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Phase-field modeling of fracture in linear thin shells

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The prediction of fracture in thin structures is of major importance in engineering applications such as aircraft fuselages, pressure vessels, automobile components, and castings. Since analytical solutions provide limited information, there has been a keen interest in numerically simulating fracture in thin shells in recent years. However, despite the advances made in modeling fracture for solid bodies, fracture in thin bodies remains a challenge due to the complex interplay between cracks and the shell kinematics and geometry. We present a phase-field model for fracture in Kirchoff-Love thin shells using the Local Maximum-Entropy (LME) mesh-free method. Since the crack is a natural outcome of the analysis, it does not require an explicit representation and tracking, which is an advantage over techniques as the extended finite element method that requires tracking of the crack paths. The geometric description of the shell is based on statistical learning techniques that allow dealing with general point set surfaces avoiding a global parameterization, which can be applied to tackle surfaces of complex geometry and topology. This topic is of high relevance for real-world applications, for example in the automotive industry and in aerospace engineering.

Biography

Fatemeh Amiri is doing her PhD at Bauhaus University of Weimar, Germany. She has completed her Master of Applied Mathematics degree from Isfahan University of Technology. She has published two papers in fracture mechanics field along with Professor Timon Rabczuk and Professor Marino Arroyo.

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