TENSOR3D: a computer graphics program to simulate 3d real-time deformation and visualization of geometric bodies

H. D. Ebert and L. P. Lavorante

UNESP-São Paulo State University, Instituto de Geociências e Ciências Exatas, Rio Claro-SP, Brazil (hdebert@rc.unesp.br / fax +55 19-35249644)

Tensor3D is a geometric modelling program with the capacity to simulate and visualize in real-time the deformation, specified through a tensor matrix and applied to triangulated models representing geological bodies. The 3D visualization allows the study of deformational processes that are traditionally considered in 2D, such as simple and pure shears. Beside geometric objects that are immediately available in the program window, the program can read other models from disk, thus being able to import objects created with different open-source or proprietary programs. A strain ellipsoid and a bounding box are simultaneously shown and instantly deformed with the main object. The principal axes of strain are visualized as well to provide graphical information about the orientation of the tensor´s normal components. The deformed models can also be saved, retrieved later and deformed again, in order to study different steps of progressive strain, or to make this data available to other programs. The shape of stress ellipsoids and the corresponding Mohr circles defined by any stress tensor can also be represented. The application was written using the Visualization ToolKit, a powerful scientific visualization library in the public domain. This development choice, allied to the use of the Tcl/Tk programming language, which is independent on the host computational platform, makes the program a useful tool for the study of geometric deformations directly in three-dimensions in teaching as well as research activities