Interaction between a cracked hole and a line crack under uniform heat flux

Vinh P.C., Hasebe N., Wang X.-F., Saito T.

Faculty of Mathematics, Mechanics and Informatics, Hanoi National University, 334 Nguyen Trai Str., Thanh Xuan, Hanoi, Viet Nam; Department of Civil Engineering, Nagoya Institute of Technology, Gokiso-cho Showa-ku, Nagoya 466-8555, Japan

Abstract: This article deals with the interaction between a cracked hole and a line crack under uniform heat flux. Using the principle of superposition, the original problem is converted into three particular cracked hole problems: the first one is the problem of the hole with an edge crack under uniform heat flux, the second and third ones are the problems of the hole under distributed temperature and edge dislocations, respectively, along the line crack surface. Singular integral equations satisfying adiabatic and traction free conditions on the crack surface are obtained for the solution of the second and third problems. The solution of the first problem, as well as the fundamental solutions of the second and third, is obtained by the complex variable method along with the rational mapping function approach. Stress intensity factors (SIFs) at all three crack tips are calculated. Interestingly, the results show that the interaction between the cracked hole and the line crack under uniform heat flux can lead to the vanishing of the SIFs at the hole edge crack tip. The fact has never been seen for the case of a cracked hole and a line crack under remote uniform tension. ?? Springer 2005.

Author Keywords: Cracked hole; Dislocation; Heat flux; Integral equation; Interaction; Mapping function; Stress intensity factor; Thermal stress

Index Keywords: Boundary value problems; Crack propagation; Green's function; Heat flux; Integral equations; Laplace transforms; Stress concentration; Stress intensity factors; Temperature distribution; Thermal stress; Cracked hole; Edge dislocations; Mapping function; Cracks

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Correspondence Address: Hasebe, N.; Department of Civil Engineering, Nagoya Institute of Technology, Gokiso-cho Showa-ku, Nagoya 466-8555, Japan; email: hasebe@kozo4.ace.nitech.ac.jp

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Authors with affiliations:

1. Vinh, P.C., Faculty of Mathematics, Mechanics and Informatics, Hanoi National University, 334 Nguyen Trai Str., Thanh Xuan, Hanoi, Viet Nam
2. Hasebe, N., Department of Civil Engineering, Nagoya Institute of Technology, Gokiso-cho Showa-ku, Nagoya 466-8555, Japan
3. Wang, X.-F., Department of Civil Engineering, Nagoya Institute of Technology, Gokiso-cho Showa-ku, Nagoya 466-8555, Japan
4. Saito, T., Department of Civil Engineering, Nagoya Institute of Technology, Gokiso-cho Showa-ku, Nagoya 466-8555, Japan

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