Numerical integration based on spline approximation

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In this paper we consider numerical methods based on spline approximation for evaluating one and two dimensional integrals. In particular we are interested in singular integrals of Cauchy principal value (CPV) and finite part (FP) type, arising in certain integral equations modelling some engineering problems.

In this context integration rules, based on optimal nodal univariate interpolatory splines, are presented for one and two dimensional CPV integrals and convergence properties are proved [1, 6].

Then cubature rules, based on local bivariate C^1 quasi-interpolating splines of non tensor product type and defined on a four directional mesh, are proposed with their features and convergence properties [2]. A computational procedure and numerical results with comparisons with other known methods are also given [2, 3]. The above spline operators are used to generate integration rules for 2D FP integrals, for which convergence results are shown [2, 4, 5].

Finally the study and the construction of cubatures based on bivariate splines defined on non uniform type-2 triangulations are considered with particular reference to their computational features [7].

References

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