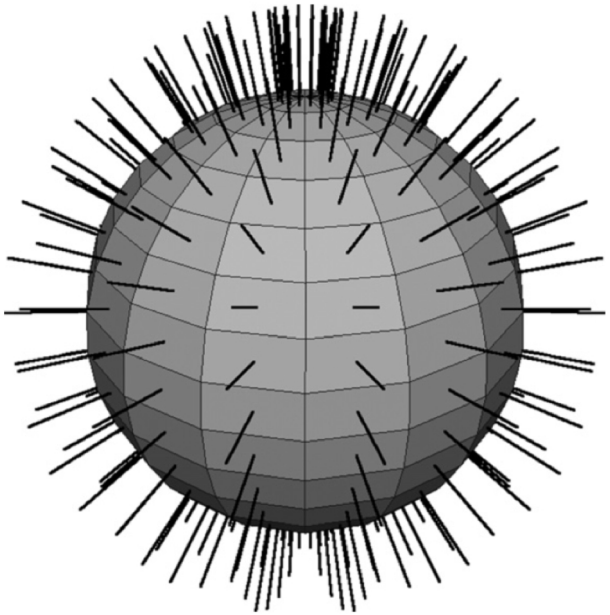
Lighting with Bunny



Min Gyu Choi

Kwangwoon University

Stanford Bunny

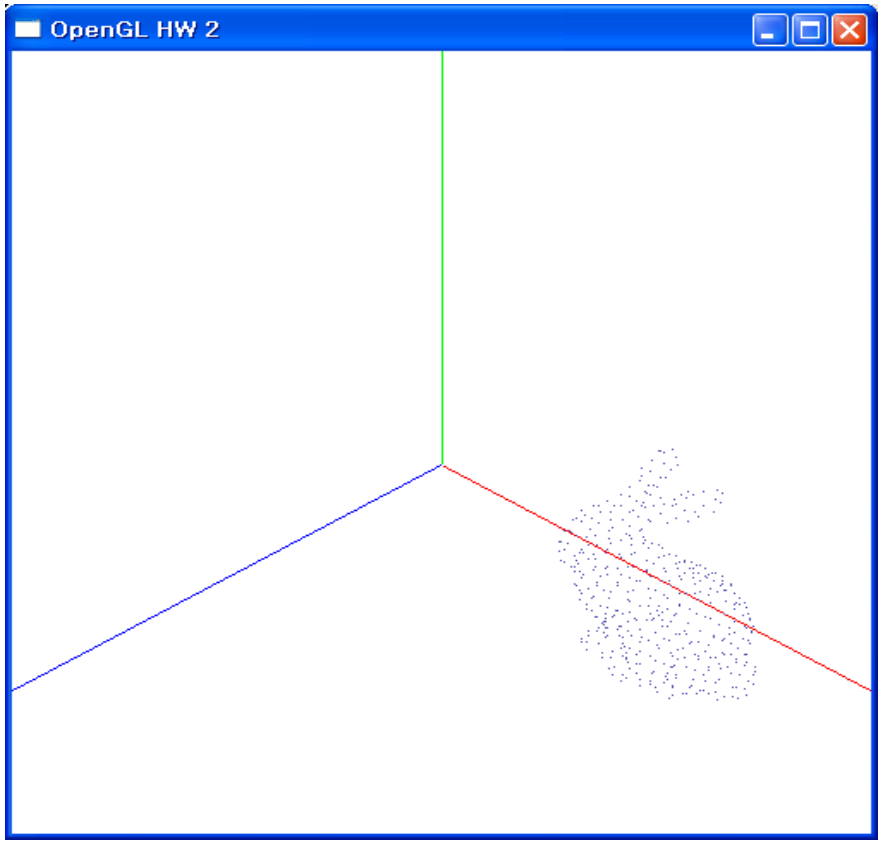
- **bunny_origin.txt**

```
// # of points and triangles

453 948

// 3D positions
0.875114 0.105216 0.020597
0.82129 0.124816 0.0228192
...

// Point indices for triangle
86 193 163
208 63 111
...
```



Stanford Bunny

- **Draw the bunny using GL_TRIANGLES**

```
// # of points and triangles

453 948

// 3D positions
0.875114 0.105216 0.020597
0.82129 0.124816 0.0228192
...

// Point indices for triangle
86 193 163
208 63 111
...
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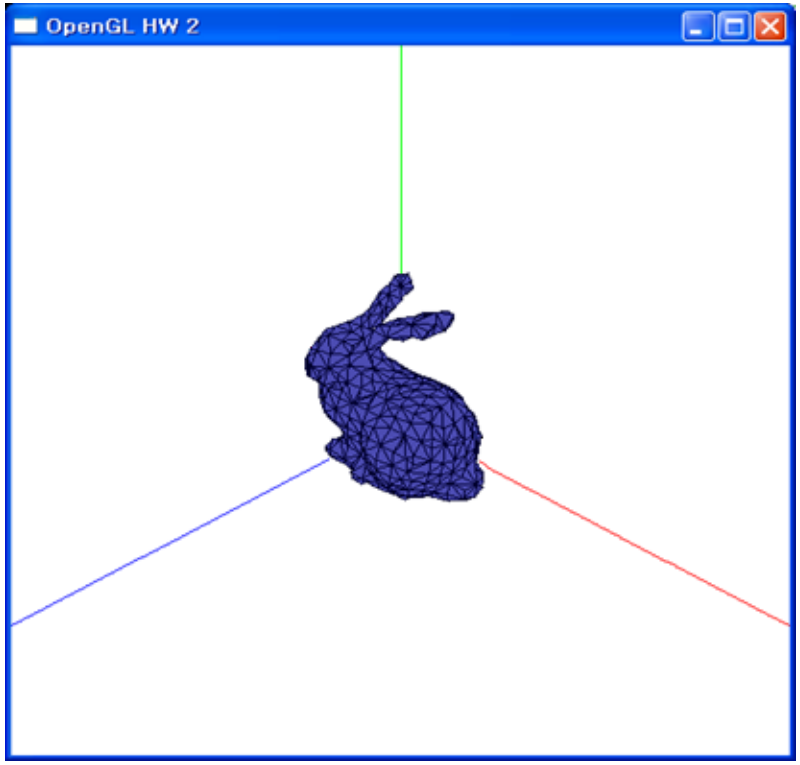
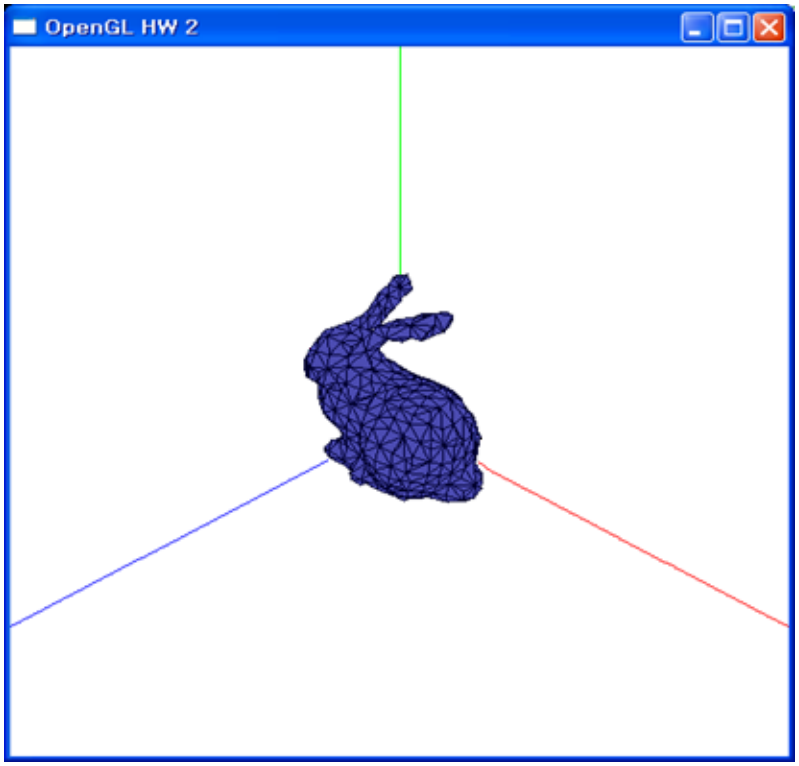


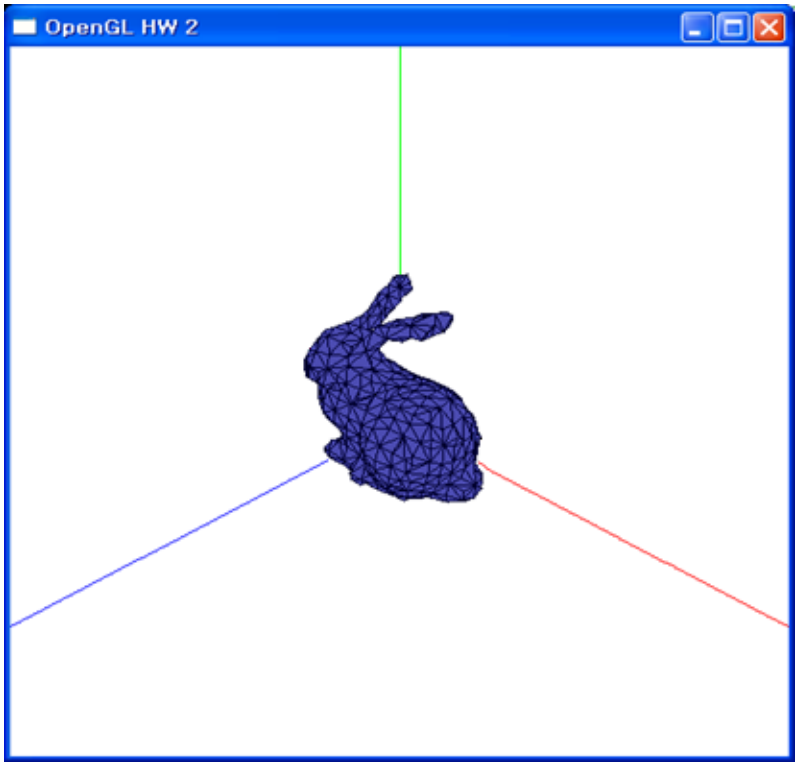
Vertex Normal Vectors

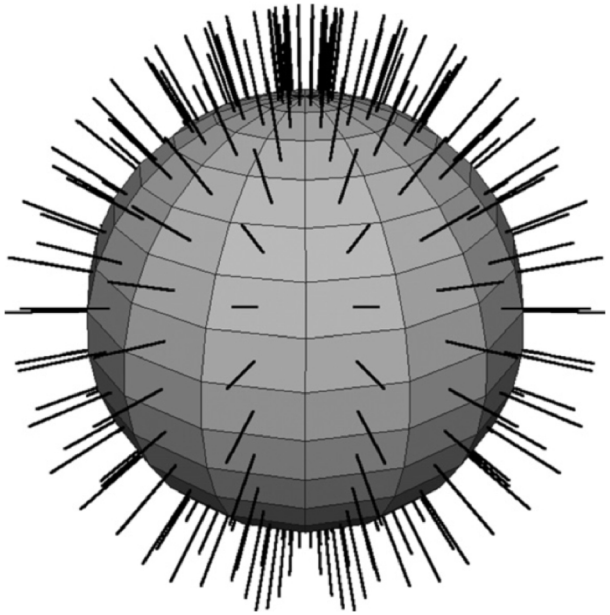
- How to obtain vertex normal vectors?



Vertex Normal Vectors

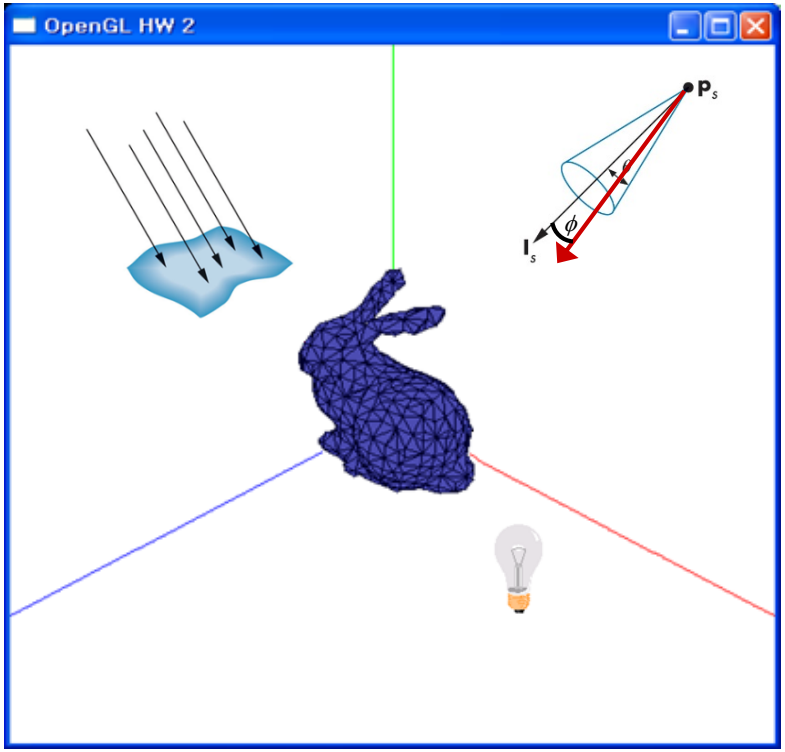
- **Draw vertex normal vectors as in the right figure**
  - Toggle with the ‘v’ key





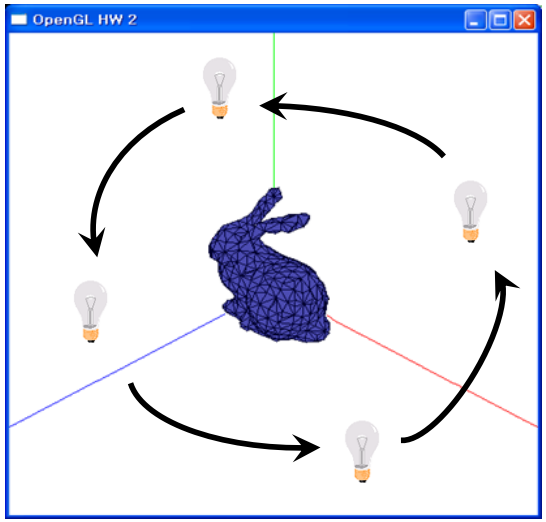
Light Sources

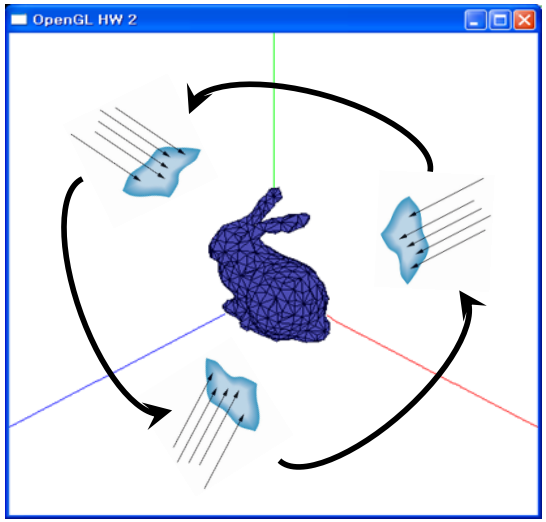
- **Make a directional light, point light, and spot light**
  - In the best positions
  - With the best parameters
- **Draw the geometry of lights**
  - gluSphere()
  - gluCylinder()
  - gluCylinder() with zero base

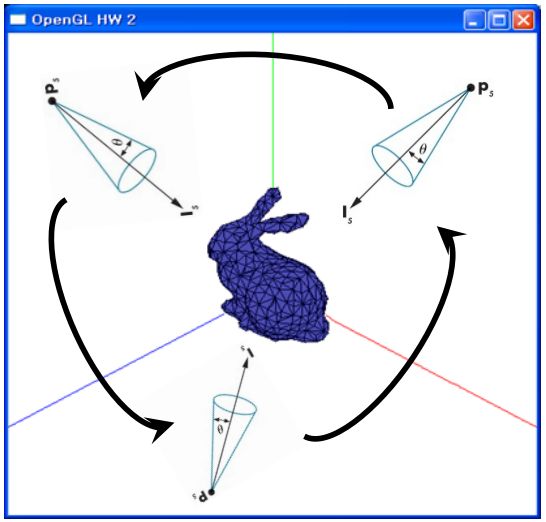


Light Sources

- **Rotate the position (and direction) of each light**
  - About the vector (1, 1, 1)
  - 1 rotation per 4 seconds
  - ‘p’/‘d’/‘s’ key to toggle the rotation of the point/directional/spot lights, respectively

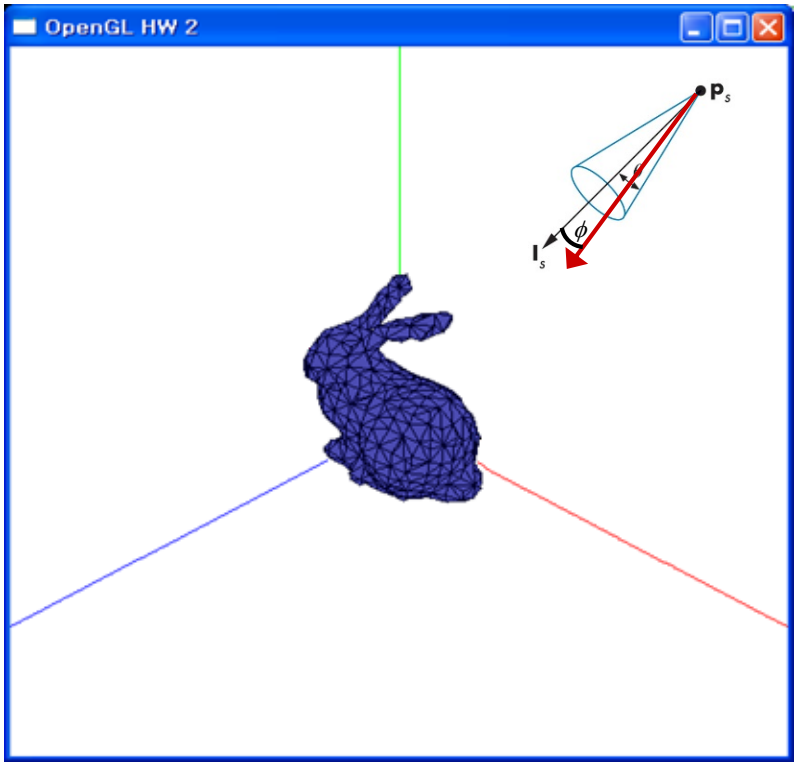






Cut-off Angle

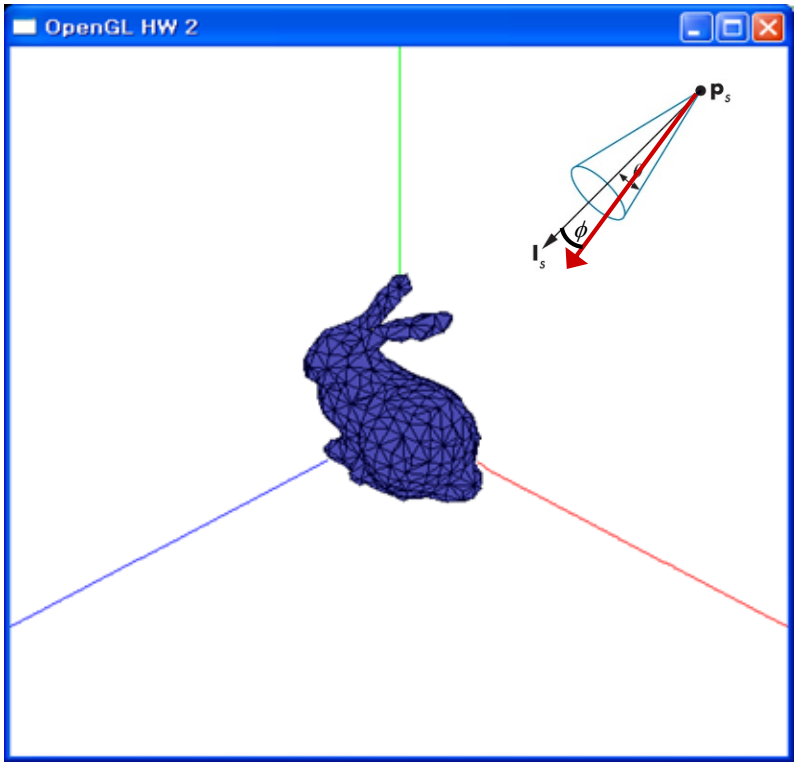
- **Change the cut-off angle of the spot light**
  - 5 degree at the minimum
  - 25 degree at the maximum
  - 1 cycle per 4 seconds
  - ‘c’ key to toggle



- **Use the timer function**
  - glutTimerFunc();
  - void timer(int value);

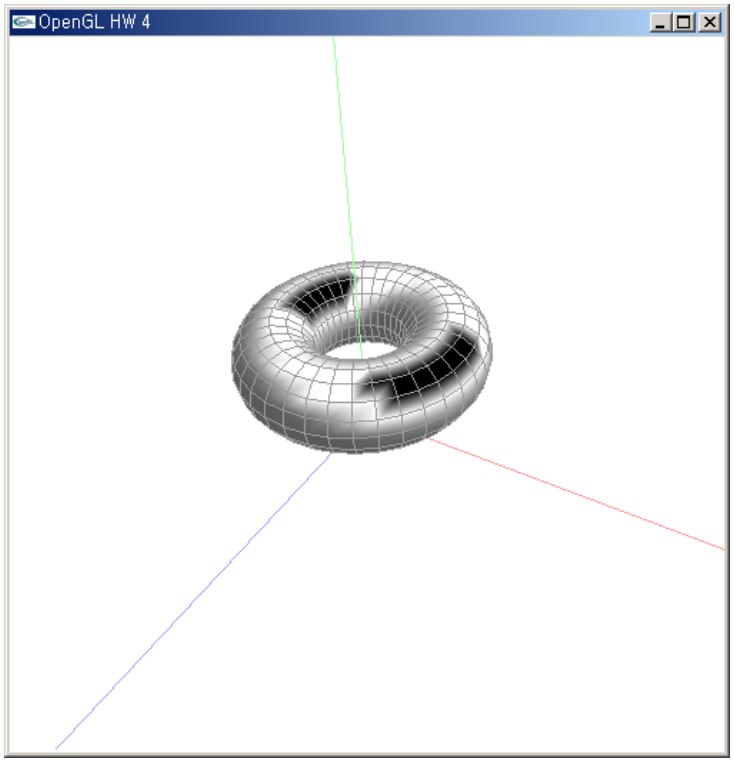
Shininess Coefficient

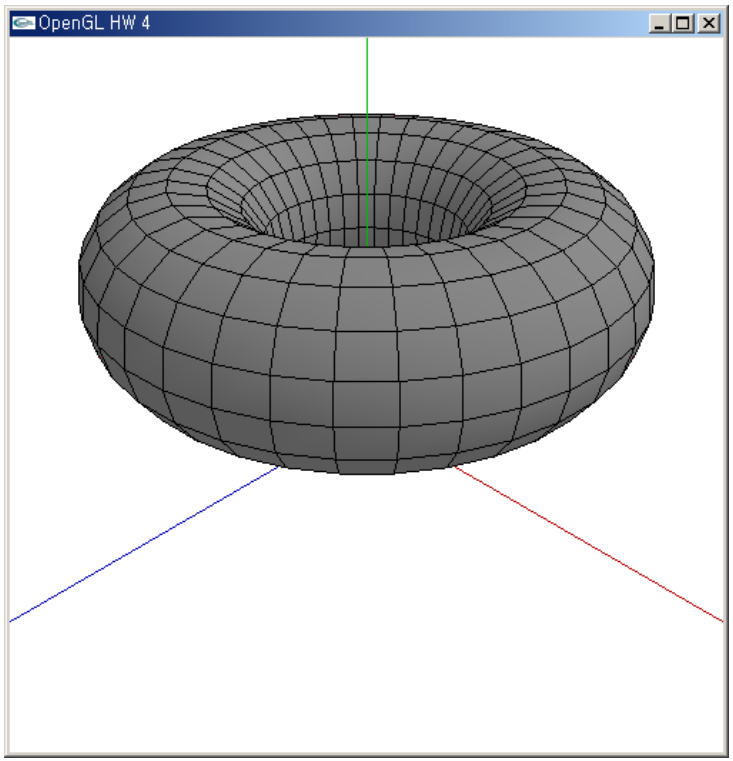
- **Change the shininess coefficient of the spot light**
  - Within an appropriate range
  - 1 cycle per 4 seconds
  - ‘n’ key to toggle



Troubleshooting

- **If you have problems like ...**
  - Search about ‘GL_NORMALIZE’
  - Check the material properties of the triangles





Requirements

- **Draw Stanford bunny**
  - Draw the bunny model (1)
  - Draw the vertex normal vectors (2)

- **Make 3 lights, rotate them, and draw their geometry**
  - Directional light (3), (4), (5)
  - Point light (6), (7), (8)
  - Spot light (9), (10), (11)

- **Change the parameters of the spot light**
  - Time-varying cut-off angle of the spot light (12), (13)
  - Time-varying shininess coefficient of the spot light (14)

Requirements

- **Report**
  - You should provide the screenshots demonstrating that the requirements are fulfilled successfully.
  - Rotation can be demonstrated with multiple screenshots.