Hattori, Gabriel; **Trevelyan, Jon**; **Coombs, William M.**

A non-ordinary state-based peridynamics framework for anisotropic materials. (English)
Zbl 1440.74026

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Summary: Peridynamics (PD) represents a new approach for modelling fracture mechanics, where a continuum domain is modelled through particles connected via physical interactions. This formulation allows us to model crack initiation, propagation, branching and coalescence without special assumptions. Up to date, anisotropic materials were modelled in the PD framework as different isotropic materials (for instance, fibre and matrix of a composite laminate), where the stiffness of the bond depends on its orientation. In this work we propose a non-ordinary state-based formulation to model general anisotropic materials. The material properties for each particle are defined using the material constitutive matrix, rather than being defined through the bond stiffness between adjacent particles. We propose a damage criterion for composite materials to model the crack propagation behaviour for anisotropic materials. We validate the model using benchmark problems obtained with established numerical methods or experimental results. The proposed approach enables the use of general classes of material models including rocks, concrete and biomaterials.

MSC:

74A45	Theories of fracture and damage
74E10	Anisotropy in solid mechanics
74S05	Finite element methods applied to problems in solid mechanics

Cited in **3** Documents

Keywords:

peridynamics; non-ordinary state-based; anisotropic materials; crack propagation

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kdtree++

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