Layered phase field approach to shell

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ABSTRACT

Fracture is one of the most commonly encountered failure modes of engineering materials and structures. Prevention of cracking-induced failure is, therefore, a major constraint in engineering designs. As with many other physical phenomena computational modelling of fracture constitutes an indispensable tool not only to predict the failure of cracked structures but also to shed insights into understanding the fracture processes of many materials such as concrete, rock, ceramic, metals and biological soft tissues.

Recently, the phase field approach to fracture revealed to be a versatile and powerful tool for the investigation of crack problems. Despite the large amount of literature few attempts have been devoted to the formulation and applications of the phase field approach to plates and shells [1], [2].

In this work an alternative phase field formulation for slender and thin structure is proposed. The main idea bases on the subdivision of the solid into several layers. The mechanical behaviour of the solid is governed by classical formulation of plate and shell whereas the phase field equation is satisfied within each layer. This approach takes advantages of the specific formulation for thin structure and at the same time the phase field problem is solved in a domain with reduced dimension.

The effectiveness of the approach will be illustrated by paradigmatic examples and comparison with full 3D approach will outline the advantages of the proposed procedure.

REFERENCES

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