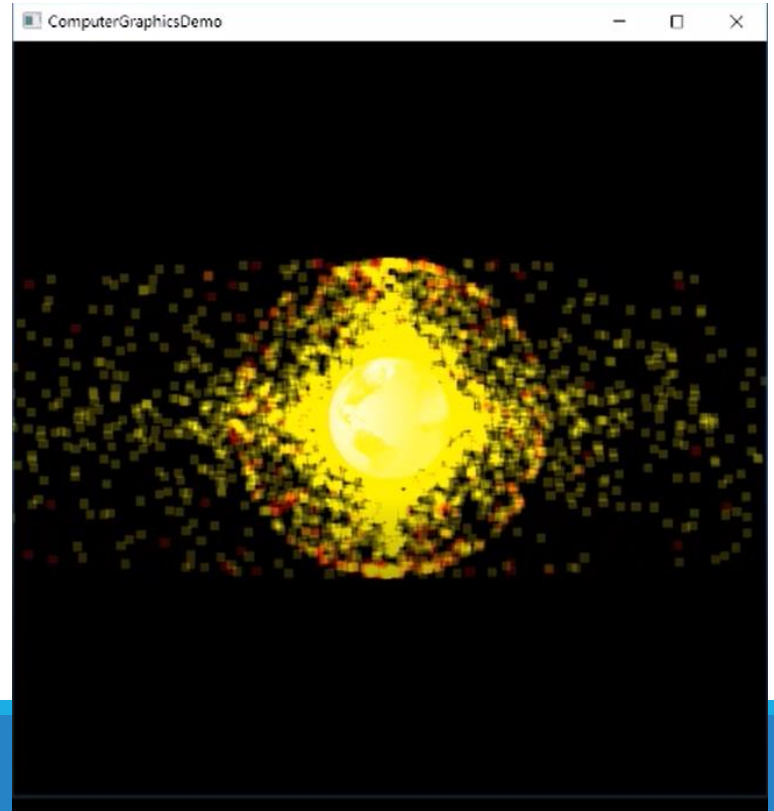
HW4

Goal

1. Make a 20~45 seconds video.
   First 10~30 seconds for playing the video.
   Last 10~15 seconds for introducing the features of the video and technique you have used.
2. Theme : Explosion
3. Must include
   (1). At least an object
   (2). The states before explosion and after explosion

*Use GLSL to do this homework, otherwise you'll get zero points.



Recording tools

1. Screen recording :

   OBS : https://obsproject.com/

2. Introduce your video :

   (1). PowerPoint

   (2). Other video editing tools

Something you can do

Ex :

1. Particle system
2. Camera movement
3. Find resources (models, textures,…..) on the internet
4. Other creative ideas…

Particle system example

You can define a particle with:

1. Position: The particle's position
2. Speed: The particle's speed
3. Fade: The time step of particle's fading
4. Life: The life of the particle

```
struct ParticleAttribute
{
    GLfloat position[3] = {};
    GLfloat speed[3];
    GLfloat fade;
    GLfloat life;
};
```

Life = Life – Fade
If Life < 0
The life cycle of the particle is end, reset the particle.

Particle system example

1. Initialize your particles.

2. You can use some random value for the speed of each particle.

```
void initParticlesPosition() {
    for (int i = 0; i < 20000; i++) {
        particles[i].position[0] = 0.0;
        particles[i].position[1] = 0.0;
        particles[i].position[2] = 0.0;
        float stepi = 2 * PI / 180;
        int randomi = rand() % 180;
        float stepj = 2 * PI / 180;
        int randomj = rand() % 180;
        particles[i].speed[0] = sin(randomj * stepj) * cos(randomi * stepi) * 100.0;
        particles[i].speed[1] = cos(randomj * stepj) * 100.0;
        particles[i].speed[2] = sin(randomj * stepj) * sin(randomi * stepi) * 100.0;
        if (i < 5000) {
          particles[i].speed[0] = sin(randomj * stepj) * cos(randomi * stepi) * 500.0;
        }
        particles[i].life = 2.0f;
        particles[i].fade = GLfloat(rand() % 100) / 1000.0f + 0.003f;
    }
}
```

Particle system example

1. After initializing the particle system, send the particles' initial positions and life into the shader by the method used in HW2 and HW3.

2. Use the same method used in HW2 and HW3 to display the particles.

   Draw the particles in points :

   glDrawArrays(GL_POINTS, 0, 20000);

Particle system example

In fragment shader, you can give the particle different colors according to the particle's life.

```
#version 430

in float frag_life;
out vec4 outColor;

void main(){
    if (frag_life > 0.8) {
      outColor = vec4(1.0, 0.0 , 0.0, 0.2);
    }
    else {
      outColor = vec4(1.0, 1.0 , 0.0, 0.2);
    }
}
```

Particle system example

Remember to update the particles' life and positions each frame. And resend them to the VBO.

```
for (int i = 0; i < 20000; i++) {
        particles[i].position[0] = particles[i].position[0] + particles[i].speed[0] / 10000.0;
        particles[i].position[1] = particles[i].position[1] + particles[i].speed[1] / 10000.0;
        particles[i].position[2] = particles[i].position[2] + particles[i].speed[2] / 10000.0;

    particles[i].life -= particles[i].fade;
    if (particles[i].life < 0.0) {
        particles[i].life = 1.0f;
        particles[i].fade = float(rand() % 100) / 1000.0f + 0.003f;
        particles[i].position[0] = 0.0;
        particles[i].position[1] = 0.0;
        particles[i].position[2] = 0.0;
    }

}
```

Particle system example

1. Because this is just a rough implementation written by TA,

   (Just some flying points…not really an explosion)

   you can’t get the high score by totally using the same method with this particle example.

2. Try to use some technique about adding textures, handling multiple particle systems, particle physics ...
3. Make a good story for your explosion video to get higher votes.

Score

1. Creativity (20%)
2. Richness (20%)
3. Integrity (30%)
4. Votes from classmates (30%)

   (We will provide a Google sheet and let you choose 5 best videos)

Others

1. Upload your video to Youtube (must be anonymous), and upload your video link to New e3.
2. The deadline is at 11:55 pm on January 10.
3. If you submit your homework late, the score will be 0.