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The surface displacements of an elastic half-space subjected to uniform tangential tractions applied on a circular area

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Abstract

In this paper we derive the complete surface displacement field of an elastic half-space uniformly loaded with unidirectional tangential tractions over a circular area, as those resulting, for instance, from frictional interactions in soft single-asperity contacts.

The elastic problem is solved in the framework of linear elasticity, by opportunely integrating over the circular loaded area the fundamental Cerruti solution for the displacements induced by a unit tangential force.

We discuss the displacement field peculiarity, in terms of symmetry and slope.

The solution here presented allows to treat analytically different contact mechanics problems in presence of friction and involving spheres and soft substrates, where frictional shear stress can be assumed uniform.

Keywords: Linear elasticity, tangential loads, coupled elasticity

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