Assignment 2 – Shading & Reflectance

Name: ______________________________________

Assignment is due **Sunday, Nov 2nd 11:59PM**. Please submit the screenshots and shader files via email. If you can scan this document and send it too, then that would be okay. Otherwise bring it to class and turn it in.

1. Using Bresenham’s algorithm fill in the pixels for each line. For this problem assume the pixel centers are in the center of the squares.

2. Using the Region Filling with Coherence Method from the slides. Fill the following map starting at A. To fill, list on the grid all the runs using the next sequence of letters (if you need more letters, start using letters with numbers – A1,B1, etc.). Use a pencil to draw the letters in the appropriate runs (white boxes).
3. Texture Mapping: You are going to implement a reflection or environment mapping technique using the texture we captured in class. You are to produce a vertex and fragment shader that performs the environment mapping taking into account that instead of cube mapping parameters, you need to calculate UV coordinates based on the latitude-longitude map. Read Section 8.5.6 on reflection mapping. Using the texture that we generated in class; each pixel on the lat-long map corresponds to an angular position on the sphere. When we have these spherical coordinates we can then transform the position of that point to world coordinates. These are Cartesian coordinates that represent the location of any point on the unit sphere. Equations for computing world coordinates from polar/spherical coordinates use trigonometric functions:
   a. \( x = \sin(\theta) \cos(\phi) \)
   b. \( y = \sin(\theta) \sin(\phi) \)
   c. \( z = \cos(\theta) \)

   You need to calculate \( R \) from Section 8.5.6, and use it to determine the texture coordinates UV. The UV coordinates are the latitude and longitude but mapped to the appropriate range for texture coordinates. Turn in 1 vertex shader and 1 fragment shader.

4. Using the Unity3d scene posted on the website, re-produce the three shading methods described in class (Flat, Gouraud, Phong). For each of the Shading methods, use two reflectance methods (Phong Reflectance, Cliff’s Model – to be posted separately with unity project).

Deliverables:
   - 6 Shader file for each permutation
   - 6 Screenshots of each permutation