NUMERICAL SIMULATION OF 3D CONTACT PROBLEMS UNDER FINITE ELASTIC-PLASTIC DEFORMATION.

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In this work 3D brick elements are applied to study contact problems undergoing large elastic-plastic 3D deformation. Initially a few numerical examples are selected to show the ability of the contact formulation (Figure 1) and furthermore, a homogenization procedure is presented to obtain by numerical simulation interface laws for normal contact pressure based on statistical surface models (Figure 2). The non-penetration condition and interface models for contact taking into account the surface microstructure are investigated in detail. For this purpose one has to model the rough surface and then, by homogenization procedures develop an interface law for contact. The interface law is obtained from numerical simulation using a model that consists of two deformable bodies in contact. Both contact surfaces are rough. The law obtained by numerical simulations and statistical evaluation of the numerical results is compared with other analytically obtained laws that take into account the plastic behaviour of the materials. This paper can be regarded as a complementary study to that presented by Bandeira *et al* elsewhere [1, 2]. Here associative von Mises plasticity of the asperities is considered by formulating an incremental stress integration scheme on the principal axes [3] of the incremental stretch tensor. An augmented Lagrangian method is applied to solve the contact problem.

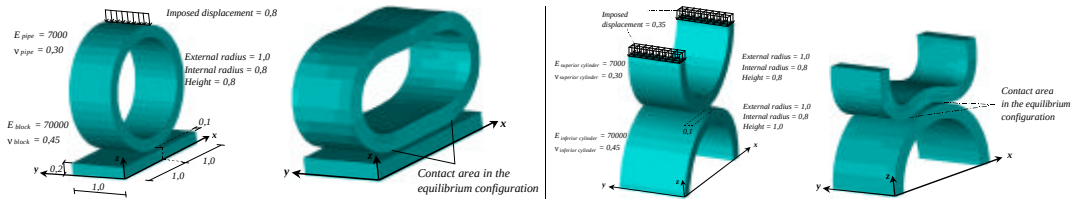

Figure 1 – Numerical examples: initial and equilibrium configuration

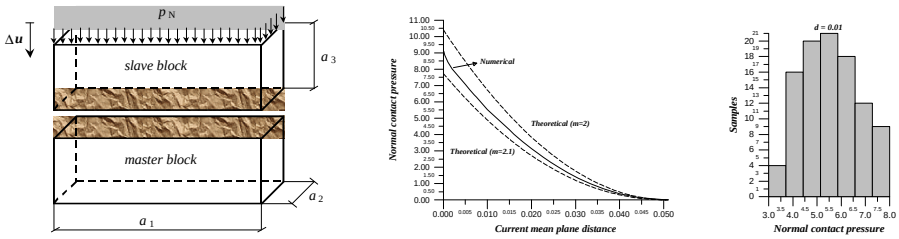

Figure 2 – Model to obtain an interface law, interface law for elastic material and statistical distribution

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