

# 《Computer-Aided Geometric Design》

## Assignment 8

November 18, 2024

1. Represent a unit sphere using a biquadratic rational Bézier surface and draw it.
2. Represent the ellipsoid  $3x^2 + 2y^2 + z^2 = 1$  using a bicubic rational Bézier surface and draw it.
3. A quadratic Bézier triangle has vertex parameter coordinates  $a = (0, 0)$ ,  $b = (1, 0)$ ,  $c = (0.5, 1)$  and the following control points:

$$F(a, a) = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, F(a, b) = \begin{pmatrix} 2 \\ 2 \\ 4 \end{pmatrix}, F(a, c) = \begin{pmatrix} 4 \\ -2 \\ 6 \end{pmatrix},$$
$$F(b, b) = \begin{pmatrix} 4 \\ 4 \\ 0 \end{pmatrix}, F(b, c) = \begin{pmatrix} 8 \\ 0 \\ 4 \end{pmatrix}, F(c, c) = \begin{pmatrix} 6 \\ -4 \\ 4 \end{pmatrix}.$$

Among the three parameters  $p_1 = (0.25, 0.5)$ ,  $p_2 = (0.3, 0.75)$ ,  $p_3 = (0.5, 0.5)$ , which parameter is outside the triangle? For the parameters inside the triangle, calculate the coordinates of the surface  $F(p, p)$  at these parameters using the de Casteljau algorithm.

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### Assignment Requirements:

Deadline: Sunday, November 24, 2024