The Virtual Element Method and its application to structural mechanics

When dealing with standard Finite Elements some limitations can be experienced during meshing of complex geometries. This is where the newly developed Virtual Elements offer a better flexibility. The methods main idea is to find a single basis function, independent of the element geometry, that can project the nodal values on the element area while being compatible with the interpolated values on the boundary. Instead of precomputing these functions beforehand they are „virtually“ determined during the computation. All integration is executed on the element boundary without the need of an isoparametric mapping. This gives the advantage over classical finite elements that it is easily possible to discretize a geometry using convex or non-convex polygons with an arbitrary number of vertices. Since the number of nodes can be changed without the need to recompute or change the element basis, additional nodes can easily be inserted during the computation.

The talk will first outline the basic features of the method and the element formulation for elasticity and then demonstrate how virtual elements can be applied to create an easy but stable contact method.

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