

An Alternative Approach for Inelastic Static Isogeometric Analysis and 3D Design with Advanced Spline Techniques with Geomiso TNL: a New Hybrid Cloud-based CAD/CAE Software

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In this paper a recently developed cloud-based simulation platform (www.geomiso.cloud) is proposed to help engineers and industries make more effective use of 3D design and isogeometric analysis with advanced spline techniques. Geomiso TNL fully integrates the industrial design of any product with its computational real-time testing by facilitating the geometry modeling within analysis, thus it can solve demanding structural engineering problems subjected to static loading conditions otherwise very challenging. Users can easily test performance, predict behavior, optimize durability, and improve efficiency of their products. This is the first time ever such a cloud-based software has been developed.

This online solution provides inelastic static isogeometric analysis and 3D design of complex multipatch structures with NURBS and T-splines. Material nonlinearity in combination with the isogeometric method has attracted increasing attention. Modern T-splines can accurately represent any geometry with their local refinement properties and overcome limitations inherent to NURBS by ensuring higher-order continuity across patches, while in practical circumstances, it is often necessary to describe domains with multiple patches, especially them with parts in which different material or physical models are to be used. Geomiso TNL directly utilizes the CAD file in its solver to perform a structural analysis without any intermediate steps of geometry clean-up or further mesh generation by using the same shape functions, namely splines, for both describing the domain geometry and building the numerical approximation of the solution. Thus, it maintains the exact representation of the geometry at any stage of the design process and eliminates geometric errors. This hybrid software provides parameterized geometries in the design, while its modern graphical user interface offers an innovative way to preserve the exact geometry at all refinement levels. As it is demonstrated in this paper with several industry applications, the developed platform is seen to handle these situations remarkably well.

Geomiso TNL is considered to be a comprehensive answer to today's simulation challenges and a viable alternative to finite element software packages, as it removes the barriers between design and analysis and represents major improvements, such as higher accuracy, robustness, and stability level, combined with cost-efficiency and instant access from a web browser. This research has been co-financed by the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship, and Innovation, under the call «RESEARCH–CREATE–INNOVATE» (project code: T1EDK-04288).

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