6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11-15 June 2018, Glasgow, UK

Large deformation contact computation with moving nodes using VEM

Wilhelm T. Rust[1], **Peter Wriggers**[1]

[1] Leibniz Universität Hannover
Institute of Continuum Mechanics
Appelstr. 11, 30167 Hanover, Germany
{rust,wriggers}@ikm.uni-hannover.de

Keywords: *Contact Computation, Node-to-node, Virtual Element Method*

In most classical contact computations nodes are projected on parametrised surfaces where then contact constraints are enforced in tangential and normal direction to differentiate between stick and slip state. As an alternative, contact can be computed without respect to the contact normal by simple coupling of the nodes. The sliding case is then considered afterwards by letting the projected node follow a friction cone defined by normal and tangential tractions. This was applied to node-to-segment contact discretisations in [1]. However these interpolations are dependent on the mesh size and relation.

Now the contact procedure using the Virtual Element Method [2] offers a flexible node-to-node formulation. It is based on freely adding contact nodes to the original mesh [3] and with this it overcomes differences in mesh size and surface interpolation. In combination with the moving cone description, the VEM contact offers a simple formulation for surfaces in sliding contact. Contrary to classical node-to-node contact, sliding movement is possible by adjusting the position of the contact nodes in the mesh according to the friction state.

After a short introduction to the used virtual elements for large deformations [4] as well as the contact algorithm the presentation will focus on the computation of the node adjustment due to the sliding motion.

REFERENCES

[1] P. Wriggers and A. Haraldsson. A simple formulation for two-dimensional contact problems using a moving friction cone. *Communications in Numerical Methods in Engineering*, 19(04):285-295, 2003.

[2] L. Beirão da Veiga, F. Brezzi, A. Cangiani, G. Manzini, L. D. Marini, and A. Russo. Basic principles of virtual element methods. *Mathematical Models and Methods in Applied Sciences*, 23(01):199214, 2013.

[3] P. Wriggers, W. Rust, and B. Reddy. A virtual element method for contact. *Computational Mechanics*, 58(6):10391050, 2016

[4] P. Wriggers, B.D. Reddy ,W.T. Rust, B. Hudobivnik. Efficient virtual element formulations for compressible and incompressible finite deformations. *Computational Mechanics*, 60:253-268, 2017.