Assignment 2

Hierarchical modelling, viewing, lighting

G53GRA/COMP3011 – COMPUTER GRAPHICS

This assignment is compulsory and worth 15% of your final mark for this module. It is due for submission via Moodle. Late submissions will receive a penalty of 5% of the assignment grade per working day. You should submit two files on Moodle:

- A single zip file containing your code, including executable (we must be able to run your program without having to reset the 'include' and 'lib' directory paths), and
- A single pdf file containing your explanation of your code (you must explain your code) and your answers to the questions. Please provide screenshots in your pdf file.

This assignment is based on lectures on hierarchical modelling, viewing, and light models. Each question is worth 5%.

1. Hierarchical Modelling

Use OpenGL commands and freeglut to create a hierarchical model of a robot. The skeletal structure of the robot should generally follow the diagram, where the individual line segments (separated by •) correspond to the individual components you should model and render using some basic polygonal shapes. Provide screenshots in your pdf file.

2. Viewing Transformation

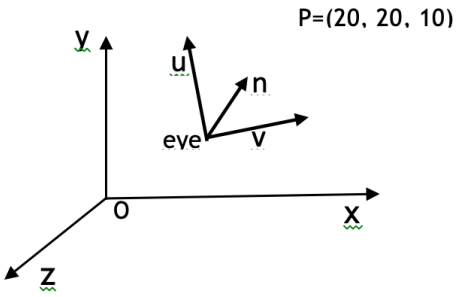
This question is to about conversion of World coordinates to View coordinates. Suppose the View space coordinate axes are defined as follows:

$$u = (0,1,0)$$

$$v = (1,0,0)$$

$$n = (0,0,-1)$$

Where u is the right vector, v the up vector, and n is the viewing direction.



Suppose that the eye/camera is positioned at eye = (10, 10, 10) in World space. The coordinates of a point P in World space is (20, 20, 10). What are P's coordinates in View space?

You must show your working.

3. Light and Texture

This question is about light reflection and attenuation.

Use OpenGL commands and freeglut to model a 'wall' light. The 'wall' should be perpendicular to the view direction (such that you can see the wall straight on), and a positional light of colour in front of, or 'on the wall'. Hint: you may use light attenuation, which is inverse to distance to light squared: $a = \frac{1}{1+kd^2}$, but you only need to provide a number between 0 and 1.

An example wall light is shown. Provide screenshots in your pdf file.

Note: You may find the Floor class from the viewing lecture demo helpful.