Exercises - Theoretical

Half-edge data structure

1. Sketch up the half-edge data structure in pseudo (or C/C++) code
2. Some adjacency queries we might want to make on a triangle mesh are:
   a. Which triangles use this vertex?
   b. Which triangles border this edge?
   c. Which triangles are adjacent to this triangle?
   d. Which vertices are adjacent to this vertex?

   Write pseudo (or C/C++) code for how you would iterate over the the half-edge data structure to find the results of these queries.

Exercises - Theoretical

From exercises10.pdf

1. Let $p_0 = (-1, 1)$, $p_1 = (1, 1)$, $p_2 = (1, 0)$ be the control points of a quadratic Bezier curve p. Evaluate p at $t = \frac{1}{4}$ using the de Casteljau algorithm
2. Express a quadratic Bezier curve $p(t) = \sum_{i=0}^{2} p_i B_{0,2}(t)$ in monomial form, i.e., in the form $p(t) = a_0 + a_1 t + a_2 t^2$
3. Express a quadratic polynomial $p(t) = a_0 + a_1 t + a_2 t^2$ in Bezier form, i.e., in the form $p(t) = \sum_{i=0}^{2} p_i B_{0,2}(t)$

Exercises - Programming

From exercises10.pdf

Start from ex7-6_bezier.cpp.template and implement the function deCasteljauEval which applies the de Casteljau algorithm to the Bezier curve defined by src_points at the parameter value t (the degree of the curve is implicitly given by how many points there are).