Master's Thesis

# ADAPTIVE ISOGEOMETRIC ANALYSIS WITH HIERARCHICAL B-SPLINES

### Supervisor: MSc. Hoang Giang Bui



**Background:** Isogeometric analysis (IGA) is an approximation method exploiting the existing geometrical representation of the CAD model. The interpolation functions are the same as the functions representing the geometry (NURBS). Therefore, IGA does not requires additional meshing step to obtain polygonal-shape finite elements. This gives huge advantage over traditional engineering analysis approach. In addition, the approximation using NURBS provides better spectral properties, comparing to the standard finite element method using Lagrange shape functions.



Hierarchical B-Splines enhances the isogeometric analysis by enabling local adaptive refinement. Firstly, the area of refinement is identified by using a problem-dependent refinement indicator. Subsequently, the basis functions with support domain completely covered in the refinement domain are refined by replacing with basis functions of smaller support domain. The linear independent properties are automatically preserved by nested properties of refinement bases.

RUB

#### Tasks:

+ Using the extension Isogeometric\_Application of KRATOS Multiphysics framework to perform various adaptive simulation.

+ Identify the area for improvements, e.g. better CAD integration for the extension Isogeometric\_Application.

+ Report the results in the final thesis

#### **Contact:**

## **Bui, Hoang Giang**

Room: IC 6/163 Lehrstuhl für Statik und Dynamik Ruhr-Universität Bochum Tel: 0234-32-29056 Email: giang.bui@rub.de