

## Shape preserving properties of general class of bases and accurate computation

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### SUMMARY

We present a very general procedure for generating, from an initial system and a positive function  $\varphi$ , new systems of functions useful for curve design. These systems, which we call weighted  $\varphi$ -transformed systems, include important rational bases (see [1], [2]) as well as systems belonging to spaces mixing algebraic, trigonometric and hyperbolic polynomials, which are useful in many applications, for instance in Isogeometric Analysis (cf. [3]). The weighted  $\varphi$ -transformed systems inherit from the initial system its nice geometric properties and its accuracy when computing with its collocation matrices.

We show many general classes of spaces that can be generated by weighted  $\varphi$ -transformed systems. In particular, our results allow us to deduce shape preserving properties of general rational functions that cover the family of bases introduced in [1]. We illustrate a Casteljau type algorithm for evaluating by means of corner cutting algorithms and we also illustrate numerical examples showing the accurate solution of linear systems associated to the collocation matrices of weighted  $\varphi$ -transformed systems.

**Keywords:** Normalized Totally Positive Basis, Normalized B-basis, Rational basis, Bidiagonal decompositions, Accurate computations.

**AMS Classification:** 65D17, 65F05, 65D05, 41A05, 42A10

### References

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