

Assignment Two -- Modeling and Rendering of NURBS Objects

NURBS have become an industrial modeling standard, mainly because they can represent a large variety of geometric shapes. Commonly-used shapes such as sphere, torus, cylinder, cone, and vase can all be modeled using NURBS surfaces.

Please write a program to represent, model, and render (1) cylinder, (2) torus, and (3) surface of revolution (e.g., vase, cone, etc.) using NURBS surfaces. The detailed information about (1) control points, (2) weights, (3) knot vectors along u and v directions, and (4) degrees of basis functions of these commonly-used shapes can be found from the following paper:

- "Curve and Surface constructions using rational B-splines", L. Piegl and W. Tiller, Computer-Aided Design, 19(9), 485-498, 1987.

The journal of Computer-Aided Design and this paper are both available in our library. I have also included a scanned .pdf file in the "Assignment-2" folder. Before you start to work on this programming assignment, you should carefully read and understand this paper, in particular, the NURBS details of sphere and torus are documented in pp. 495-497. If you have any difficulties in understanding the technical details of this paper, feel free to consult with the instructor. The basic functionalities of your program should include: (1) read NURBS data from a file; (2) display the control points and control polygon of cylinder, torus, and/or surface of revolution; (3) display the wireframe of cylinder, torus, and/or surface of revolution; and (4) display the smoothly shaded object. Please refer to the lecture notes for the idea and algorithm of B-Spline discretization. If you have any questions, please consult with the instructor.