Numerical contact method for large deformations based on Mortar method and integration using the collocation method, obtained through Automatic Differentiation

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SUMMARY

Numerical contact methods are always a challenge**[2]**, especially in the case of large deformations and/or displacements and friction phenomena, so that in the literature there many alternatives can be found. When implementing any of these methodologies, it is interesting that there are as few user-dependent variables as possible, and that the method allows solving as many problems as possible.

The alternative presented by the authors consists of a segment-by-segment method**[1]** (called Mortar) using Lagrange multipliers as an optimization method. The authors present a method of contact that replaces the complex and costly exact integration of the domain in contact with collocation points, where integration points are considered uniformly distributed within the slave domain. This method is considerably faster than the alternative using the exact Mortar integration, at cost of accuracy in the solution. For a correct operation of the method it is necessary to linearize**[1,3]** as many terms as possible, in order to reduce this effort, we opt to use the automatic differentiation**[4]** method to obtain closed expressions.

The method has been implemented in Kratos Multiphysics, an open source software. Different tests will be presented for validation, as well as industrial examples demonstrating the good operation of the method.

REFERENCES

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