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

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, you may just using one type of a primitive color, for example red.
 - (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 or higher to make diffuse reflection with the best dynamic range of the color.

2. Use linear decoration algorithm to

(1) to place a tree on one of the 2 frontal surfaces of the cube per your choice, and design 2 letters then use them to draw 2 letter initial on top of the tree surface. For example, my initial is HL, then draw this 2 letters on top of the tree.

3. What to submit:

(1) project readme to describe how to compile and run the code and describe your implementation, please write the readme 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;
- (3) photo of the finished display;
- (4) 5 second video clips, please name your video clip with your first and last name, 4 digits student ID, and cmpe240 class. Example: john-doe-1234-cmpe240.mp4

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)