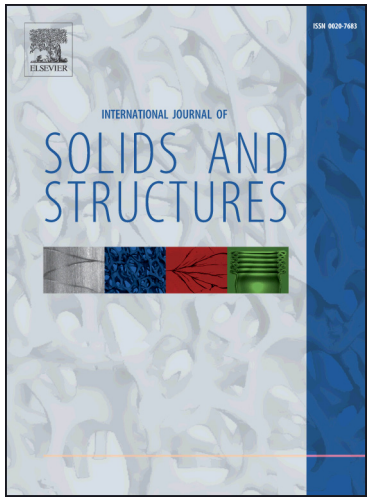

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Contact mechanics of fractal surfaces by spline assisted discretization

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Abstract:

We present a newly developed approach for the calculation of interfacial stiffness and contact area evolution between two rough bodies exhibiting self-affine surface structures. Using spline assisted discretization to define localized contact normals and surface curvatures we interpret the mechanics of simulated non-adhesive elastic surface-profiles subjected to normal loading by examining discrete contact points as projected Hertzian spheres. The analysis of rough-to-rough contact mechanics for surface profiles exhibiting fractal structures, with fractal dimensions in the regime 1-2, reveals the significant effect of surface fractality on contact mechanics and compliance with surfaces of higher fractality showing lower contact stiffness in conditions of initial contact for a given load. The predicted linear development of true contact area with load was found to be consistent with diverse existing numerical and experimental studies. Results from this model demonstrate the applicability of the developed method for the meaningful contact analysis of hierarchical structures with implications for modelling tribological interactions between pairs of rough surfaces

Keywords: Fractal; Contact compliance; Interface; Micro-mechanics

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