CS5243 Assignment #5: Collision Detection

I. Introduction

The most common types of collision are the camera-object or object-object collision. In this Assignment, we implement the collision detection based on the BSP tree implemented in Assignment #4.

A BSP tree partitions the space and classifies objects in the scene into different BSP tree leaves. This partition greatly improves the efficiency of collision detection because only objects within the same leaf have any possibility of colliding each other.

For detection of the camera-object collision, we first classify the camera into a BSP tree leaf. The collision between the camera and an object in the same leaf as the camera is detected in two steps:
1. Check the possibility of collision between the camera and the AABB of the object.
2. If no collision, no further checking is needed. If there is collision, check the possibility of collision between the camera and the triangles of the mesh using sphere-triangle collision test.

The object-object collision detection is done in the same way.

II. Requirements

1. Write a method for the BSPTree class to classify the camera into a leaf of the BSP tree.
2. Write a method for the Camera class to check the possibility of collision between the camera and the AABB of an object in the same leaf.
3. Write a method for the Camera class to check the possibility of collision between the camera and the triangles of the meshes and terrain.

III. Advanced Option (extra-credit)

1. Implement advanced collision detection techniques.

IV. Demonstration

1. To display the scene you build up to now. Navigate the camera around to test the collision detection feature.