

Some Splines Produced by Smooth Interpolation

Karel Segeth

Institute of Mathematics, Czech Academy of Sciences, Praha, Czech Republic
segeth@math.cas.cz

Abstract

The theory of splines can be based on two approaches: the algebraic one (where splines are understood as piecewise smooth functions of some presumed form) and the variational one (where splines are obtained via minimization of quadratic functionals with constraints). We show that the general variational approach called smooth interpolation, first introduced by Talmi and Gilat, covers not only the classical cubic spline but also some other more general ways of spline interpolation, cf. Mitáš and Mitášová.

To this end, we choose the system of functions $\exp(-ikx)$ for the basis of the space where we measure the smoothness of the result. It also generates the functions used for the interpolation itself. The principal means of the analysis is the Fourier transform. The results can be obtained in one-dimensional but also multidimensional case.

We also consider the problem of smooth curve fitting (data smoothing). We present several simple 1D numerical examples.

References

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2. A. TALMI AND G. GILAT. Method for Smooth Approximation of Data. *J. Comput. Phys.* 23 (1977) 93-123.