Sample Test 2: Basic Objects, Coordinates

February 9, 2025

– 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 octah-hedron using OpenGL (no exact OpenGL commands are needed).

2 Basic Operations on Coordinates

a. (1 point) Prove or disprove: Is the vector $\left[\begin{smallmatrix}2\\3\end{smallmatrix}\right]$ orthogonal to $\left[\begin{smallmatrix}3\\-2\end{smallmatrix}\right]$?

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 $\overline{\left[\begin{smallmatrix}1\\0\\0\end{smallmatrix}\right]\left[\begin{smallmatrix}2\\0\\0\end{smallmatrix}\right]}$ to the line segment $\overline{\left[\begin{smallmatrix}1\\1\\0\end{smallmatrix}\right]\left[\begin{smallmatrix}q\\q\\0\end{smallmatrix}\right]}$ 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?