NUMERICAL SIMULATION OF PRESSURE DISTRIBUTION IN MULTIASPERITY DENTAL CONTACTS

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Dental contacts are often modeled by point Hertz contacts [1], for which an analytical solution for pressure distribution and stress state exists. However, real-life dental contacts microtopography is not restricted to Hertz formalism. In order to bypass this limitation, numerical analysis is often used, due to its robustness. In this paper, digitized contact geometry of a real tooth is obtained via laser profilometry, and inputted to a numerical elastic contact solver based on the Conjugate Gradient (CG) method [3]. The use of spectral methods like Discrete Convolution Fast Fourier Transform (DCFFT) [2] allows for efficient computation of high resolution grids. Stress state induced in tooth body under the assumption of a normal and tangential load is also assessed.

The simulations are performed considering contact microtopography obtained via laser profilometry from a real tooth. A topography sample, of 128×128 grid cells, was obtained from the original array by clipping the edges of the original data set. This set was inputted as initial contact geometry to the elastic contact solver [3, 4], together with enamel's elastic parameters and load. The program outputs the nodal pressures, Fig. 1, which are later used for stress state computation, Fig.2, via DCFFT [2].

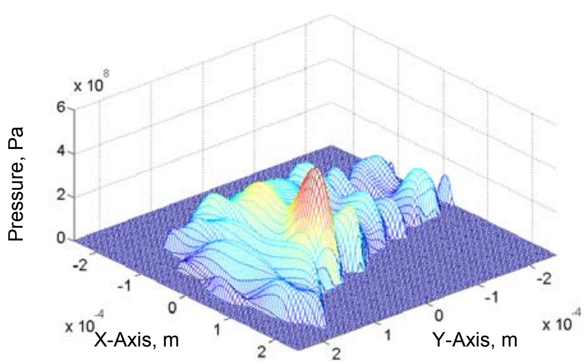

Fig. 1. Digitized tooth topography

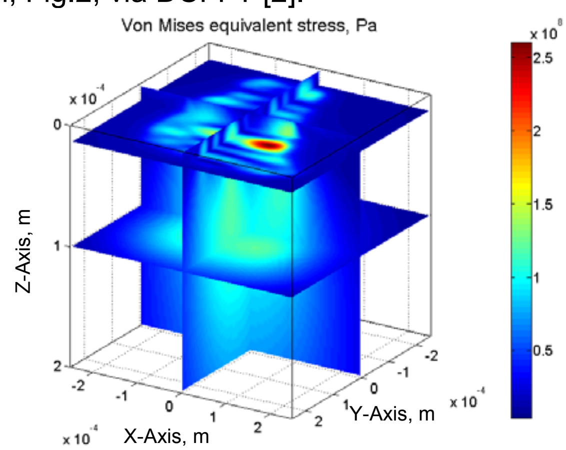

Fig. 2. Subsurface Von Mises equivalent stress

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