

# Assignment 2

## Planet in Space

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It started with gl-05-transform, but after deleting unnecessary parts, the base is almost the same as gl-05-circ.

## 1. Data Structure (Additions)

### 1.1 Declaration constant and variable

Provide longitude and latitude, 72, 36.

unit\_theta, unit\_phi are divided each possible ranges by latitude and longitude.

r is radius, this assignment gives 1.

t\_passed is a storage of the time when the rotation was stopped. t\_gap is accumulated time which unrotated.

b\_rotate is bool value, check the rotation status. b\_color\_type is fragcolor type.

Initial window size set 1280\*720.

### 1.2 Function

create\_sphere\_vertices() is function that makes vertices.

In this assignment, vertex buffer should not be updated every time. So, update\_index\_buffer() is update index buffer, not vertex buffer.

update() function is update b\_color\_type, matrix in vertex/fragment shaders.

In render() function, update rotate matrix, and rendering.

## 2. Algorithm

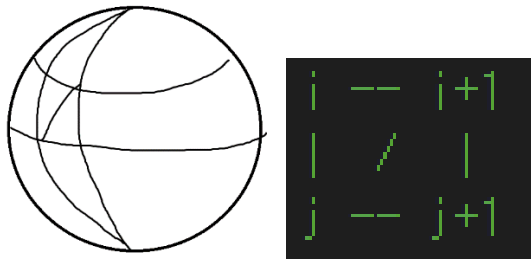
### 2.1 create\_sphere\_vertices

$$P(x, y, z) = (r \sin \theta \cos \varphi, r \sin \theta \sin \varphi, r \cos \theta)$$

Use this method, r = 1. put in vertex position, normal, tex\_coor.

### 2.2 update\_index\_buffer

Only update index list, index buffer.



Like this, make indices.

(The  $i$  is positive  $z$  direction.)

Default front face is counter-clockwise face culling.

### 2.3 update

Update view, projection, aspect matrix and color type to vertex and fragment shader. Aspect matrix make sphere not be an ellipsoid.

### 2.4 render (additions)

Update rotate matrix. Rotate angle is proportional to (current frame –  $t\_gap$ ). After stopping the rotation, when it is restarted, it is allowed to start again from the last stop.

### 2.5 user\_init (additions)

Vertex buffer should not be updated every time. So, update vertex buffer in this function. And get index buffer, load mesh.

### 2.6 keyboard (additions)

If press D, change color type to  $b\_color\_type++$ .

When press R, if it was rotating, stored stopped time. If it was not rotating, add (current time – passed time) to  $t\_gap$  (stationary time). After this, change rotate status.

## 3. Discussions

Attention to the direction in which Indices are generated. And think about view, projection matrix, and even more camera(viewer) elements.