Trigonometric and polynomial approximations of the Fabius function for use as Blending functions

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Most blending functions are either single polynomials where the degrees of the polynomials determine the Hermite order at the start and end of the domain of the functions, or (expo-)rational fractions that have an infinite Hermite order. Trigonometric polynomials have been used for approximation for decades, but there has been little focus on the use as blending functions.

We present new types of trigonometric blending functions with the shape and properties similar to the Fabius[1] function. Some have piecewise polynomials to improve the approximation. Since the Fabius function is self-differential, these approximated functions can be used can be used to approximate their own derivatives.

References

[1] J. Fabius. "A probabilistic example of a nowhere analytic C^∞-function. Zeitschrift für Wahrscheinlichkeitstheorie und Verwandte Gebiete". In: 5 (1966), pp. 173–174. DOI: 10.1007/bf00536652.