

HIGHER ORDER DISCRETE MAXIMUM PRINCIPLE FOR A PROBLEM WITH ABSOLUTE TERM

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Abstract

This contribution discusses the discrete maximum principle (DMP) for the one-dimensional problem $-u'' + \kappa^2 u = f$ discretized by higher-order finite element method. The problems of DMP are studied almost exclusively in the context of the lowest order approximations. This presentation shows techniques suitable for higher-order finite elements.

Moreover, it is easy to infer that for linear finite elements the above problem leads to a linear algebraic system with M-matrix if and only if $\kappa h_i \leq \sqrt{6}$ holds for all elements (here h_i denotes the length of the i -th element). We show that this condition can be weakened for higher order elements. This is non-trivial because the straightforward application of higher-order elements *does not* lead to M-matrices in general. We present a technique that leads to M-matrices (and hence to DMP) even in the case of higher order elements.

The results about DMP for higher-order approximations are scarce. This work extends the original results of the author and his co-workers [1–3].

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