IT-441

Computer Graphics

Assignment 2

Sphere using primitives

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INTRODUCTION

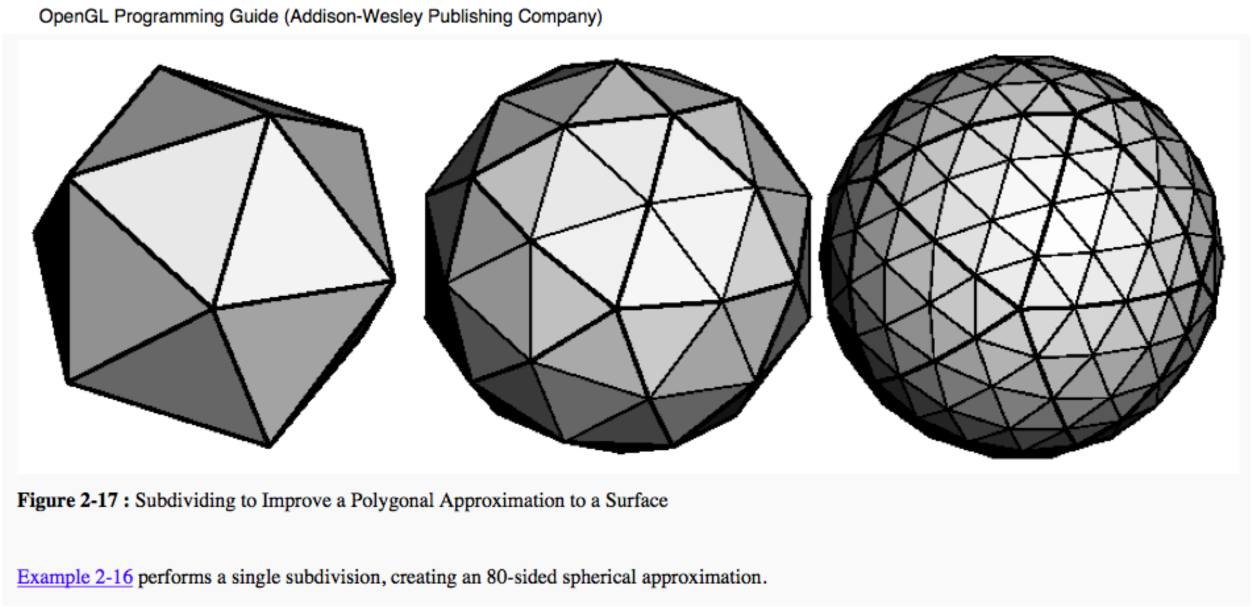
This program is based on the example given in the redbook chapter 2(end)
It creates a geodesic sphere from primitive triangle, using an icosahedron as an approximation for a sphere.
An icosahedron is constructed and repeatedly subdivided to form a sphere, by calculating the midpoint of edges of each triangle. More the number of subdivisions,smoother is the sphere.
Lighting has also been added.

PROGRAM FUNCTIONS

The program does the below mentioned:
1) Create a Sphere from an icosahedron
2) Enable the user to change its size(radius) and number of subdivisions and enable or disable light effects.

ALGORITHM

In geometry, an icosahedron is a polyhedron with 20 triangular faces, 30 edges and 12 vertices.



OpenGL Programming Guide (Addison-Wesley Publishing Company)

Figure 2-17 : Subdividing to Improve a Polygonal Approximation to a Surface

Example 2-16 performs a single subdivision, creating an 80-sided spherical approximation.

The above image taken from our reference text “redbook” shows how we can make a sphere from an icosahedron by increasing the number of subdivisions.

Using the two arrays for vertices and triangular faces (triangle indices) which contain the points on the sphere and the triangles drawn on the sphere, the icosahedron is drawn with GL_TRIANGLE.

Depending on the number of subdivisions/recursive levels, keep on subdividing the triangles that is creating four triangles from one, by joining midpoints of the edges of the triangles and updating the vertex and triangular face list and also normalizing for a smooth curve.

Enable lighting if user chooses to do so.

USER OPTIONS

The user can increase/decrease the radius(size) of the sphere and the number of subdivisions and enable/disable the lighting using keyboard input.

P.S:As there is a lot of computation,it may take a while to load.Please be patient.

Also,do not try to reduce the radius or number of subdivisions below the initial/base/minimal size as it will lead to the sphere disappearing completely.

MODULES

Init function that clears the screen and sets the shading model.

Addpoint module to add points to the array Pos which are rendered as points on the sphere.

midpoint module takes two points as input & calculates the midpoint of the two points, and adds it to pos[] & returns its index.

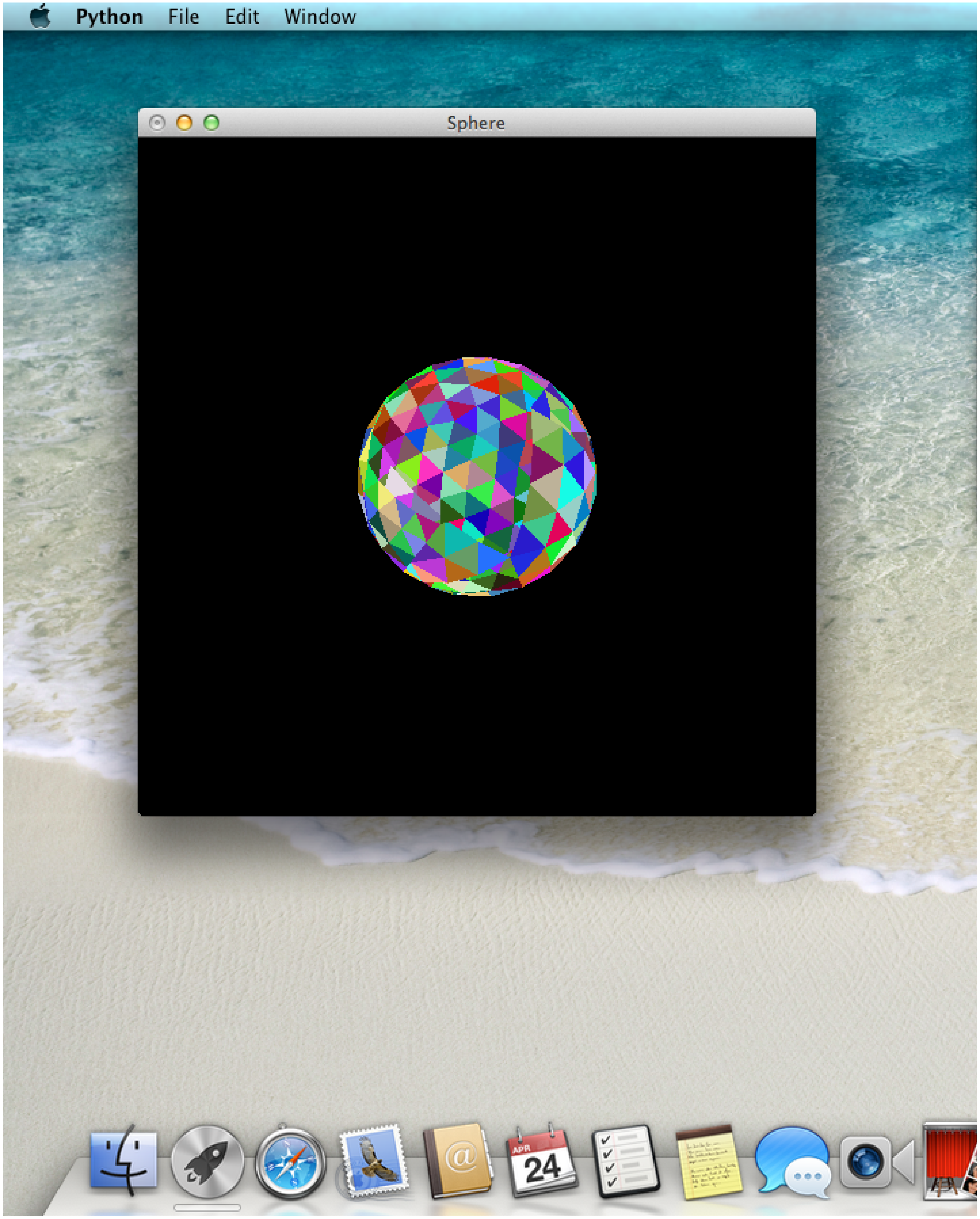
L_enable module to set up the material and light properties & enable the lighting effect .
L_Disable module to disable lighting effect

Display renders the sphere. It creates a sphere from an icosahedron as described in the algorithm.

Reshape sets the window resizing mechanism.

Mykey which is the keyboard function defines functions to be called at each key input and helps execute actions as per user's choice.

SCREENSHOTS(Please see the next page)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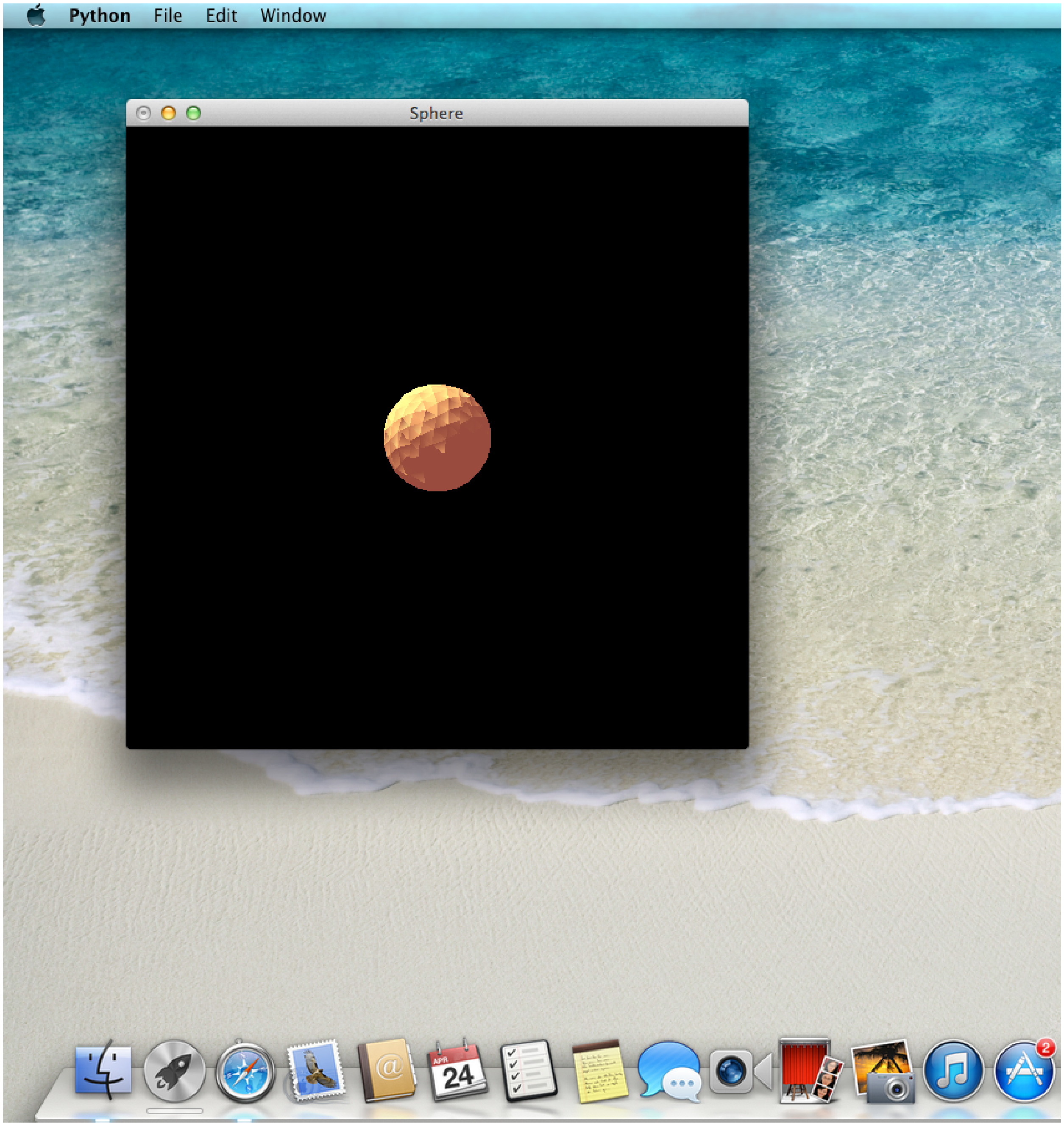
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