

# CS-562 Project1 Assignment Report

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For this assignment, I mainly implemented Deferred shading, Main light, Many local lights, and Skysphere.

This is the instruction for each feature's implemented code files or line numbers.

1. Deferred Shading:

- GBO.hpp, GBO.cpp
- SampleScene.cpp with 430~450 line (UpdateGBuffer), 98~112 line (Draw)
- In shaders file - gBuffer.vert, gBuffer.frag, deferred.vert, deferred.frag

2. Main Light:

- MainLight.hpp, MainLight.cpp
- In shader file - deferred.frag with 45~124 line (GetColor, LightDirection)

3. Many Local Light:

- LocalLights.hpp, LocalLight.hpp
- In shader file - localLights.vert, localLights.frag

4. SkySphere:

- SkySphere.hpp, SkySphere.cpp, Texture.hpp, Texture.cpp
- In shader file - skysphereShader.vert, skysphereShader.frag

+ ) It takes a little bit taking time to start the project. Because I used a high polygon obj file of the Bunny model.

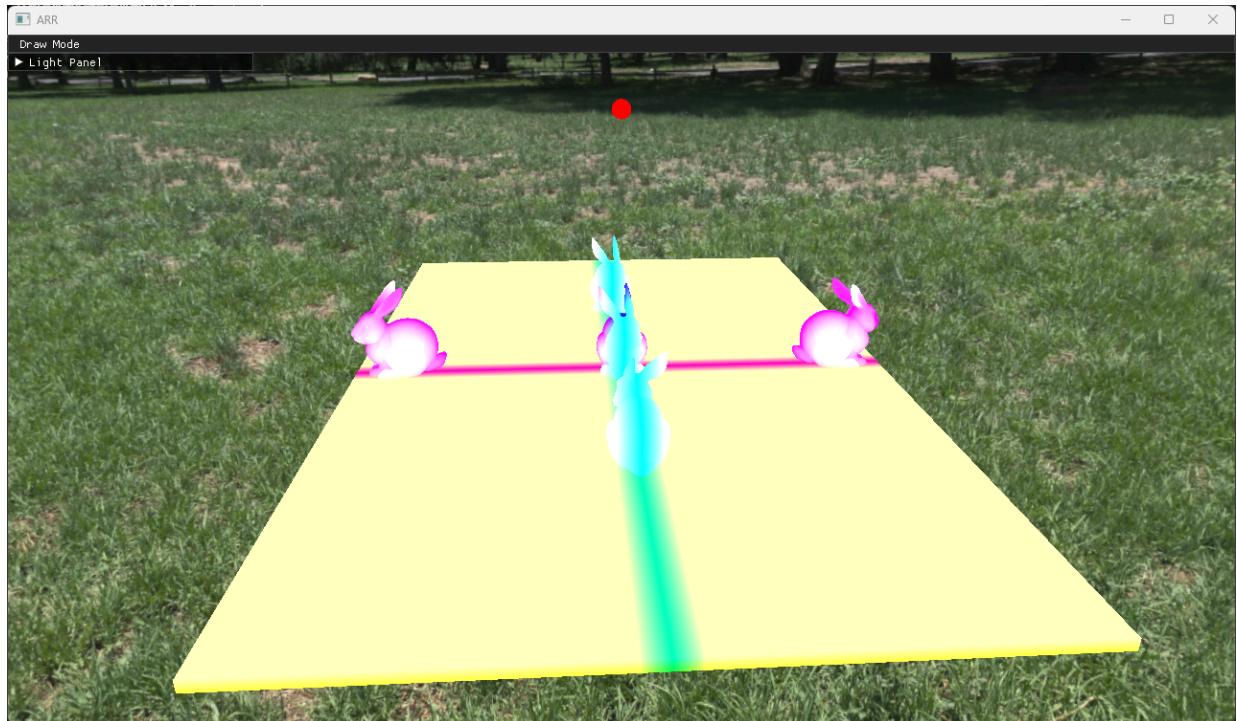
+ ) I set only the x64 version.

## Implementations:

- Deferred Shading
- Main Light with 3 types (Direction, Point, Spot Lights)
- Many Local Lights with unlimited of light counts
- SkySphere with HDR files.

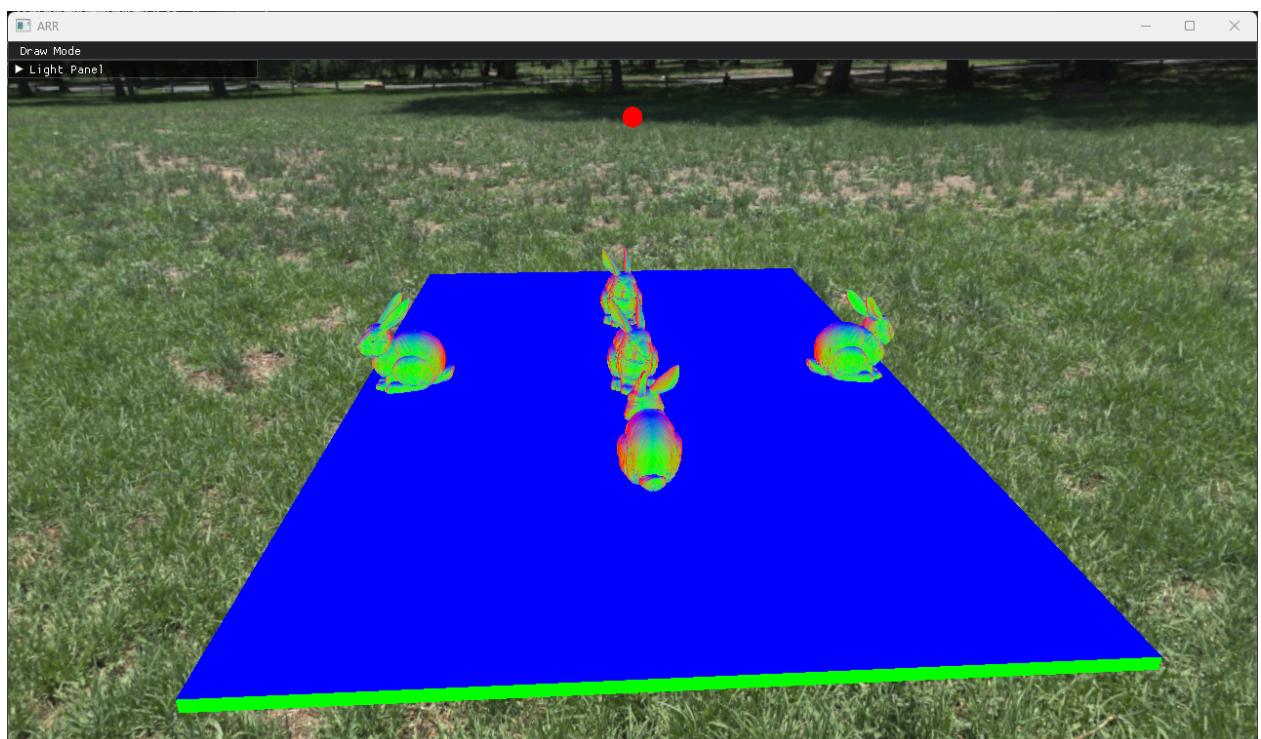
## Deferred Shading:

### 1. World Position



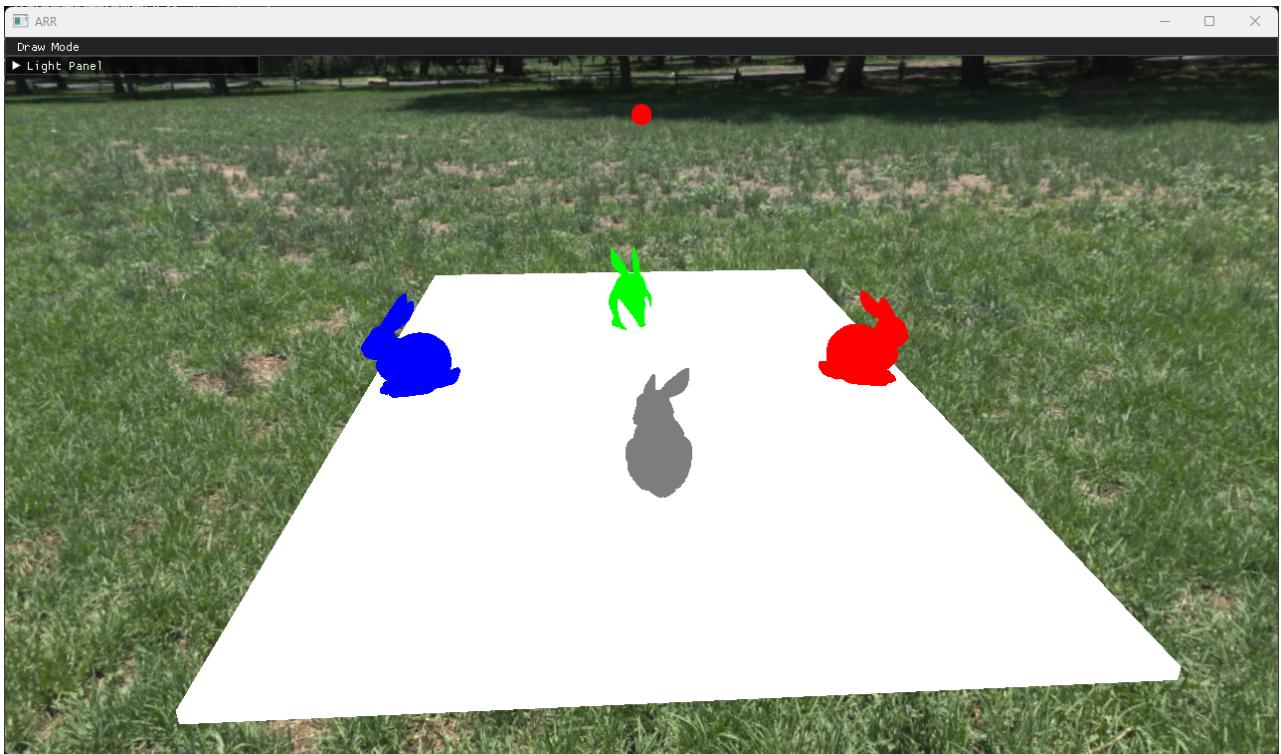
This scene shows that each object's color means its world position value as a color with absolute values.

### 2. Vertex Normal



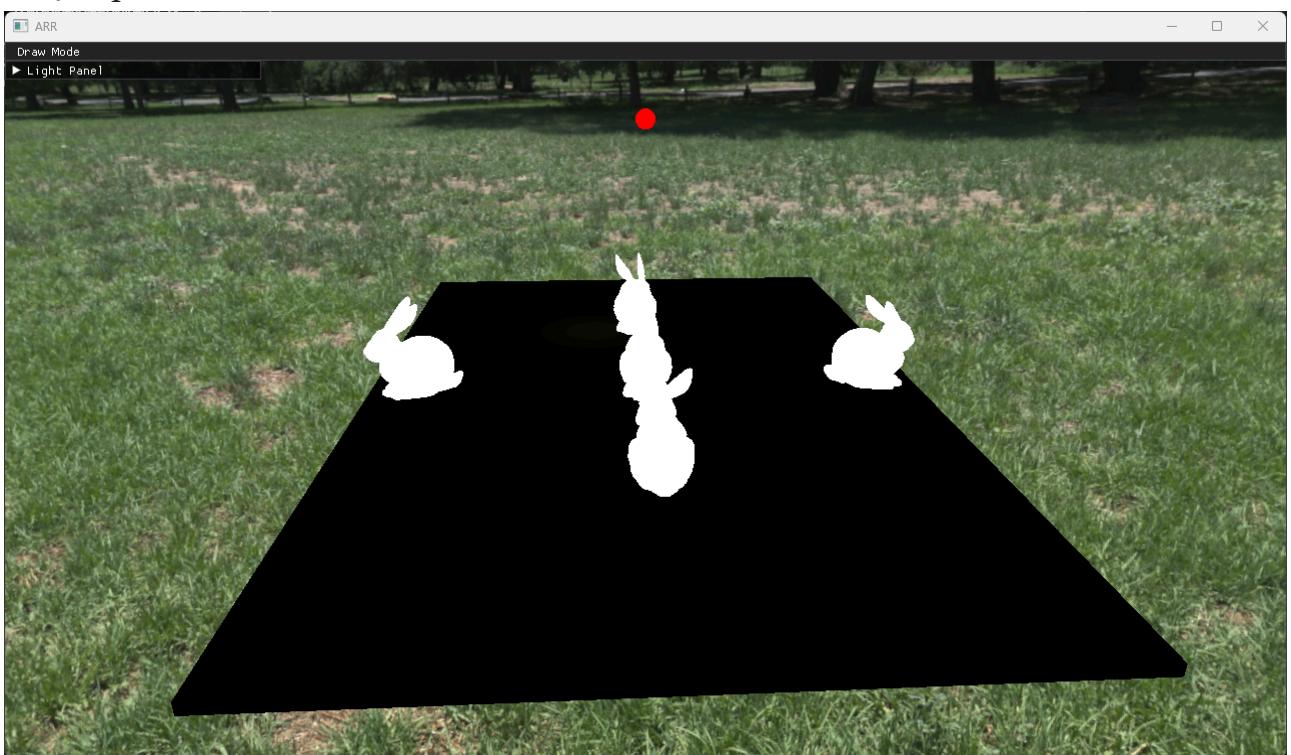
This scene shows that each object's color means its vertex normal value as a color with absolute values.

### 3. Diffuse Color



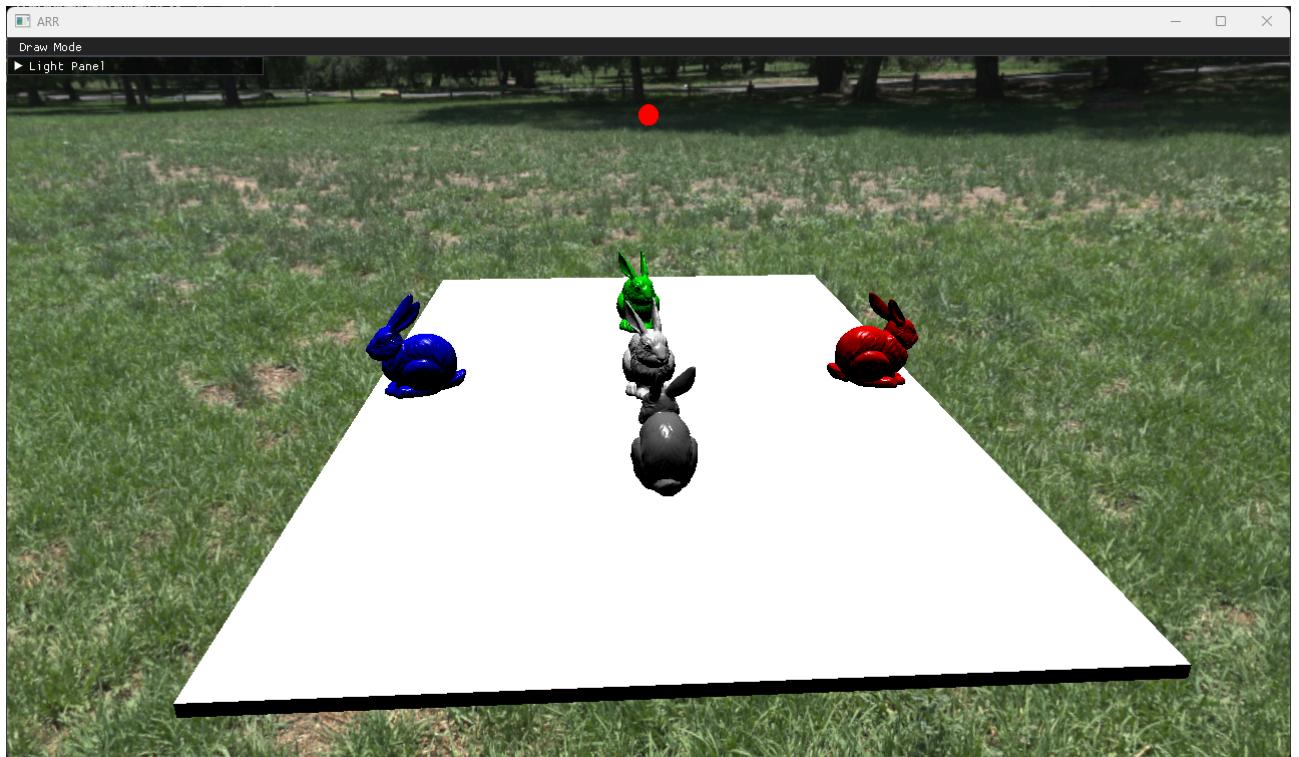
This scene shows that each object's color means its diffuse color.

### 4. Specular



This scene shows that each object's color means its diffuse color.

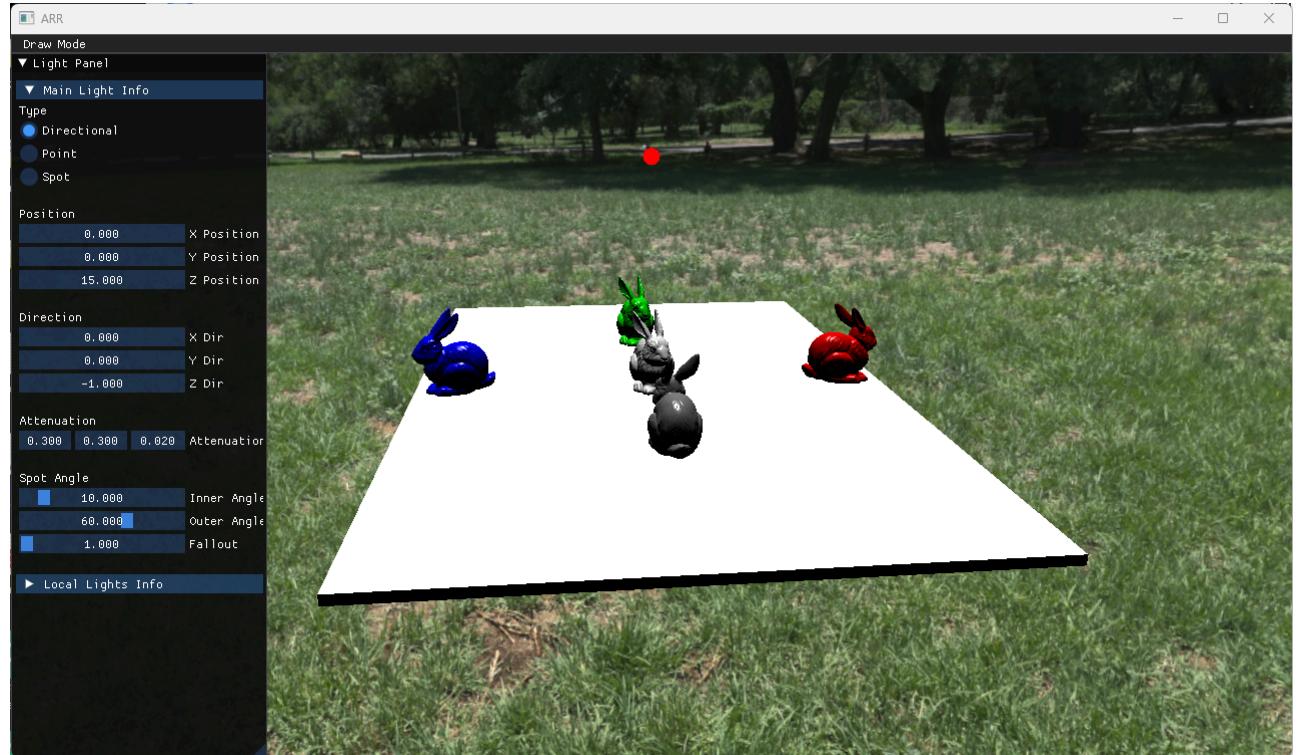
## *5. Total Result of Deferred Shading*



This scene shows each total result of deferred shading.

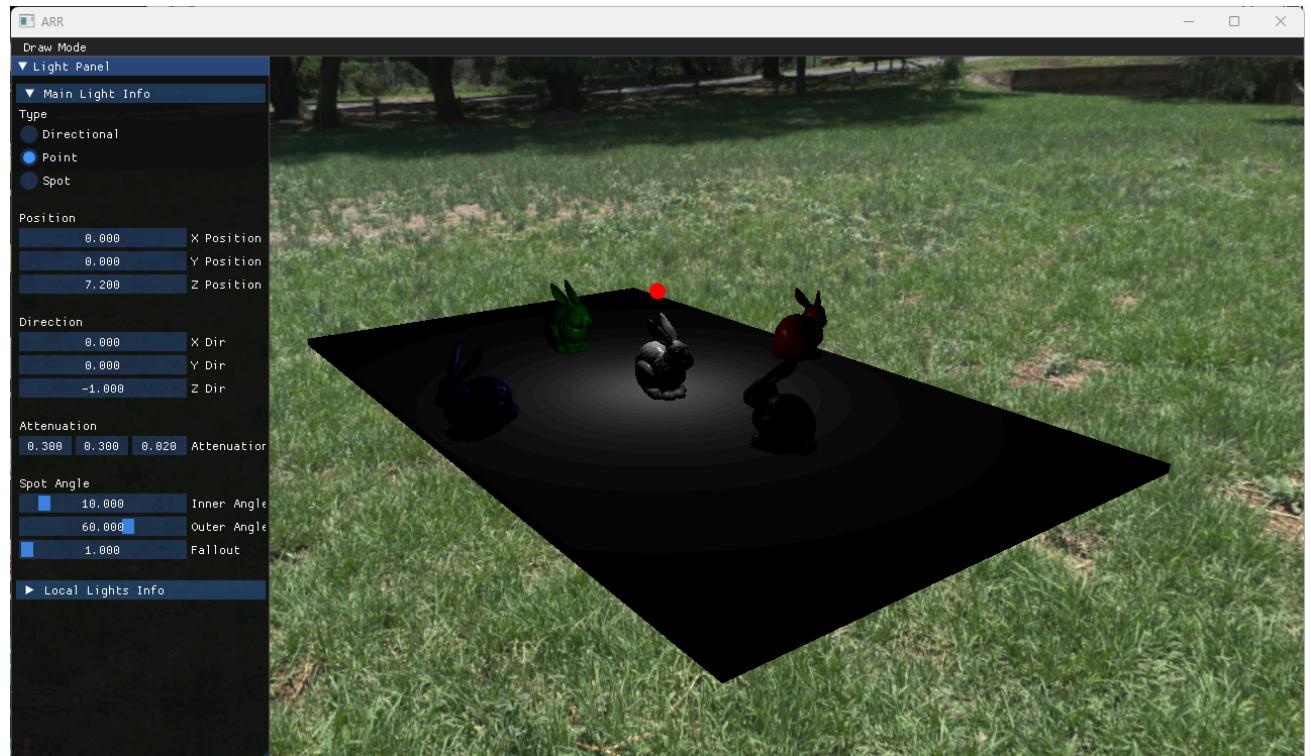
## Main Lighting:

### 1. Directional Light



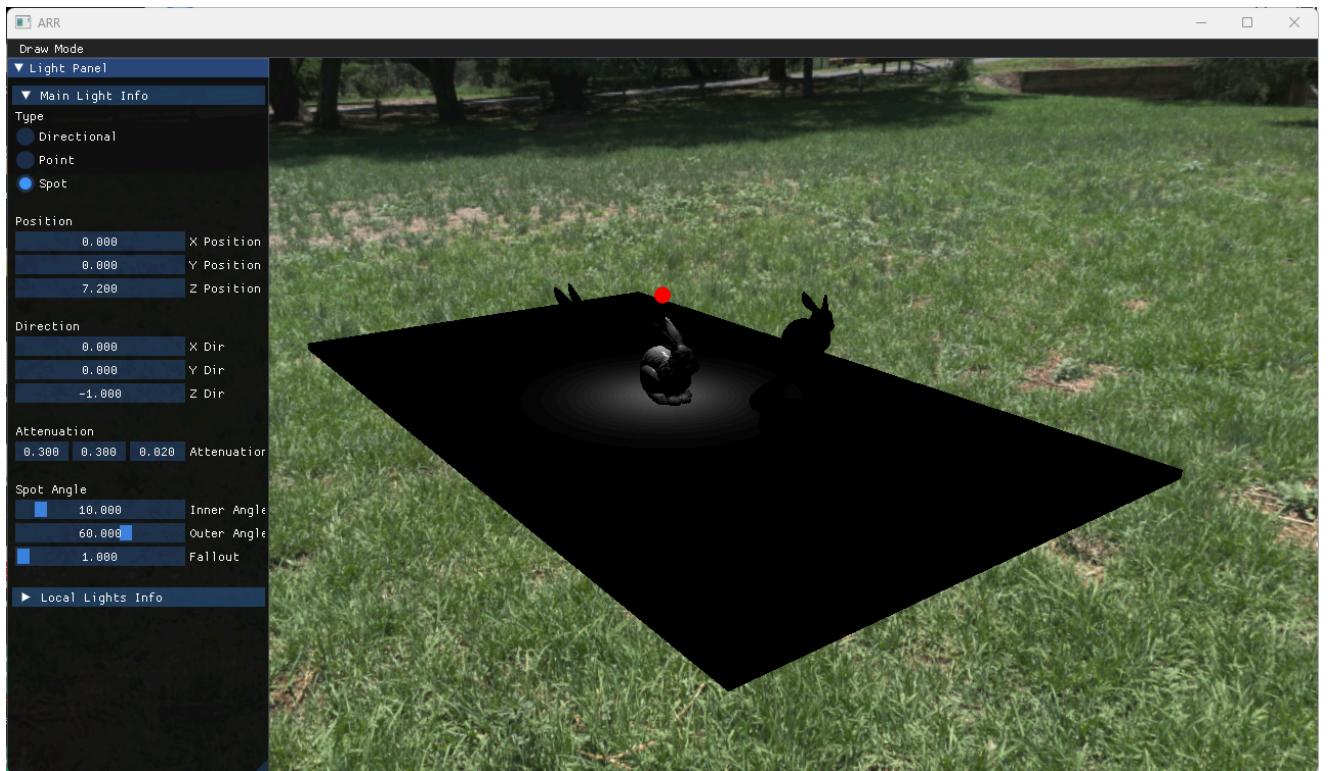
This picture shows the result of Directional Light of main light (the red color ball)

### 2. Point Light



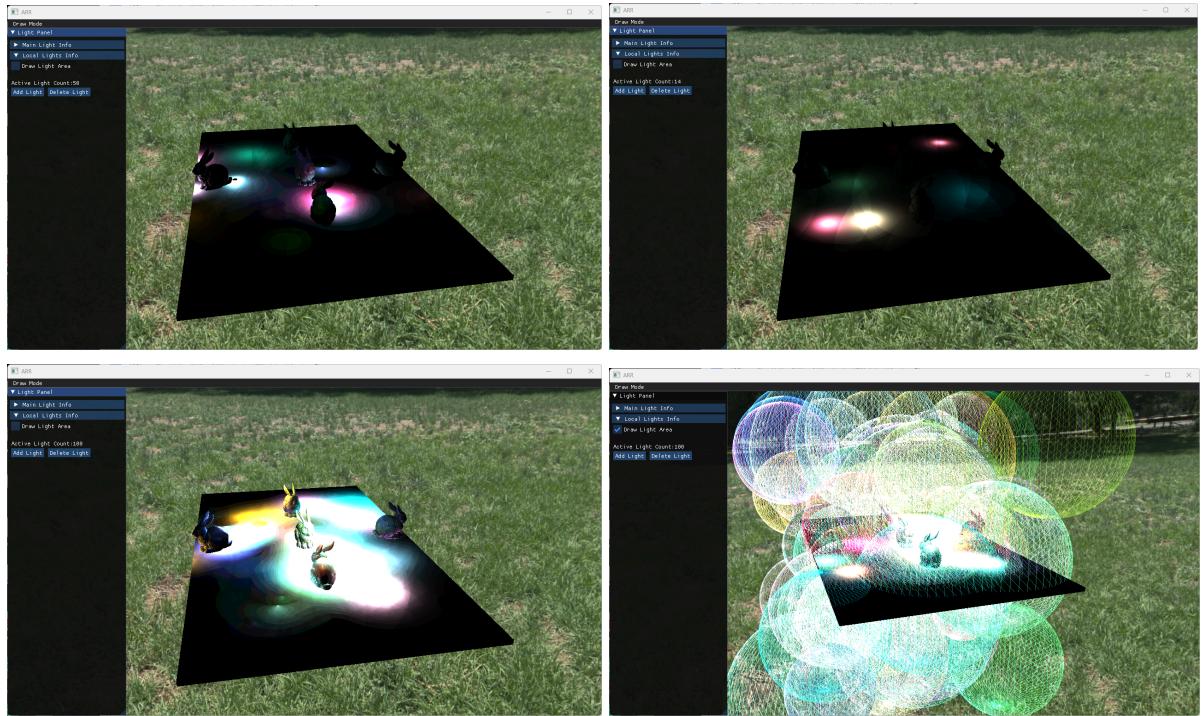
This picture shows the result of Point Light of main light (the red color ball)

### 3. Spot Light



This picture shows the result of Spot Light of the main light (the red color ball)

## Many Local Lights with unlimited of light counts:



These pictures show that many local lights are without the constraint of light count size. Each picture shows 14, 50, 100, 100 lights with lights area.

+ ) I used SSBO for implementing unlimited size of lights count.  
Because I want to use the shader code like that:

```
struct Light
{
    vec4 position;      // position.w is range
    vec4 color;
};

layout (std430) buffer LocalLights
{
    uint activeLightCount;
    Light light[]; //
} localLights;
```

For using unsized of array, I should use the buffer data type and for using this one I should use Shader Storage Buffer Objects (SSBO)

## SkySphere with HDR files:



This picture shows the skysphere features with HDR file.