A meshfree thin shell for arbitrary evolving cracks based on an extrinsic enrichment

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Summary

This paper proposes a meshfree method for arbitrary evolving cracks in thin shells. The approach is an improvement of the method proposed by Rabczuk T., Areias P.M.A., Belytschko T. (A meshfree thin shell for large deformation, finite strain and arbitrary evolving cracks, International Journal for Numerical Methods in Engineering). In the above cited paper, a shell was developed based on an intrinsic basis of third order completeness. Third order completeness was necessary to remove membrane locking. This resulted in the use of very large domains of influence that made the method computationally expensive. If the crack was modelled by a set of cracked particles where the crack is introduced through the entire domain of influence, a very fine resolution was needed to capture the crack path. We will modify the method and use an extrinsic basis to increase the order of completeness of the approximation. The advantage is the saving in computational cost due to smaller domain of influences and coarser resolutions to capture the crack path. The method is applied to several crack problems and shows good agreement with experimental results.