# CSC 433 / 533: Spring 2015
# Assignment 4

**Assigned:** Monday, April 20th
**Due:** 11:59pm Sunday, May 3rd

For this assignment you will be adding texture mapping to your viewer. This will involve modifying your application to read and send texture map indices to your vertex shader. You will also need to add texture map look up to the vertex and fragment shader pair from assignment 3 that implements the classic lighting model. As before, your program will be graded on the linux workstations on the 9th floor of Gould-Simpson building.

For all programs this semester:

1. Provide a Makefile that builds the program. We will not grade programs that do not compile.
2. Your directory should be self-contained and not need any files from other directories. So, it will contain all source code for both the application on the CPU and shader files for the GPU, and it will include any required data files.
3. Report any errors to stderr and provide a usage message when the program is invoked with no parameters.
4. Include a readme.txt file and include any special instructions or assumptions.

## Task:

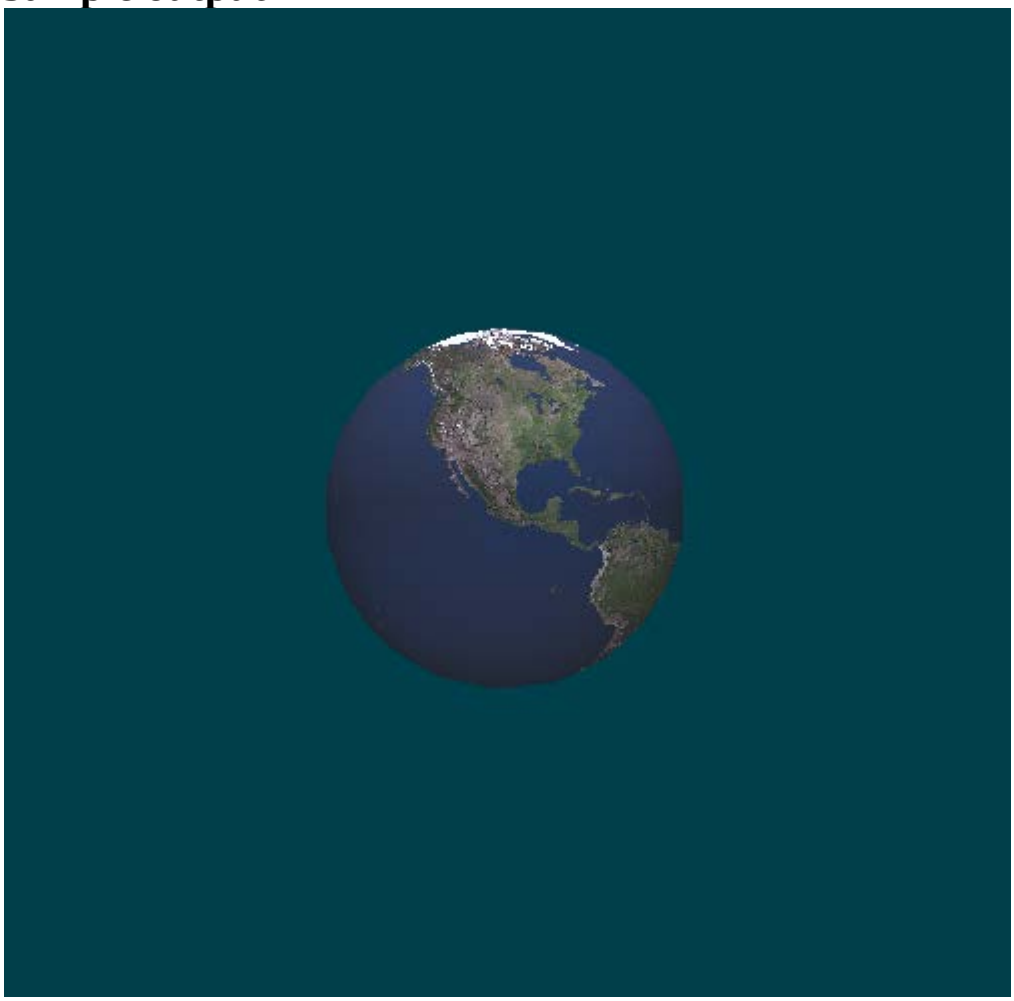
1. **viewer program**
   a. In your makefile create an executable named viewer.
   b. Control files read by the viewer are the same as assignment 3.
   c. Usage statement for *viewer*
      -c controlFile
   d. Input geometry will again be described in Wavefront OBJ files in ASCII format for polygonal descriptions only. The addition for this assignment is reading and using lines in an OBJ file that describe texture map indices. A line that begins with ***vt*** can have up to three values, but for this assignment you will only need to be able to read a line with two values. For example:
      vt 0. 1.
   e. There is another line in a material file that you need to process. That line describes a texture map used as a replacement for the diffuse color of a material. That line begins with ***map_Kd***. You will only be required to read such a line with the keyword map_Kd and a filename. There can be many other lines that describe various types of texture mapping, but we will only deal with the map_Kd for this assignment.
   f. During rendering the diffuse color values from a Kd line are replaced by the color values from the texture map. This is slightly different than specified in the OBJ processing in http://paulbourke.net/dataformats/mtl/. It is possible to have additional values on these lines, but you do not need to be able to process the optional arguments. For example:
      map_Kd mandrill.png

g. The texture map file (image, such as mandrill.png) will be in the same directory and the executable for your viewer.
h. Control of 3D viewing remains the same as assignment 2.

2. **Grading rubric – 100 points total**
   a. (20 points) View one object with a single texture map
   b. (20 points) View two objects each with a single texture map
   c. (20 points) View one object with multiple texture maps.
   d. (20 points) View multiple objects, at least 3 or more, each with either a single texture map or multiple texture maps
   e. (10 points) Create a custom scene, e.g. a control file and collection of OBJ files
      i. A minimum of three OBJ files, and three of these OBJ files cannot be from the examples provided with this assignment. At least two of your original OBJ files need to include texture mapping.
      ii. A minimum of three lights, 1) a directional light source, 2) a local light source, and 3) a spot light.

   f. Any of the test cases can have these characteristics
      i. A test case can be illuminated with any combination of light types from assignment 3.
      ii. Texture maps can contain transparent sections.

## Sample output

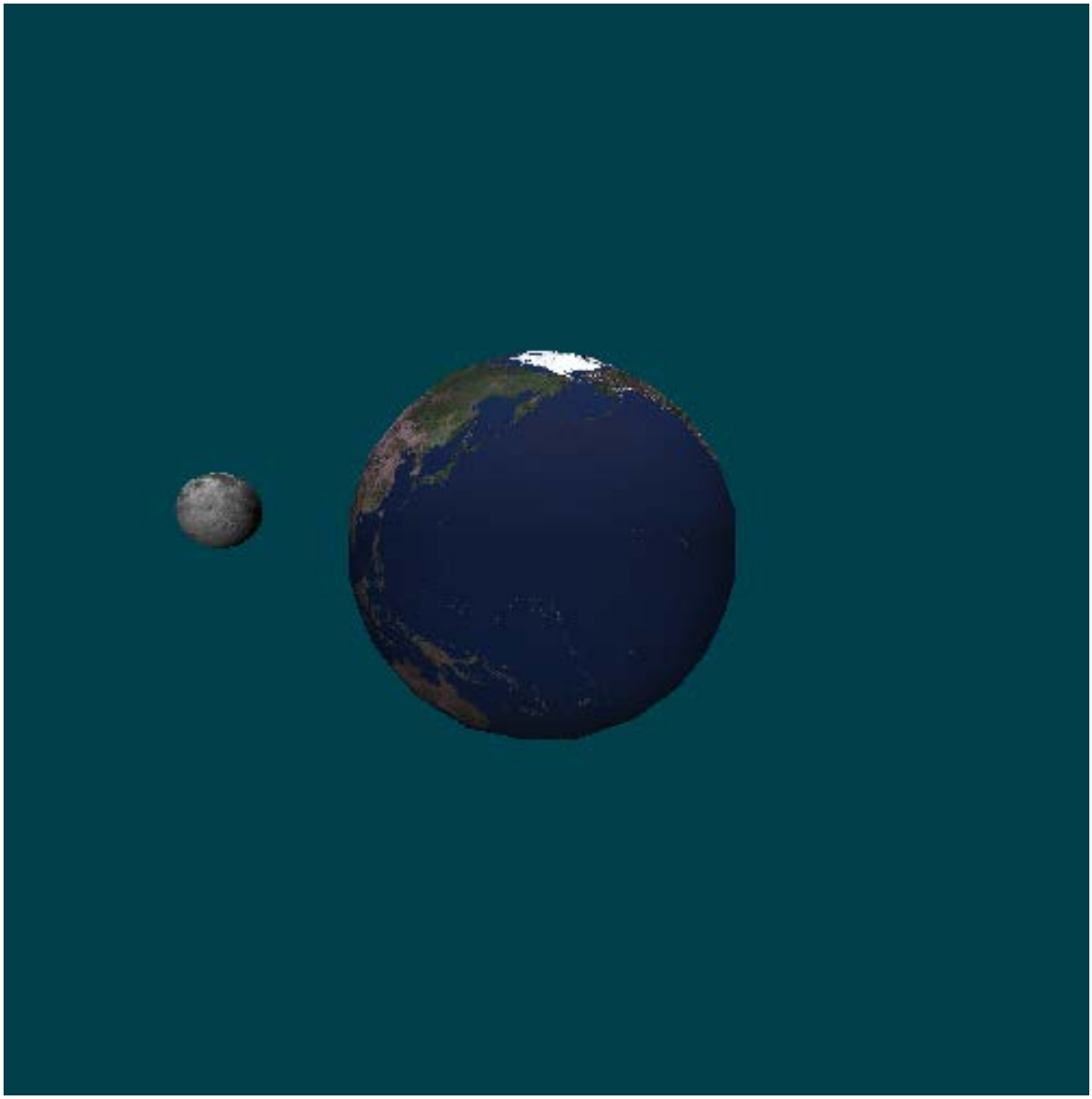


obj objFiles/earth.obj
rx 90 rz 270

light directional ambient 1. 1. 1. color 1. 1. 1. position 0. 1. 0.

light directional ambient .1 .1 .1 color .5 .5 .5 position 0. 0. 1.

view  camera 2. 2. 1. focal 0. 0. 0.  viewup 0. 0. 1.



```
obj objFiles/earth.obj
rx 90
s 2 2 2

obj objFiles/moon.obj
s .25 .25 .25
t 3 0 1

light directional ambient .1 .1 .1 color 1. 1. 1. position 0. 1. 0.

light directional ambient .1 .1 .1 color .7 .7 .7 position 0. 0. 1.

view  camera 4. 4. 2. focal 0. 0. 0.  viewup 0. 0. 1.
```

obj objFiles/cube_with_texture.obj

light directional ambient .1 .1 .1 color 1. 1. 1. position 0. 1. 0.

light directional ambient .1 .1 .1 color 1. 1. 1. position 0. 0. 1.

view  camera 0.75 1.5 1. focal 0. 0. 0.  viewup 0. 0. 1.

## Submission Instructions

Submit your files on the host **lectura.cs.arizona.edu** using the command
**turnin cs433s15-assg4 [files]** We will use your makefile to create your viewer for testing.

## Assignment Advice

1. Start early.
2. Do your own work.
3. Check piazza regularly.