Trimming Surface Analysis and Its Applications

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NURBS (Non-Uniform Rational B-Splines) is a mathematical language widely used in CAD and computer graphics for creating geometrical objects. The Isogeometric Analysis is basically a NURBS based spline finite element method. In the method NURBS is used both for the discretization of analysis models and for the approximation of field variables of the problems. In CAD, trimming curves (or surfaces) are frequently employed for the efficient modeling of objects of complex topology. The trimming curves are defined independently on the spline patches and Boolean operation between the patches and the trimming curves produces the final objects of complex topologies. This technic greatly reduces the efforts and time in the CAD modeling of engineering objects. The TSA(Trimming Surface Analysis) is a technique that can directly treat the trimmed objects in the finite element analysis. In this lecture, the basic scheme of TSA for the analysis of the trimmed objects in the setting of the Isogeometric Analysis is explained. Then shape/topology optimization of structures, and meshfree method based on the TSA will be presented with some numerical examples. Also it will be demonstrated that the same idea can be extended to the analyses of nonlinear problems.