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T-Spline Finite Element Analysis of the Trimmed Surface

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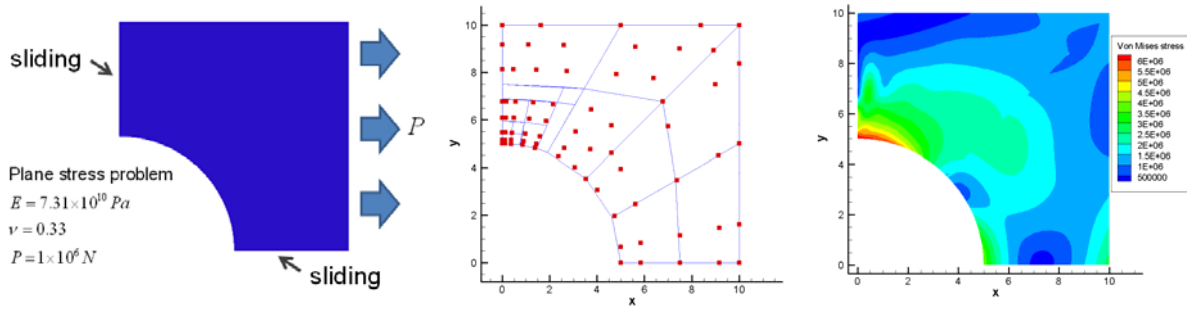
ABSTRACT

The concept of isogeometric analysis, introduced by Hughes et al.[1] is that NURBS (Non-Uniform Rational B-Splines) are employed to construct geometrical representation, and field variables are approximated by NURBS shape function for the analysis of the problems governed by partial differential equations. However there are still shortcomings that insertion of one knot into the surface causes propagation of new control points along an entire row or column.

Recently Kim et al.[2] and Uhm et al.[3] presented finite element analysis based on T-spline[4]. T-spline is capable of significantly reducing the number of unnecessary control points and gives truly local refinement capabilities. (Fig. 1)

T-spline finite element analysis would be also extendable to complex topologically shaped surface if trimming operations are used. Trimmed NURBS surfaces which are represented by a parametric surface and a set of trimming curve have become one of the most effective means of representation for various types of geometric applications in CAD/CAM technology.

In this research, trimmed surface is analyzed by using T-spline finite element analysis. The efficient integration scheme is proposed to analysis trimmed curve. With proposed scheme, arbitrary topological shape will be manageable and various surface/volume operations such as Boolean operation will be applicable. The effectiveness and efficiency of proposed method are showed by applying to 2D linear elasticity problem



(a) Problem definition (b) Control points (p=3) (c) Von-Mises stress

Fig.1 Examples of T-spline FEA

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