Sample Test 2a: Basic Objects, Coordinates

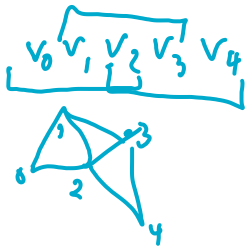
March 5, 2023

– State any simple, reasonable assumption used to arrive at your answer.
– A 'yes' or 'no' answer without reasoning is worth 0 points.
– Zero points if the writing is hard to decipher. Use a black pen if in doubt.
– Indicate with arrow if you use the back of the previous page (last page for page 1).

1 Polyhedra

a. (2 points) Specify a regular octa-hedron in *.off* file format (=location + connectivity). Use integer coordinates. Illustrate with a clear drawing.

b. (1 points) Explain: What is the fewest number of triangle strips to cover the octa-hedron?



c. (4 points) Specify the key operations to draw the octa-hedron using OpenGL (no exact OpenGL commands are needed).

2 Basic Operations on Coordinates

a. (1 point) Compute the reflection of $\begin{bmatrix}1\\1\\1\end{bmatrix}$, across $\begin{bmatrix}0\\0\\1\end{bmatrix}$.

b. (2 points) Define a 4×4 translation matrix T_1, a rotation matrix R and a second translation matrix T_2 that map the line segment $\overline{\begin{bmatrix}1\\0\\0\end{bmatrix}\begin{bmatrix}2\\0\\0\end{bmatrix}}$ to the line segment $\overline{\begin{bmatrix}1\\1\\0\end{bmatrix}\begin{bmatrix}q\\q\\0\end{bmatrix}}$ of equal length. Clearly indicate your reasoning! What is q?

c. (1 point) A color (pink) has the Hue Saturation Intensity values (red, 0.5, 0.5). What is are the values (coordinates) in RGB color space?