Isogeometric methods

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Geometry is the foundation of analysis yet modern methods of computational geometry have until recently had very little impact on analysis. The reason my be that the Finite Element Method (FEM), as we know it today, was developed in the 1950's and 1960's, before the advent and widespread use of Computer Aided Design (CAD) programs, which occurred in the 1970's and 1980's. Many difficulties encountered with FEM emanate from its approximate, polynomial based geometry, such as, for example, mesh generation, mesh refinement, sliding contact, flows about aerodynamic shapes, buckling of thin shells, p-methods, etc. It would seem that it is time to look at more powerful descriptions of geometry to provide a new basis for analysis. An attempt to generalize and improve on the finite element analysis in the area of geometry modeling and representation has led to the introduction and development of Isogeometric Analysis.

Different approaches with this spirit are being developed. Among those that have demonstrated considerable potential over typical FEM basis functions are subdivision surfaces, NURBS, and T-Splines. NURBS-based isogeometric analysis methods have been successfully applied to fluids, structures, fluid-structure interaction, and phase-field modeling of phase separation. T-Splines, which are a generalization of NURBS, and which allow efficient local refinement while maintaining the higher-order continuity and exact geometry, have also been applied to diverse applications, including nonlinear shells.

The purpose of this symposium is to bring together experts in geometry and analysis interested in developing a new generation of analysis procedures based on modern developments in computational geometry. We request four sessions:

1. Geometry for Analysis: Treatment of geometry in analysis applications and the development of geometrical modeling techniques tailored for analysis.
2. Mathematics of Isogeometric Methods: The mathematical analysis of isogeometric methods using modern geometric representations.
3. New Analysis Technologies: This session includes topics of that may be of broad interest including the development of fast and accurate quadrature techniques.
4. Applications: Applications of isogeometric methods and their implementation.