

Assignment in Computer Graphics II

– Assignment 9 –

Computer Graphics and Multimedia Systems Group

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Assignment 1 [1 Point] Quaternion

Given the following quaternions

$$\mathbf{q}_1 = \frac{5}{13} - \frac{12}{13}k \quad \mathbf{q}_2 = \frac{4}{5} + \frac{4}{5}j \quad \mathbf{q}_3 = \frac{1}{17} - \frac{12}{17}i + \frac{12}{17}j$$

and let be $s_{ij} := q_i + q_j$ and $p_{ij} := q_i q_j$ the sum and the product of quaternions.

1. **Addition:** Calculate s_{12}, s_{23} and s_{13} .
2. **Multiplication:** Calculate p_{12} and p_{13} .
3. Determine if $q_1, q_2, q_3, s_{12}, s_{23}, s_{13}, p_{12}$ and p_{13} correspond to rotations in 3D.

Assignment 2 [1 Point] Rotation

Rotate the vector $\mathbf{w} = (0 \ 2 \ 4)^T$ by the angle $\frac{\pi}{2}$ around the z-axis

1. using a rotation matrix in \mathbb{R}^3 ,
2. using quaternions.

Annotation: Please indicate in each case the complete solution.

Assignment 3 [1 bonus Points] Body of revolution

Consider the function $y = f(x) = \sqrt{1 - x^2}$ with $x \in [-1, 1]$.

Calculate the corresponding body of revolution obtained by the rotation about the x-axis function. Calculate surface area and volume of the rotating body. Which geometric primitive corresponds to the body?

Annotation: Please indicate in each case the complete solution.

Submission: 11.12.2014, before/at the beginning of the exercise.