Physics II

CITM

Bullet Physics - OpenGL

OpenGL: The origin

- In the 80's, developing software for a wide range of graphic hardware was a pain. There weren't any APIs.

- In the early 90's, Silicon Graphics Inc. (SGI) was the leader in 3D graphics and had developed their own API to render them more easily: IRIS GL.
- Due to hard competition and IrisGL growing too fast, they decided to make IrisGL into an Open Graphics Library.
- An Open GL ARB (Architectural Review Board) was created to establish and maintain its software specifications.

OpenGL: The origin

- Today, Khronos group is responsible of OpenGL maintenance.

- OpenGL support: pretty much everyone. Except Microsoft (DirectX)

New (3D) perspective

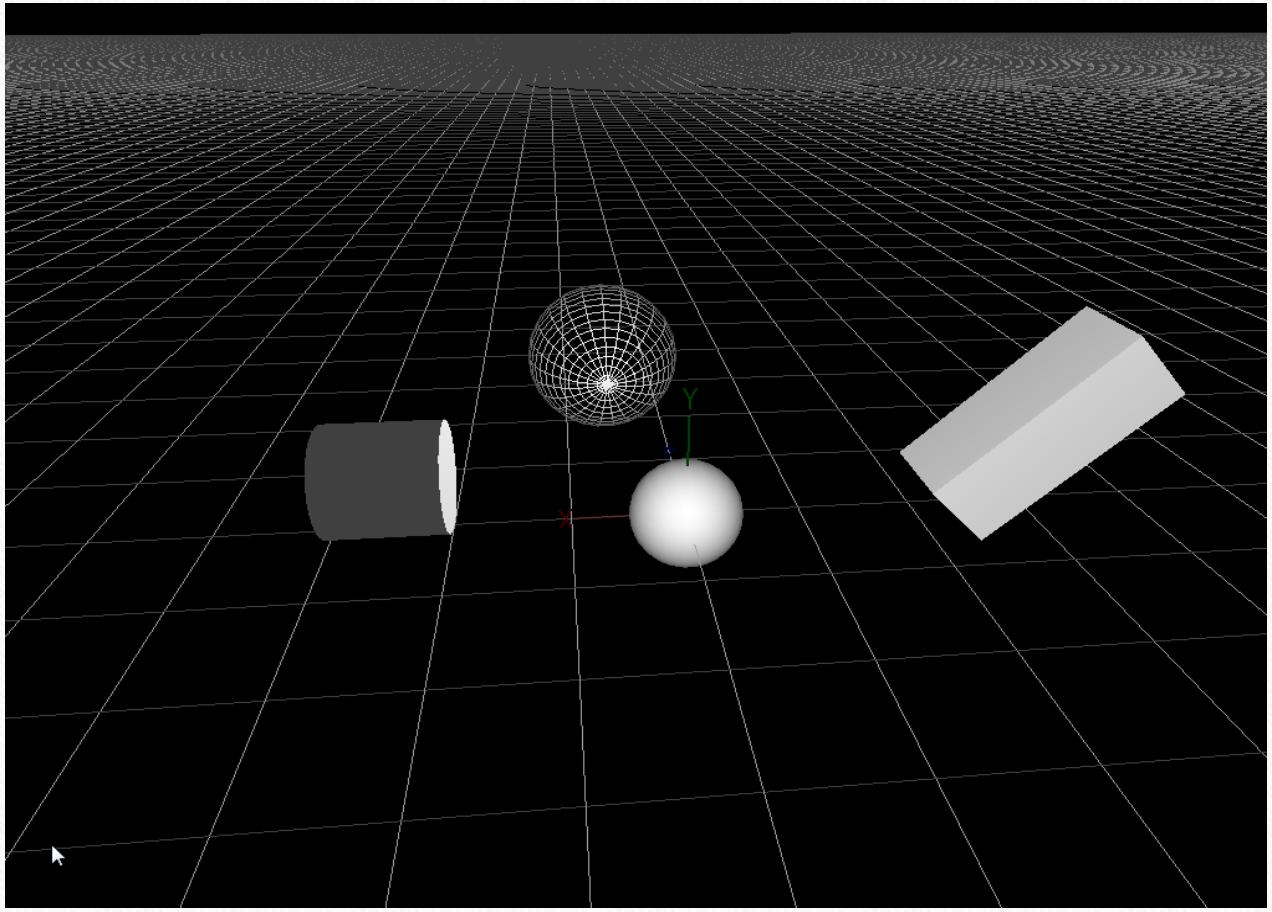
- We still will use SDL, but now we draw onto a OpenGL context.
- Immediate Mode will be used for drawing (no buffering).

- Render module will adapt to OpenGL (see ModuleRenderer3D class)
- A Camera module will be necessary (see ModuleCamera3D class)
- The racing game will be formed by simple primitives (see Primitives class)
- The math library will include more functionality

What you already have

- OpenGL context initialized
- Some lights illuminating the scene
- Some primitives ready to Render (Line, Plane, Cube, Sphere, Cylinder)
  - Check Primitive.h
- Updated Camera module!
- Extended math library (glmath.h)

What you will have

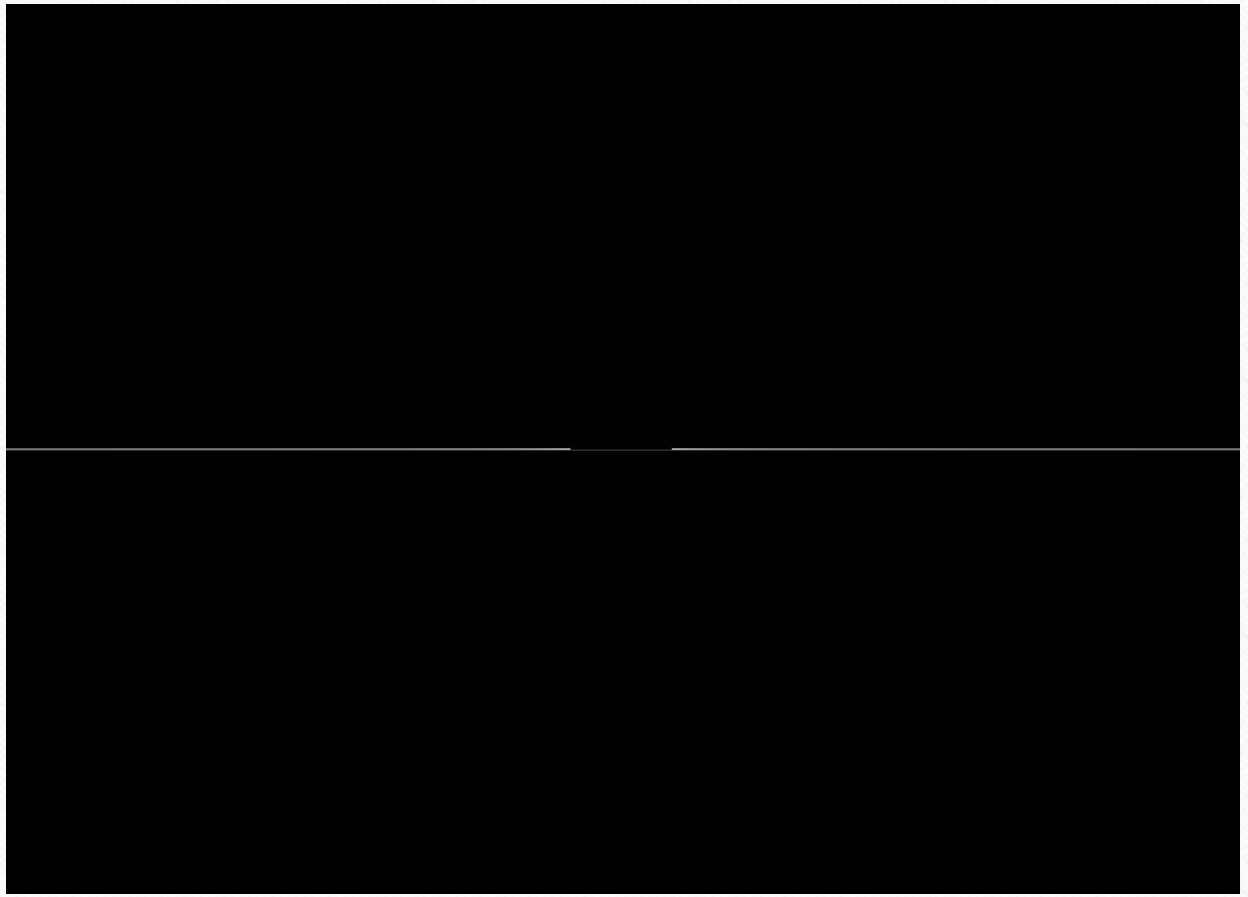


TODO 1

Create a Plane primitive. This uses the plane formula so you have to express the normal vector of the plane to create a plane centered around {0,0}. Draw the axis for reference.

- Theoretically a plane is infinite, but drawing infinite lines isn't a good plan…
- Don't forget to call **Render**();
- Enable "axis" as a reference.

TODO 1 - Result

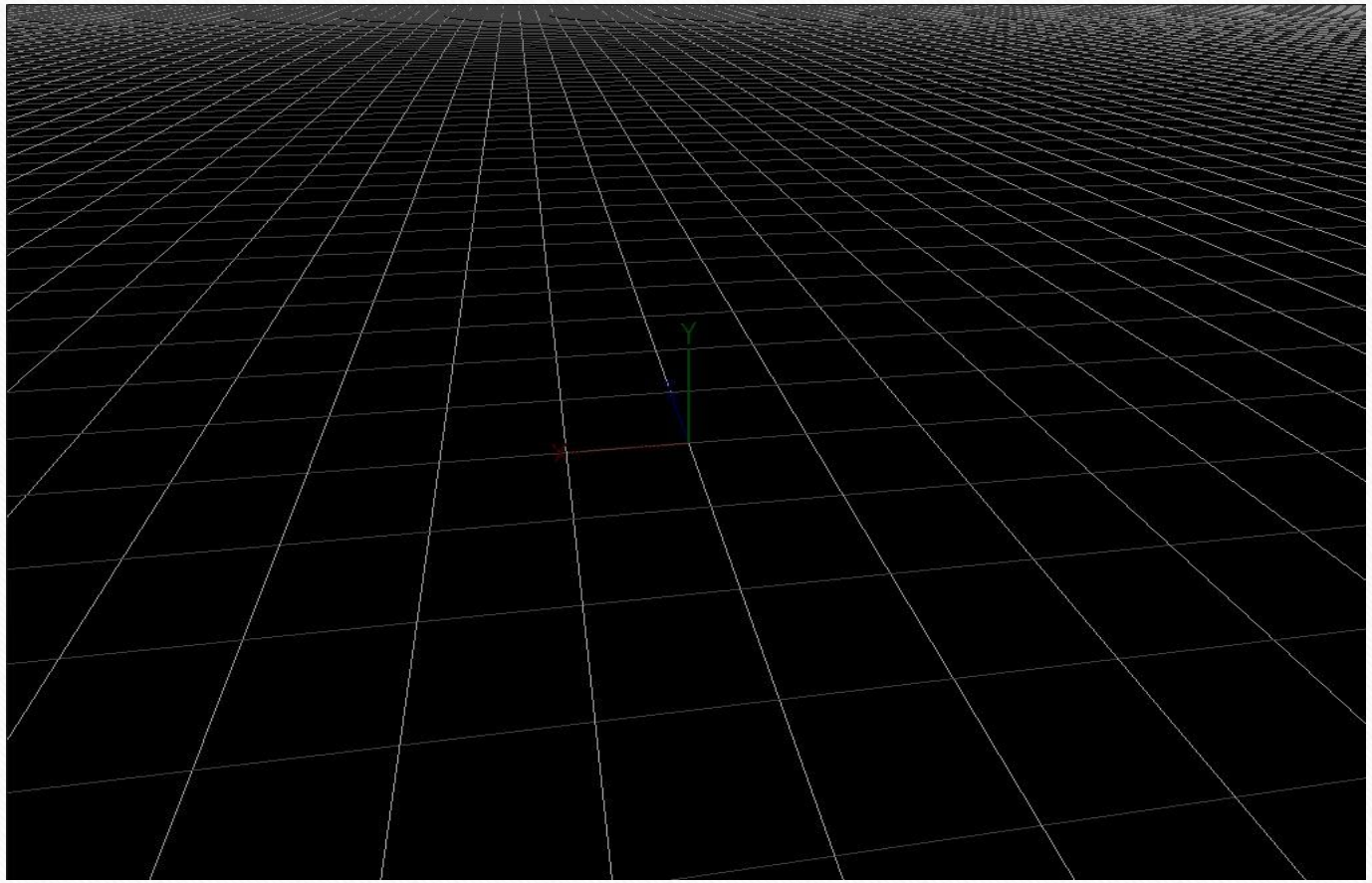


TODO 2

Place the camera one unit up in Y-axis and one unit to the right. Experiment with different camera placements, then use **LookAt**() to make it look at the center.

- Here's where having the axis will come in handy.
- Set Position.
- Call **LookAt**(vec3) to rotate the camera easily.

TODO 2 - Result



TODO 3

Make the camera go up/down when pressing R (up) F(down)

- Use **KEY_REPEAT** to add small increments to the camera position
- Around **0.05f** per frame should do it
- Update **Reference** as well (for the future)

TODO 4

Make the camera go forward with (w) and backward with (s). Note that the vectors X/Y/Z contain the current axis of the camera. You can read them to modify Position.

- Similar to the previous TODO.
- Update camera's position.
- **Read from** vectors X, Y, Z. You don't need to change them.
- Update **Reference** as well!

TODO 5

Make the camera go left with (a) and right with (d). Note that the vectors X/Y/Z contain the current axis of the camera. You can read them to modify Position.

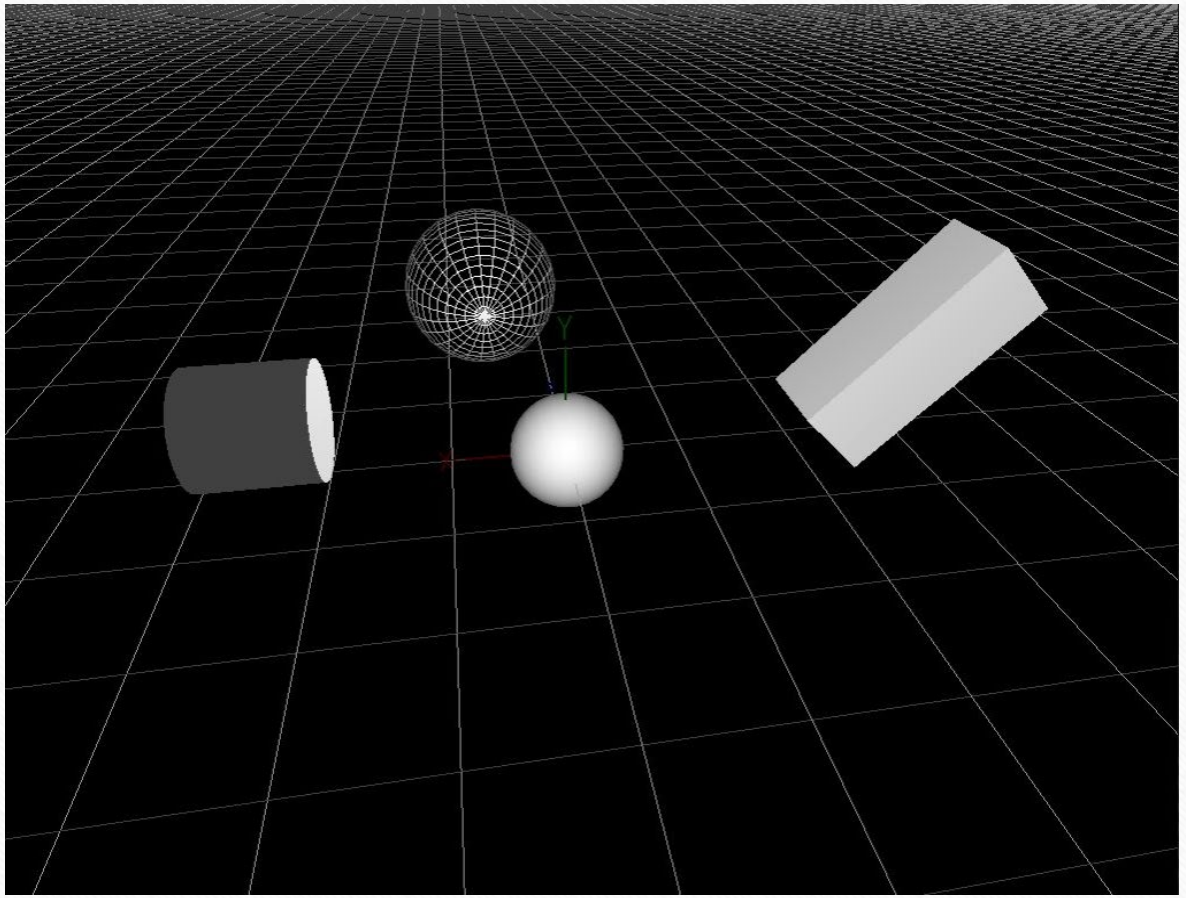
- Similar to the previous TODO.
- Update camera's position.
- **Read from** vectors X, Y, Z. You don't need to change them.
- Update **Reference** as well!

TODO 6

Draw a sphere of 0.5f radius around the center. Draw somewhere else a cube and a cylinder in wireframe.

- Add some more primitives to the scene.
- Don't forget to **Render**()!
- Try enabling "wireframe".
- Try rotating them around!

TODO 6 - Result



Homework

- Rotate the camera with the mouse
- There are different ways to do that. The easiest one may involve "LookAt(vec3)".
- You may need:

```
// "u" is the vector to rotate
// "angle" is the value to rotate
// "v" is the axis of rotation
vec3 rotate(const vec3 &u, float angle, const vec3 &v);
```

```
int GetMouseXMotion();
int GetMouseYMotion();
```