

Solving the stress intensity factor for a planar crack by using the modified
multiple-source Trefftz method

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Abstract

In this paper, the stress intensity factor for a planar crack is calculated by the modified multiple-source Trefftz method. To simulate the discontinuous behaviors of physical quantities across crack surface, we locate a Trefftz source point at the crack tip and construct necessary basis functions to simulate the discontinuous behaviors along a semi-infinitely crack surface. For a finite length crack with two crack tips, we then need to arrange two source points at two crack tips and construct corresponding basis functions. In order to reduce the ill-posed behavior resulting from the conventional Trefftz method, we adopt the modified Trefftz method which uses the concept of characteristic length. It is found that the current proposed method can easily treat planar crack problems which are difficult for the conventional Trefftz method. Four numerical examples are demonstrated to show the validity of current approach. Numerical results show the current approach is promising and highly accurate.