Development of theory and numerical procedures for estimating of properties of contact that influence friction-induced vibration and noise

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The phenomena of noise and vibration caused by frictional contact in mechanical systems must be related to the properties of contact. The parameters of interest to vibration response include equivalent contact stiffness, damping, and frictional function. Accurate account of these properties will lead to the fundamental understanding of causes of friction-induced vibration and noise. Elastic-Plastic interactions of surfaces are treated and plastic asperity concept is forwarded. A mathematical formulation for the contact of rough surfaces is presented. The derivation of the contact model is facilitated through the definition of plastic asperities that are assumed to be embedded at a critical depth within the actual surface asperities. The surface asperities are assumed to deform elastically whereas the plastic asperities experience only plastic deformation. The deformation of plastic asperities is made to obey the law of conservation of volume. It is believed that the proposed model is advantageous since (a) it provides a more accurate account of elastic-plastic behavior of surfaces in contact and (b) it is applicable to model formulations that involve asperity shoulder-to-shoulder contact.