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Stress computation in a sphere with surface defects

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In this paper, we consider the problem of calculating the stresses of a sphere with surface defects for a set of different initial conditions of the problem at hand. Varying materials, size and shape of defects are considered. We perform computations in a system that we developed form open source components that combine CAD and CAE functions inside one user interface. We compare the operation of the system in comparison to some of its commercial counterparts with respect to the complexity of the work, expressed in the number of necessary user actions. Also we compare the operational capabilities in relation to the geometry processing - the maximum number of polygons and support for co-processors.
A parametric approach to the creation and processing of geometry in combination with an ecosystem that provides FEM tools for working with GPGPU allows for minimization of the amount of time needed to test an engineering idea under widely varying initial and boundary conditions. This paper shows change of the time required for calculation of the task depending on the boundary conditions and the complexity of the geometry, presents the main stress points in the load of the system performing the task.
For the end user experience, the system provides an interface that combines interactive web components based on the Jupyter Notebook platform and a programming environment based on the Python language. The system is opensource and can be deployed on to any Linux compatible system thanks to Docker containerization technology.

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