CS148 Project: Raining Effect

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1 Introduction

The project is about to create a real-time raining simulation. The rain drop is of sphere shape, but with many variation. It can be stretched along the Y-axis because of the gravity. Also it can be of different size. Also rain drop has its lighting attribute which comprise of both reflection and refraction. What is more, raining effect needs to render thousands of rain drops, and simulate their physical movements and interaction between the rain drops.

2 Challenging

This raining effect is challenging in the following parts:

1. render a convincing rain drop is not easy. It needs to take into the light attributes into account.
2. render thousands of rain drop is huge. Also to simulate their physical movement is hard. For example, when two rain drop collide, they will become one. Also, when a big rain drop sliding down, it will leave behind a trail of small rain drops. To take all these into consideration and make it a convincing rain effect is challenging.

3 Implementation

1. Render one single drop
   A rain drop, without motion is round shape water with depth. It has both refraction and reflection. In terms of refraction, the scene is upside down seeing throught the rain drop. Here is the image of the rain drop:
   
   I use shader code to render the rain drop. The rain drop is consisted of 4 vertex. For the vertex

shader code, it is easy to draw two triangles based on the 4 vertex. Because the rain drop will appear randomly on the screen with random size, so the model matrix will take the translation and scale effect into account. For the fragment shader, it will handle the transparency of the drop. The texture of the rain drop is blended with the background, making the effect of transparency.

2. Motion of the rain drop
   The rain drop has its initial speed and also because of the gravity, the moving rain drop will be stretched in the vertical direction. so in the model matrix, the scale in the x-axis and y-axis are treated differently.

3. Trailing effect
   When a big rain drop is falling down, it will leave behind a series of small rain drops. Here is the image of the trailing effect:
   

4. Collision of the rain drop When the rain drop is falling down, it may collide with some other rain drop. They will merge together and form one big rain drop with even higher speed. I will show this effect in the later demo link.

4 Demo

I submit the code at:https://github.com/xavi1989/cs231n/tree/master/LearnOpenGL/src/rain_effect. And here is the record of the demo: https://youtu.be/BW-P1YIMwco. In this video, we can see that the rain is continuously falling down. And with close look, we can identify the trailing effect and the collision effect.

5 Reference

I was inspired by the link: http://tympanus.net/Development/RainEffect/ and here is the git repository of his implementation: https://github.com/codrops/RainEffect.