Project: Shading and Diffuse Reflection
for Advanced Microprocessor 3D GE Design
HL

This project counts total 20 points.

1. This project is for 3D shading model and diffuse reflection computation on
   LPC1769 micro processor platform for the purpose of design 3D Graphics
Processing Engine, you will need to
   (1) generate a solid cube.
   (2) The size of the cube with side length of 50 to begin with, and the
       virtual camera location E = (ex,ey,ez) = (100, 100, 100) for example.
   (3) compute diffuse reflection on the top surface of the cube.
   (4) place a point light source P_s(xs, ys, zs) in the world coordinate
       system, you design its location, as a reference, you may consider
       P_s(xs, ys, zs) = (40,60,120) as a testing location and you can may
       adjustment later accordingly.
   (5) compute the ray equation and its intersection with the x_w-y_w plane.
       For the top surface of the cube there are 4 ray equations, each of the ray
       equations forms intersection point on the x_w-y_w plane.
       keep track this set of 4 points and produce a shade of dark color (for
       example black or dark blue) by plotting a polygon.
   (6) compute diffuse reflection on the top surface of the cube. Assuming
       reflectivity for red is 0.8 and for blue and green are 0.0.
   (7) use scaling linear equation to scale up the diffuse reflection color
       from 20 to 255 for example with an offset = 20 to
       make diffuse reflection with the best dynamic range of the color.

2. Use linear decoration algorithm to place a tree on one of the 2 frontal
   surfaces of the cube per your choice.

3. What to submit:
   (1) project report using IEEE paper template given in the class github
       (https://github.com/hualili/CMPE240-Adv-Microprocessors/blob/master/2018F/
Guidelines%20for%20Report%20Writing%20v2%20HL%202015-9-9.doc)
   (2) source code and all development environment as an exported project. The
       submitted work (source code) are subject to testing and verification;

4. Rubrics for project report:
   (1) the report should cover (hardware part):
       system block diagrams of the entire system setup including laptop computer;
       system block diagram of the SPI colour LCD interface
       Schematics of the LPC1769 interface to LCD colour display panel
       table(s) of the pin connectivity
       photo(s) of the implementation
   (3) the report (software part) should cover
       Algorithm description
       Flow chart(s)
       Pseudo code
       testing and verification section
       sourec code listing (appendix)
(END)