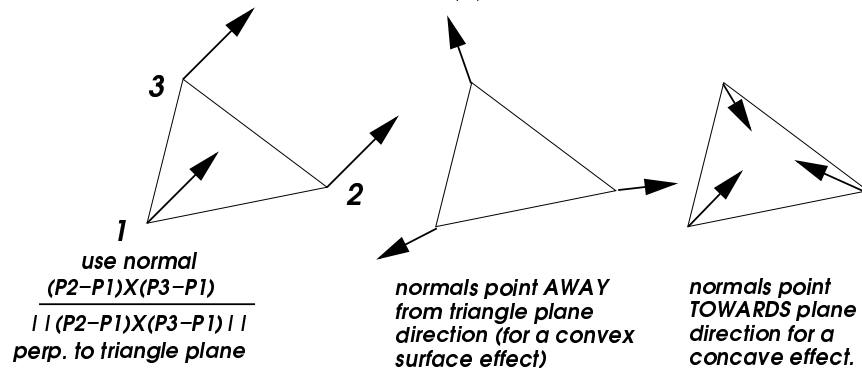


Case Study in OpenGL 3d viewing, color and lighting: Create a 3D scene that includes (1) three triangles with their vertex normals (2) specified as below,



plus (3) either the Redbook Ch. 2 icosahedron or a torus (doughnut surface) with proper normals which you should try to compute yourself. (The torus is required for full credit to CSI502 students and is extra credit for CSI422. The torus will be rated 50% if you copy code from somewhere, and 100% if derive the formulas on paper and code the formulas you derive; submit the paper to me.)

(4) Gourand Shading (smooth) and z-buffering (depth, for hidden surface elimination) must be enabled.

(5) The initial display must give a perspective view of all 4 objects.

The following key-presses should modify variables to control the corresponding OpenGL features and/or object properties. The Capital key turns on the corresponding demonstration and the corresponding lower case key turns it off:

- (6) A enables ambient light which makes the scene visible.
- (7) M changes the original material used for the 4 objects to a significantly different material. (m changes it back to the original.)
- (7) N changes the original material used for the 4 objects to a material significantly different from the other two.
- (8) L enables a directional light source which (9) provides specular reflection from two of the triangles and the icosahedron (or torus).
- (9) (S) enables a spotlight.
- (10) U makes the program repeatedly redraw the scene with the position and/or direction of the spotlight changing. (11) The moving spotlight should reveal changes involving the specular and diffuse shading effects. (u stops this action and redraws it with the original spotlight.)
- (12) V makes the program repeatedly redraw the scene with a changing view, so the viewer appears to be flying around somehow in front of the scene.
- (13, extra credit) T replaces the materials on the objects with textures.

Acknowledgment: This assignment was adopted from material from Prof. Keyser's web site.