ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE
Fakulta stavební
Thákurova 7, 166 29 Praha 6

Diplomová práce: Development and implementation of an isogeometric scaled boundary shell formulation

Jméno studenta: Mathias Ferdinand Maria Reichle

Datum odevzdání práce: letní semestr 2020/21

Magisterský studijní program: Civil Engineering

Student Mathias Ferdinand Maria Reichle absolvoval studium na Fakultě stavební ČVUT v Praze souběžně se studiem na univerzitě Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen v rámci double degree studia na základě smlouvy uzavřené mezi oběma univerzitami.
V souladu s touto smlouvou proběhlo na RWTH Aachen v rámci double degree studia zpracování diplomové práce zapsané na Fakultě stavební ČVUT a následně dne 7. 5. 2021 i obhajoba diplomové práce.

Abstrakt diplomové práce:
In the field of numerical structural analysis, shell formulations are generally proposed to model the mechanic response of thin curved structures. Typical approaches consist in the numerical approximation of the surface of the structure in order to develop the element stiffness matrix which is used in the framework of the finite element method (FEM). In this context, the thickness direction of the shell is included in the derivation of the element stiffness matrix which is the associated to translational and rotational degrees of freedom. In recent years, the scaled boundary method has been proposed to model thin structures such as plates and shells. The main idea of this approach consists in a solid shell formulation with scale separation. The in-plane direction is approximated in a classical sense by shape functions, but for the thickness direction, the analytic solution is taken into account. By these means, the nodal degrees of freedom are given by the displacements of the top and bottom surface of the shell. The objective of the present thesis is to develop and implement a scaled boundary shell formulation into the framework of isogeometric analysis (IGA). This framework offers the advantage of an exact approximation of a shell structure, since it is based on the NURBS functions which are used for the geometrical description. Furthermore, a higher continuity of the solution field is given naturally by means of these functions. The initial tasks of this project consist in the familiarization with the scaled boundary shell formulation as well as with IGA. Afterwards the element formulation needs to be derived and implemented into the IGA framework. To conclude the work, standard shell element benchmarks such as the pinched cylinder are to be performed and documented in the final written elaboration

1. 6. 2021

prof. Ing. arch. Zuzana Pešková, Ph.D
proděkanka