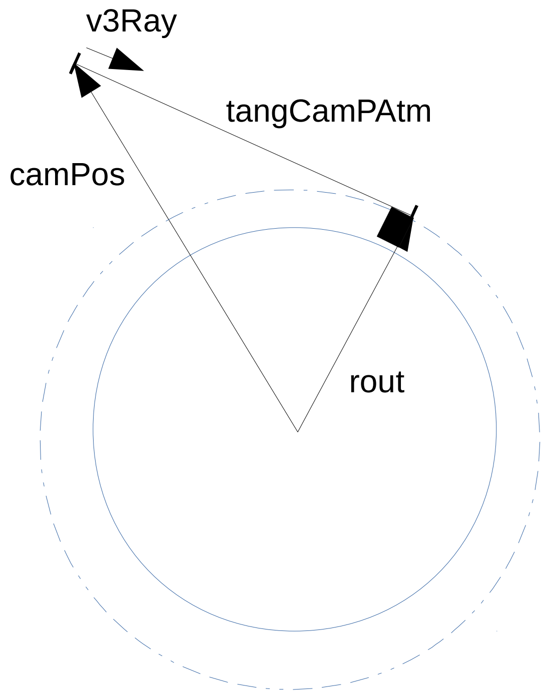


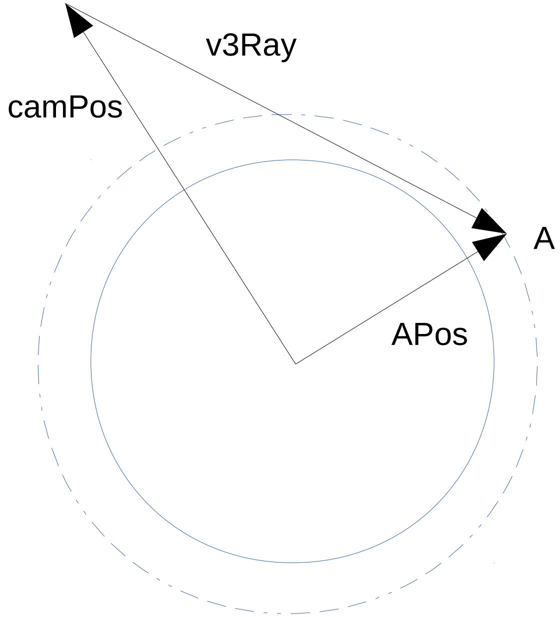
Surface of planet With mapped texture, without ambiental lighting, without specular lighting and with rotation effect

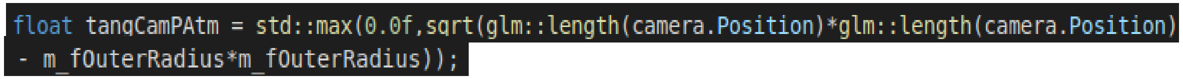


Surface of atmosphere degraded with Rayleigh and Mie effect and transparency

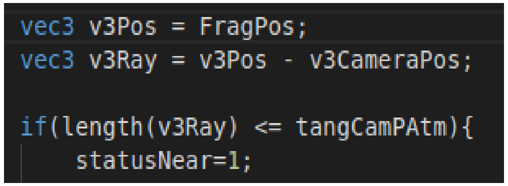
Is there line of sight from the camera to the Frag Position?







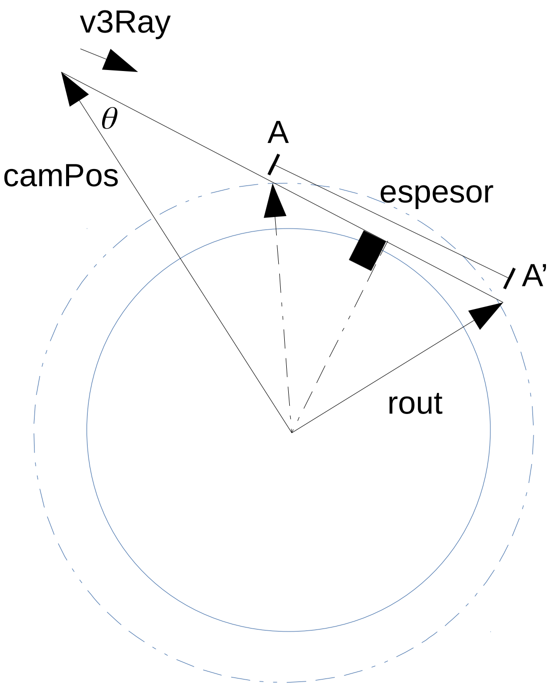
```
float tangCamPAtm = std::max(0.0f,sqrt(glm::length(camera.Position)*glm::length(camera.Position)
 - m_fOuterRadius*m_fOuterRadius));
```

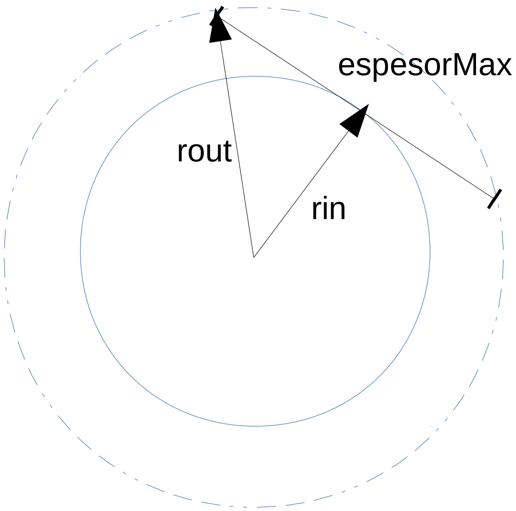


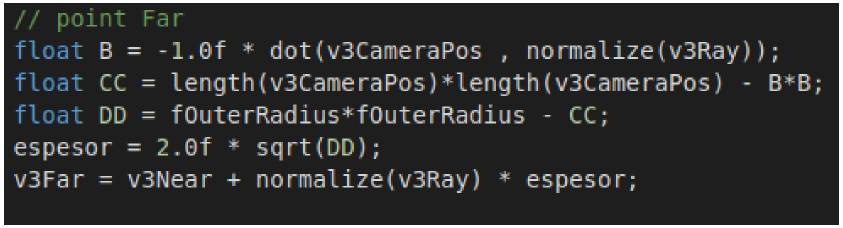
```
vec3 v3Pos = FragPos;
vec3 v3Ray = v3Pos - v3CameraPos;

if(length(v3Ray) <= tangCamPAtm){
    statusNear=1;
```

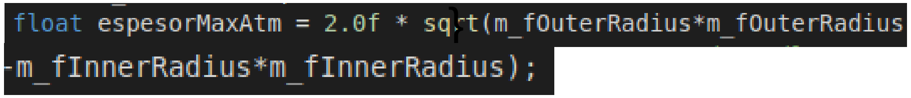
Is this Frag Position going through the atmosphere without touching the earth?







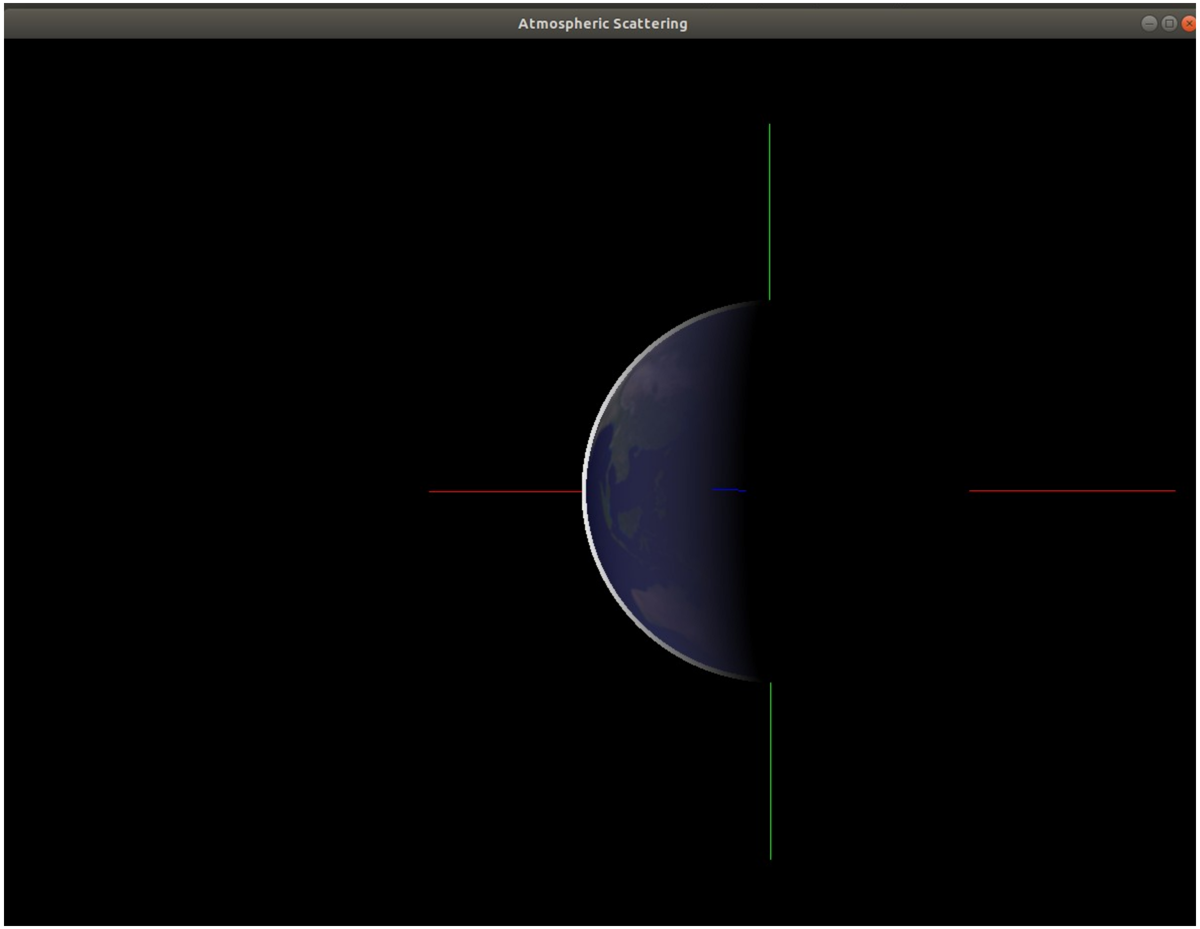
```
// point Far
float B = -1.0f * dot(v3CameraPos , normalize(v3Ray));
float CC = length(v3CameraPos)*length(v3CameraPos) - B*B;
float DD = fOuterRadius*fOuterRadius - CC;
espesor = 2.0f * sqrt(DD);
v3Far = v3Near + normalize(v3Ray) * espesor;
```

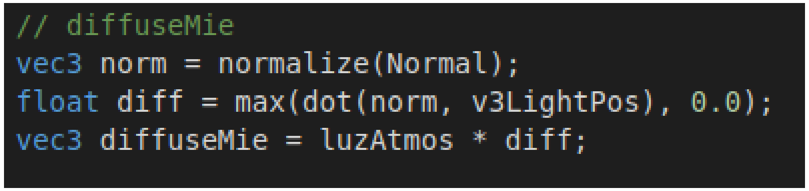


```
float espesorMaxAtm = 2.0f * sqrt(m_fOuterRadius*m_fOuterRadius
-m_fInnerRadius*m_fInnerRadius);
```

If espesor <= espesorMax , the ray going through the atmosphere
Without touching the earth.

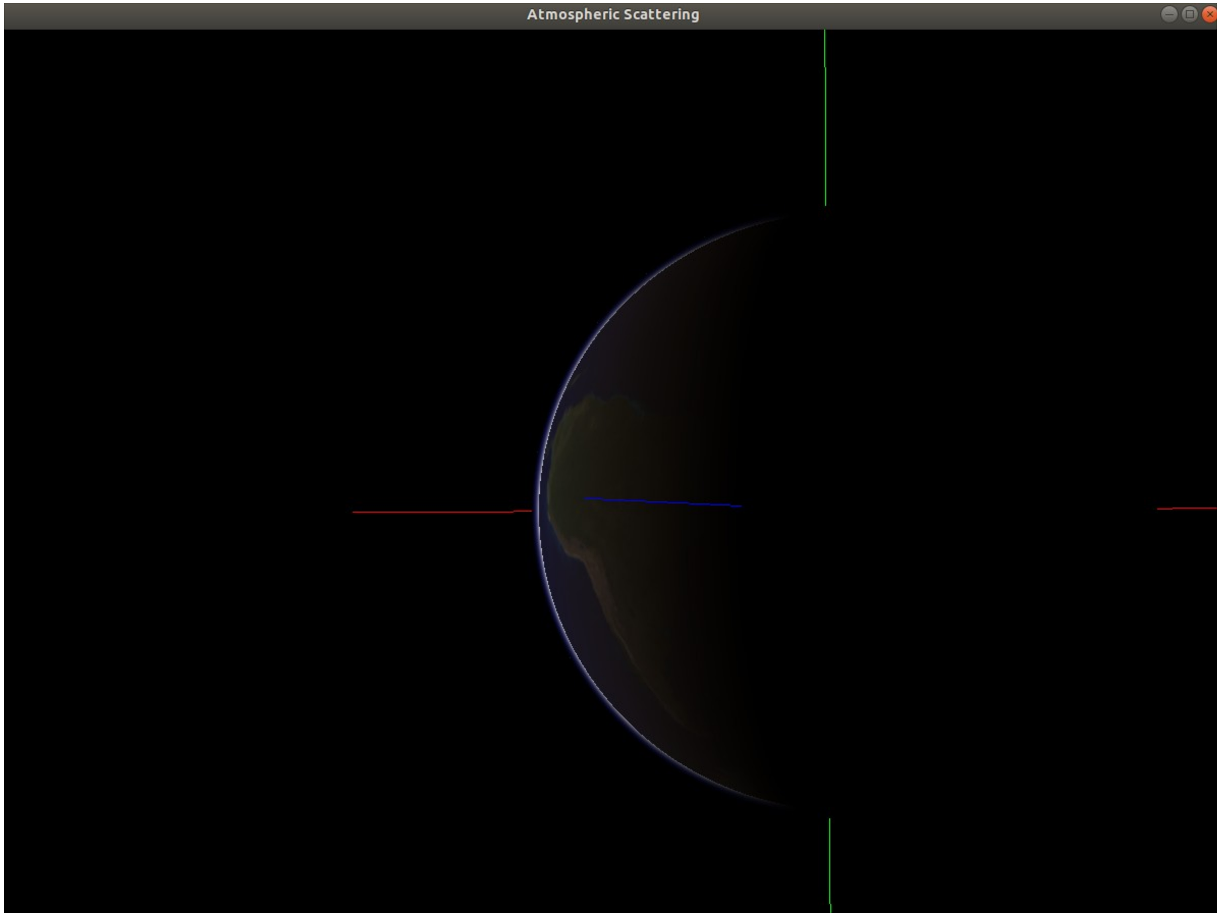
Mie Scattering

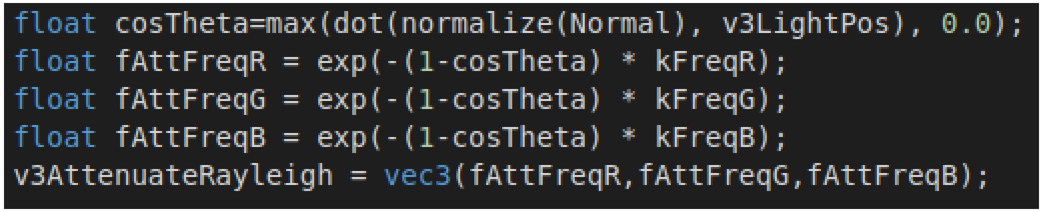




```
// diffuseMie
vec3 norm = normalize(Normal);
float diff = max(dot(norm, v3LightPos), 0.0);
vec3 diffuseMie = luzAtmos * diff;
```

Rayleigh Scattering




```
float cosTheta=max(dot(normalize(Normal), v3LightPos), 0.0);
float fAttFreqR = exp(-(1-cosTheta) * kFreqR);
float fAttFreqG = exp(-(1-cosTheta) * kFreqG);
float fAttFreqB = exp(-(1-cosTheta) * kFreqB);
v3AttenuateRayleigh = vec3(fAttFreqR,fAttFreqG,fAttFreqB);
```

Thank you

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