Project report for the CG 100433 course

Project Title

Galaxy

Team member

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Abstract

We want to show the beautiful deep universe and go on a impressed journey. There is a 4 and a half minute demo which includes 4 scenes. GLSL , modeling Technique , particle system , skeletal animation are included.

Goal of the project

Simulation of a fine Space trip.

Including:

- Different scenes with music.
- Different sights as the ship travels(i.e. different features)
- Using Modern OpenGL
- Various particle effects
- Skeletal animation
- Random scenes with planets

- A fine spaceship model

Scope of the project

Free move may not be included.

You can move the Camera while the trip is going on but it's not recommended. Better watch it :).

Involved CG techniques

- GLSL

OpenGL Shading Language (abbreviated: GLSL or GL slang), is a high-level shading language based on the syntax of the C programming language.

- Modeling Technique

We used blender and Magic-Voxel for our models.

- Particle System

A technique that uses a large number of very small sprites, 3D models, or other graphic objects to simulate certain kinds of "fuzzy" phenomena, which are otherwise very hard to reproduce with conventional rendering techniques.

- Skeletal Animation

A technique in computer animation in which an articulated object is represented in two parts: a surface representation used to draw the character and a hierarchical set of interconnected bones used to animate (pose and key frame) the mesh.

Implementation

Describe the implementation details.

1. GLSL

   We first learned to use GLSL and VAO/EBO. Later they are sealed as class and it's easy for us to use it.

2. Modeling

   Blender is used to make UV texture and handle the spaceship model.

3. Particle System

   Particle system mainly contains three procedure: 1)Generate new particles if needed 2) update the particles who are 'alive' 3)Kill the particles who run out of their lifetime(Usually done in procedure 2).

   We defined a struct(C struct) Particle who had position , velocity ,color and lifetime. And later they are organized as a Vector(C++ STD LIB) in the class.

   When a new particle is generated , it may has different random lifetime and velocity (with direction I mean) defined by the parameters we passed to the generator when we create it.

   The similar thing happens when it's updated.(Parameters are different so we can create more effects).

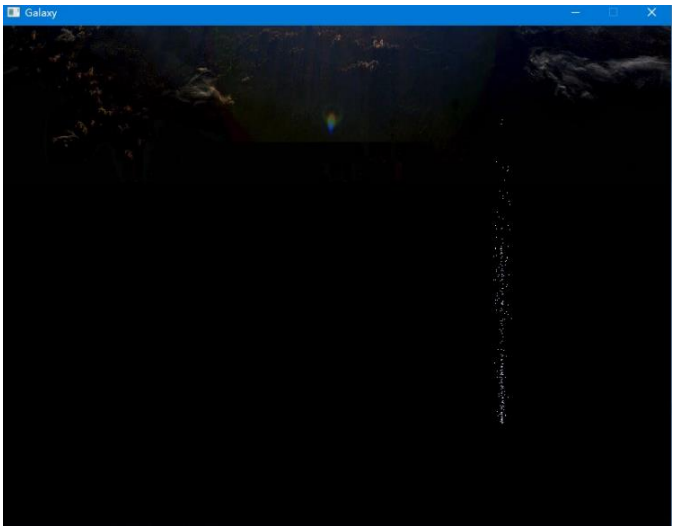
4. Skeletal Animation

A C STRUCT is defined to represent a unit. In the unit , you can define a main(father) joint who receive the motion from another unit and several son joints(in fact a vector) to pass the motion down to other units.

The pass of the motion is a little tricky. Note that if initial rotation is done to the unit , remember append it to the rotation matrix you pass all the way down , and the initial axis should be transformed to world coordinates instead of local coordinates which you use to initialize it.

For the detail , refer to void node::draw() @ include/roll .h ,it's well commented.

Results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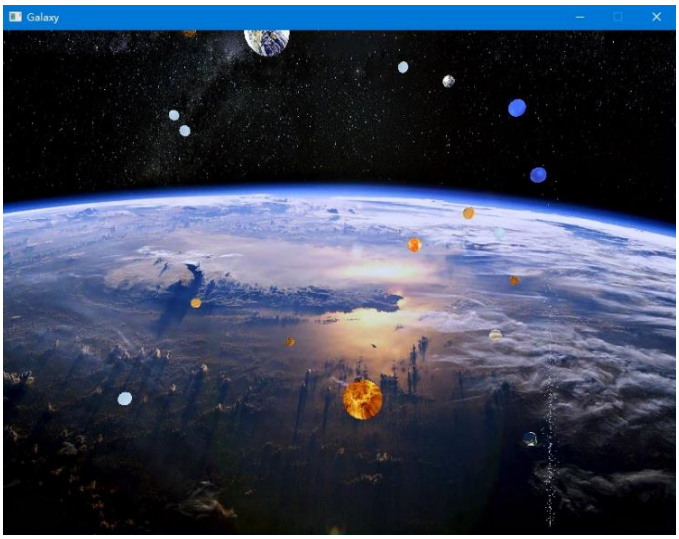
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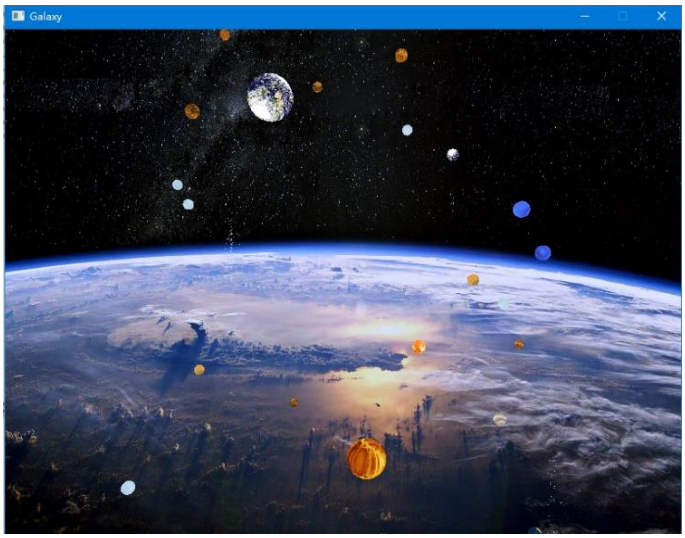
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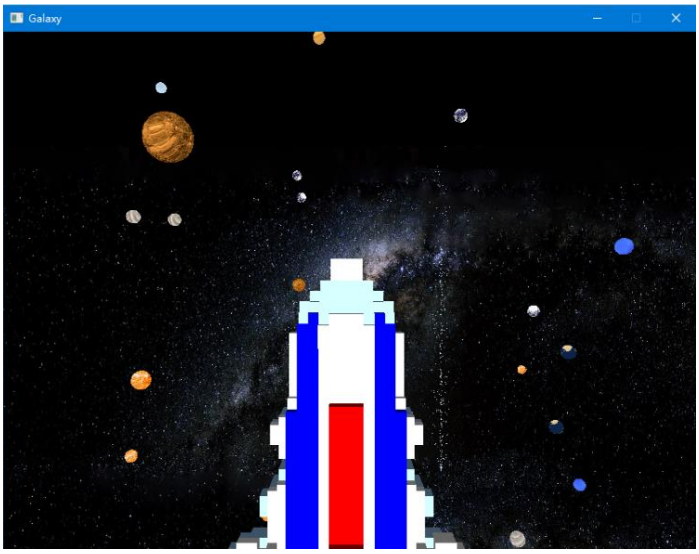
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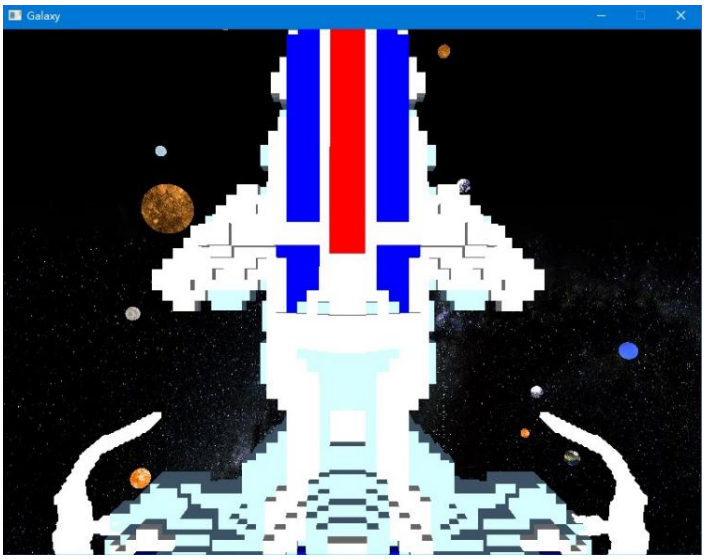
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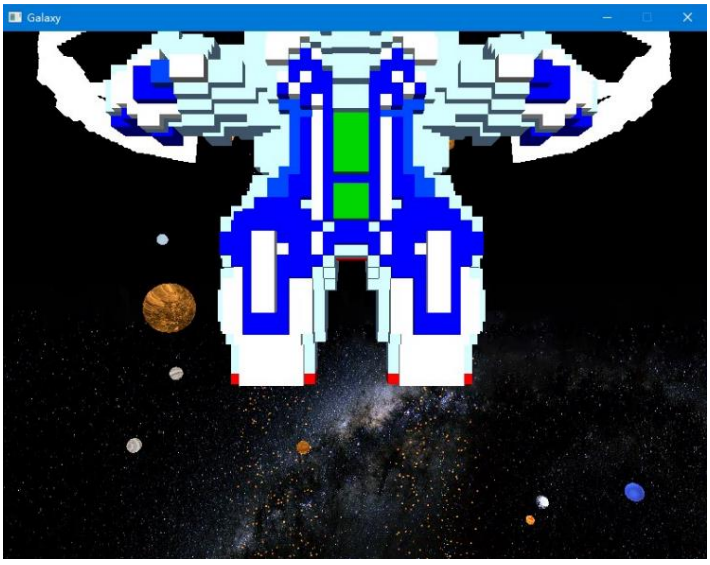
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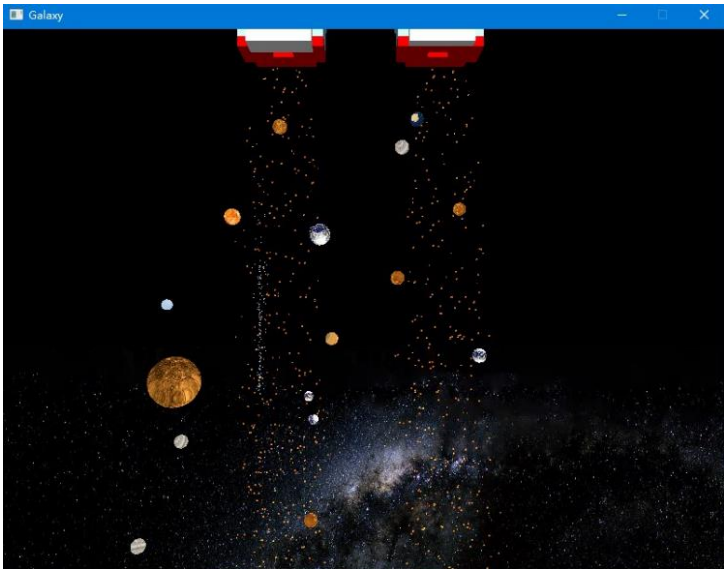
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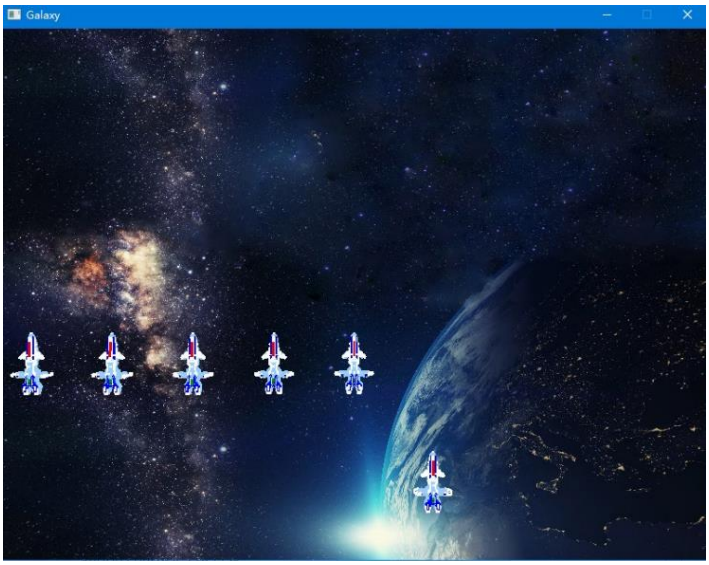
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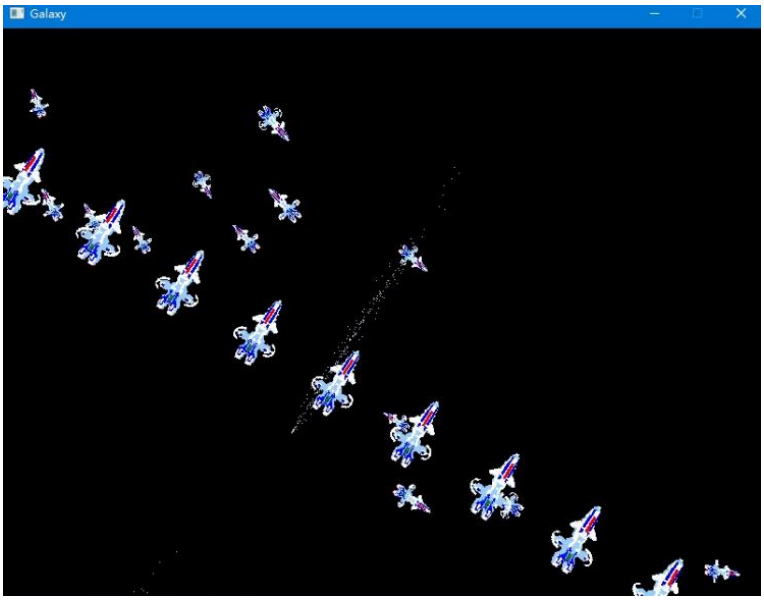
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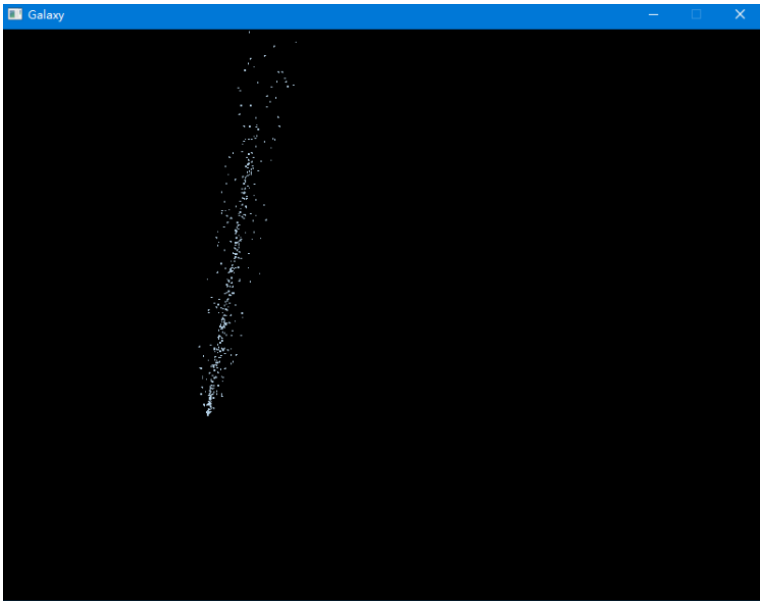
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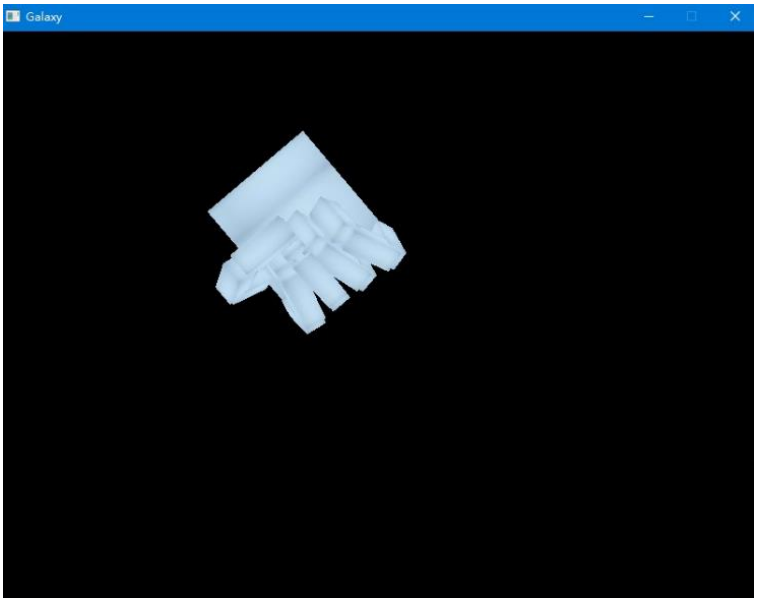
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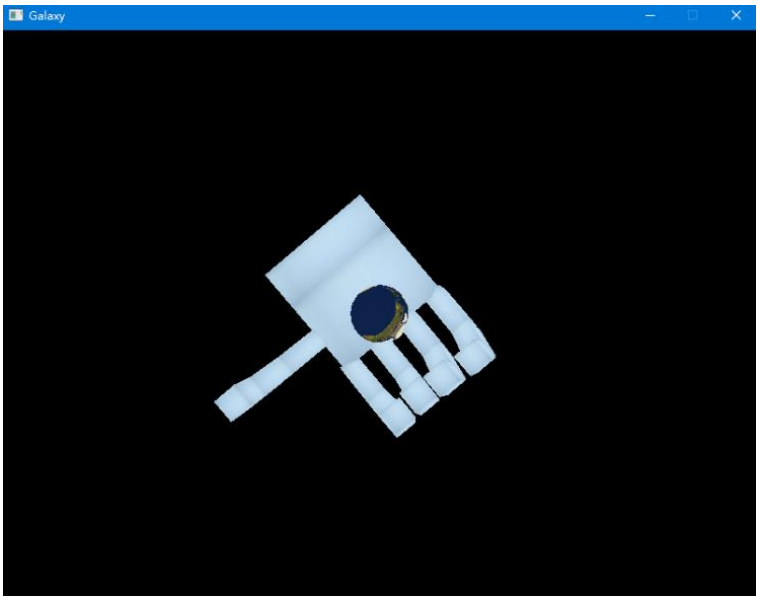

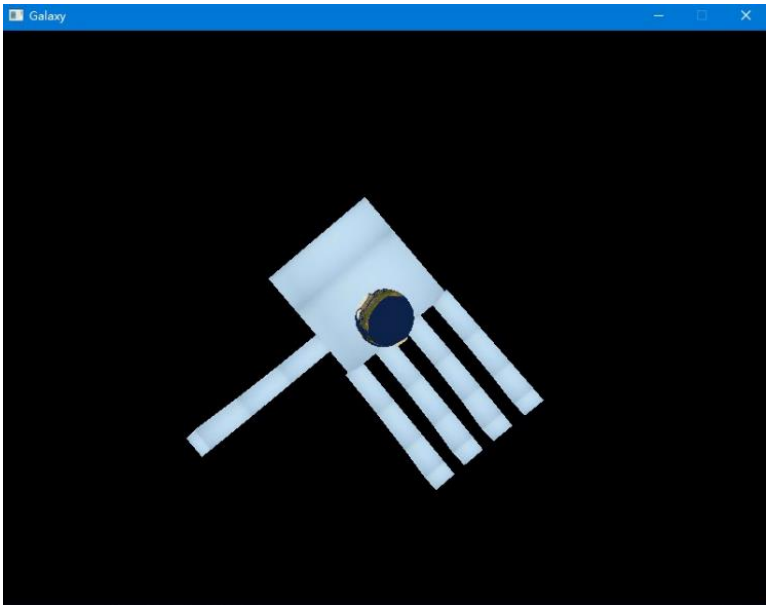

Roles in group

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References

[1] 项志钢. 计算机图形学. 北京： 清华大学出版社,2014

[2] (美) Richard S. Wright 等. OpenGL 超级宝典.第 5 版， 北京： 人民邮电出版社,2012

Websites:太阳系 demo http://www.cnblogs.com/jackybu/p/5349648.html

Websites:learnopengl-cn https://learnopengl-cn.github.io