

Combined Trefftz methods of particular and fundamental solutions for
corner and crack singularity of linear elastostatics

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Abstract

The singular solutions at corner and the fundamental solutions are essential in both theory and computation. Our recent efforts are to seek new models of corner and crack singularity of linear elastostatics and their numerical solutions. In Li et al. (2009) [43], a systematic analysis for singularity properties and particular solutions of linear elastostatics is explored. This paper is continued study of Li et al. (2009) [43], general singular solutions for corner with free traction boundary conditions are derived. Both particular solutions and fundamental solutions are explored for plane strain and plane stress problems, and the singular solutions are derived directly from linear elastostatics. Two new accurate solutions can be found by the collocation Trefftz method. Moreover, for the corner and crack singularity problems, the combined methods by using many fundamental solutions, but by adding a few singular solutions are proposed. Such a kind of combined method is significant for linear elastostatics with corner (i.e., the L-shape domain), because the singular solutions can be obtained only by seeking the power r^k of r^k numerically (as shown in Li et al. (2009) [43]). Hence only a few singular solutions used may greatly simplify the numerical algorithm, thus to enrich the numerical solutions of linear elastostatics with corners, and to extend the method of fundamental solutions (MFS) for singularity problems.

Keyword : Combined Trefftz Methods of Particular and Fundamental Solutions for Corner and Crack Singularity of Linear Elastostatics