CSC0049 Advanced Computer Graphics
Assignment 2

Due: October 15
(-10% for each day late)

The goal of this assignment is to build a simple ray tracing program. It is separated into two parts, each with its own due date. This assignment is Part B.

- Part B (Assignment 2): You will extend the program in Part A to produce an image which contains the following shading effects:
    1. Lighting: The lighting is calculated with the Phong lighting model.
    2. Shadow: Trace a ray from the surface to the light position to determine if it is in the shadow. Keep the ambient component but ignore the diffuse and specular components for shadowed areas.
    3. Reflection: Compute the reflection direction and trace a ray recursively if the material is reflective (i.e. the ratio of reflection is non-zero).

- The format of the input file is modified to include the following:
    - ✓ Eye position: E x y z
    - ✓ View direction: V Dx Dy Dz Ux Uy Uz
    - ✓ Field of view: F angle
    - ✓ Resolution: R w h
    - ✓ Sphere: S Ox Oy Oz r
    - ✓ Triangle: T x1 y1 z1 x2 y2 z2 x3 y3 z3
    - ✓ Light position: L x y z
    - ✓ Material: M r g b Ka Kd Ks exp Reflect

    where (**r, g, b**) is the surface color; **Ka, Kd, Ks** are the coefficients of the ambient, diffuse, and specular components; **exp** is the specularity; **Reflect** is within the range of [0, 1] and represent the ratio of reflection.

    Note that the output image plane is no longer explicitly defined by a rectangle. It is now defined by the viewing direction (Dx, Dy, Dz) and the **horizontal** field of view (angle). You may infer the image rectangle from the viewing direction and the horizontal field of view. The viewing distance may be chosen arbitrarily as it would not affect the output results. (Ux, Uy, Uz) define the upward direction of the image. .

- Please name your programs “hw2” and submit it on Moodle (https://moodle3.ntnu.edu.tw/course/view.php?id=45306). If you submit multiple files, then please pack your source files in a single ZIP or RAR file for the upload.