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A REVIEW OF RECENT METHODS IN THE NUMERICAL SOLUTION OF FREDHOLM INTEGRAL EQUATIONS OF THE SECOND KIND BY SPLINE QUASI-INTERPOLATION

Quasi-interpolation is a general and powerful approximation approach introduced by I.J. Schoenberg several decades ago for function approximations. Since that time, many quasi-interpolation schemes have been proposed both in the univariate and in the multivariate setting to achieve different goals. Their common denominator consists in defining local approximants, as well as in the reduced computational cost of construction. As a consequence, quasi-interpolating splines have been used to solve problems in many different areas of science and engineering. An application concerns the numerical solution of integral equations.

In the case of the Fredholm integral equations of the second kind, some methods proposed to approximate the kernel are based on the use of a discrete quasi-interpolant with respect to one variable, the other remaining free, or also of spline projectors. The main objective is to produce an integral equation with a degenerate kernel.

In this talk, after reviewing some recently proposed methods, I will present some new results when the kernel is globally approximated as a bivariate function by means of two different types of bivariate spline quasi-interpolation operators that are not projectors: the tensor product and the continuous blending sum of two univariate spline quasi-interpolants. The first one leads to simpler and less expensive computation than the method based on tensor product splines for approximating the bivariate kernel due to G. Hämmerlin and L.L. Schumaker. The other scheme provides significant and encouraging performances in comparison with some of those recently introduced in the literature.