

Povzetek

V diplomskem delu obravnavam krivulje in ploskve v CAGD - računalniško podprtem geometrijskem oblikovanju. V prvem razdelku so predstavljene različne reprezentacije krivulj in ploskev in geometrijska in parametrična gladkost.

V drugem razdelku definiram in opišem lastnosti Bézierovih krivulj. Ogledam si algoritma za višanje stopnje krivulje in delitev krivulje na dva kosa.

V tretjem razdelku rezultate posplošim na B-zlepke, kjer si podrobneje ogledam vpliv vektorja vozlov na obliko krivulje. Zapišem tudi algoritma za višanje stopnje in vstavljanje novega vozla ter ju primerjam.

B-zlepke v četrtem razdelku posplošim na NURBS (racionalne B-zlepke) in pokažem, da se z njimi da reprezentirati tudi krožnico.

V zadnjih treh razdelkih se ukvarjam s ploskvami iz tenzorskega produkta. Definiram Bézierove ploskve iz tenzorskega produkta, B-zlepke iz tenzorskega produkta in NURBS iz tenzorskega produkta. Ogledam si njihove lastnosti. Rezultate uporabim za reprezentacijo vrtenin.

Diplomi prilagam svoje programe v Mathematici, ki implementirajo predstavljene algoritme, in s katerimi so zgenerirane krivulje in ploskve na slikah.

Ključne besede: CAGD, krivulje, ploskve, Bézierove krivulje, NURBS, B-zlepki, ploskve iz tenzorskega produkta

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Abstract

Curves and surfaces in CAGD - Computer Aided Geometric Design - are being considered. Section one focuses on different types of curve and surface representation and on geometric and parametric continuity.

In section two Bézier curves are defined. Properties of Bézier curves and algorithms for degree elevation and subdivision are discussed.

In section three previous results are generalised. B-splines are defined and the influence of knot vectors is discussed. Algorithms for degree elevation and knot insertion are compared.

In section four NURBS (rational B-splines) are defined. The NURBS representations of a circle is obtained.

Bézier, B-spline and NURBS surfaces are defined in the last three sections. Surface properties are shown and the results are used to represent surfaces of revolution.

Programmes in Mathematica that implement the presented algorithms are enclosed. These programmes are used to generate the curves and surfaces in the figures.

Key words: CAGD, curves, surfaces, Bézier curves, NURBS, B-splines, tensor product surfaces

Literatura

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