Mixed Types of Boundary Conditions at Corners of 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 paper is a continued study of [1,2], to explore
new particular solutions for mixed types of boundary conditions at corners, which mean that the
displacement and the free traction boundary conditions are subjected to the same corner edge in this
paper. Explicit particular solutions have been found for any angle YAð0,2p ; this is distinct from [1,2]
where the explicit solutions only with Y¼ p and Y¼ 2p can be obtained. In this paper 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 0ðr1=4Þ and even 0ðr1=7Þ are
found (Refs. [1-3]). 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.