On the shape control of B-spline curves by knots

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B-spline curves and their rational generalizations (NURBS curves) play central role and are widely used in computer aided design today. A B-spline curve is uniquely defined by its degree, control points and knot values, while in terms of NURBS curves the weight vector has to be specified in addition. The modification of a curve is also an essential problem in CAD systems, hence numerous methods have been presented to control the shape of a curve. The most basic possibilities can be found in any book of the field. Further control point-based shape modification is discussed in [6] and [1], weight-based modification is described e.g. in [6] and [2].

It is an obvious fact, that the modification of the knot vector also affects the shape of the curve, the geometric characteristics of this change, however, have not been described as yet. Even in one of the most comprehensive books ([7]) one can read the following: "Although knot locations also affect shape, we know of no geometrically intuitive or mathematically simple interpretation of this effect...". Here we present the geometrical and mathematical representation of the effects of knot modification for B-spline curves based on some recent papers of the authors [3], [4], [5].

References

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