Corner and Crack Singularity of Different Types of Boundary Conditions for Linear Elastostatics and their Numerical Solutions

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Abstract

The singular solutions at corners and the fundamental solution are *essential* in both theory and computation. Our recent efforts are made to seek the particular solutions of corner and crack singularity of linear elastostatics, to design new models of corner singularity, and to find their numerical solutions. In [1, 2], a systematic analysis for singularity properties and particular solutions of linear elastostatics is explored, and the singular solutions for corners with the displacement or the free traction boundary conditions have been found. This talk is a continued study of [1, 2, 3], to explore new particular solutions for the case that the displacement and the free traction boundary conditions are subjected to the same corner edge. Explicit particular solutions have been found for any angle $\Theta \in (0, 2\pi]$; this is different from [1, 2, 3] where the explicit solutions only with $\Theta = \pi$ and $\Theta = 2\pi$ can be obtained. In this talk new singularity models with L-shaped domain and other non-rectangular domains are designed, and the highly accurate solutions are computed. Moreover, the singularity solutions as $O(r^{\frac{1}{4}})$ and even $O(r^{\frac{1}{7}})$ are found (ref. [1, 2, 3]). To our best knowledge, this is the first time to provide the particular solutions with different boundary conditions on the same corner edge in linear elastostatics. The new particular solutions, new singularity, analysis, and computation in this paper are important for both theory and computation of linear elastostatics.

Keywords: *Singular solutions, fundamental solutions, particular solutions, corner singularity, crack singularity, linear elastostatics, intensity factors, collocation Trefftz method, Trefftz method.*

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