

# Accepted Manuscript

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PII: S0997-7538(17)30527-2

DOI: [10.1016/j.euromechsol.2017.12.004](https://doi.org/10.1016/j.euromechsol.2017.12.004)

Reference: EJMSOL 3527

To appear in: *European Journal of Mechanics / A Solids*

Received Date: 3 July 2017

Revised Date: 10 December 2017

Accepted Date: 17 December 2017

Please cite this article as: Tofique, M.W., Hallbäck, N., Development of the distributed dislocation dipole technique for the analysis of closure of complex fractures involving kinks and branches, *European Journal of Mechanics / A Solids* (2018), doi: 10.1016/j.euromechsol.2017.12.004.

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# Development of the distributed dislocation dipole technique for the analysis of closure of complex fractures involving kinks and branches

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## Abstract

This paper presents the development of the distributed dislocation dipole technique (DDDT) for the analysis of straight, kinked and branched cracks where parts of the cracks may close during loading. The method has been developed for plane problems. Crack cases in which closure occurs are analyzed by reformulating the Bueckner's principle, taking into account the contact stresses at the contacting portions of the crack surfaces. Stress intensity factors corresponding to opening and the in-plane sliding mode of deformation at the crack tips are computed. Several test cases involving straight, kinked and/or branched cracks where parts of the cracks undergoes crack surface closure when subjected to the outer loading are analyzed. The results obtained from the DDDT are compared to those obtained from a Finite Element Method (FEM) analysis of the same crack cases. This com-

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