

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

This project counts total 15 points.

1. This project is for 3D shading model and diffuse reflection computation on LPC1114 or LPC1769 micro processor platform for 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, 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, use $P_s(xs, ys, zs) = (-5, 60, 100)$ as a testing location.
 - (5) compute the ray equations and its intersections with the x_w-y_w plane. For the top surface of the cube generate 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 green is 0.9 and for blue and red are 0.0.
 - (7) use scaling linear equation to scale up the diffuse reflection color with the minimum of the 4 diffuse reflections of the vertices from the top surface of the cube equal to 100 and the maximum of the 4 diffuse reflections equal to 255 to make good use of the display 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 include (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 include
 - Algorithm description
 - Flow chart(s)
 - Pseudo code
 - testing and verification section
 - source code listing (appendix)
- (END)