Multiscale Quasicontinuum Methods for Dissipative Truss Models and Beam Networks

Lars Beex, Ron Peerlings, Marc Geers, Pierre Kerfriden, Stephane Bordas

Mechanical models with discrete elements are frequently used to predict the behavior of discrete microstructural materials. The advantage of discrete models is that they are able to predict small-scale, individual events occurring in materials with discrete microstructures. Since discrete models are defined at small length scales, they are computationally prohibitive for engineering scale computations. Multiscale approaches can avoid this issue. The quasicontinuum (QC) approach is a multiscale approach specifically introduced for discrete (conservative) atomistics [1]. The method has recently been reformulated in terms of the virtual-power statement of non-conservative/dissipative discrete models [2]. This has introduced new application fields to the approach, since it can now be used for discrete models that include local dissipative mechanisms (e.g. useful for truss networks of electronic textile [3]) and non-local dissipative mechanisms (e.g. useful for truss networks describing bond failure and fiber sliding in paper materials [4]). Not only the work on QC frameworks for dissipative truss networks will be presented, but also how the QC method can be used for beam lattices [5]. The presentation will finish with an overview of the developments that will be made in the near future.

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[3] Beex LAA, Peerlings RHJ, Van Os K, Geers MGD, *The mechanical reliability of an electronic textile investigated using the virtual-power-based quasicontinuum method*, Mech. Mater., DOI: 10.1016/j.mechmat.2014.08.001.

[4] Beex LAA, Peerlings RHJ, Geers MGD, *A multiscale quasicontinuum method for lattice models with bond failure and fiber sliding*, Comput. Meth. Applied M., 269 (2014) 108-122.

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Short Bio

2014	Research Fellow, Research Unit of Engineering Science, University of Luxembourg
2013-2014	Assistant Professor, School of Engineering, Cardiff University
2002-2012	PhD, MSc (cum laude), BSc (cum laude), Mechanical Engineering, Eindhoven University of Technology.