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Geometrically continuous piecewise Chebyshevian NU(R)BS. (English) Zbl 1462.65022

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Summary: By piecewise Chebyshevian splines we mean splines with pieces taken from different Extended Chebyshev spaces all of the same dimension, and with connection matrices at the knots. Within this very large and crucial class of splines, we are more specifically concerned with those which are good for design, in the sense that they possess blossoms, or, equivalently, refinable B-spline bases. In practice, this subclass is known to be characterised by the existence of (infinitely many) piecewise generalised derivatives with respect to which the continuity between consecutive pieces is controlled by identity matrices. Somehow inherent in the previous characterisation, the construction of all associated rational spline spaces creates an equivalence relation between piecewise Chebyshevian spline spaces good for design, among which the famous classical rational splines. We investigate this equivalence relation along with the natural question: Is it or not worthwhile considering the rational framework since it does not enlarge the set of resulting splines? This explains the parentheses inside the acronym NU(R)BS.

MSC:

65D07 Numerical computation using splines
65D17 Computer-aided design (modeling of curves and surfaces)

Keywords:

piecewise Chebyshevian splines; rational splines; NURBS; shape effects; blossoms; geometric design

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