AN ISOGEOMETRIC MODEL FOR RUPTURE DYNAMICS

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The objective of this contribution is to investigate the performance of isogeometric analysis when applied to problems with existing interfaces under dynamic loading.

Extending the model presented in [2], we use non-uniform rational B-splines to exactly model complex geometries, and in particular predefined interfaces of arbitrary shape (e.g. adhesive layers, geologic fault). The model makes use of the flexibility exhibited by IGA to control the continuity of the approximated fields across elements by adjusting the knot multiplicity. In the current application, the knot multiplicity is increased locally to insert discontinuities in the displacement field. This displacement jump is used together with traction-opening or slip-weakening friction laws.

The model is tested on a number of numerical experiments and in particular earthquake-like loadings in the spirit of [1], where elasto-plastic material behaviour is considered. Emphasis will be placed on the solution procedure of the dynamic problem.

REFERENCES

[1] Templeton, E., Rice, J.: Off-fault plasticity and earthquake rupture dynamics: 1. dry materials or neglect of fluid pressure changes. Journal of Geophysical Research: Solid Earth **113**(B9), 2008.

[2] Verhoosel, C., Scott, M., de Borst, R., Hughes, T.: An isogeometric approach to cohesive zone modeling. International Journal for Numerical Methods in Engineering **87**(1-5), 336–360, 2011.