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Stabilized finite element method for the elastodynamics equation in vector-tensor mixed form for time and frequency domain

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ABSTRACT

The most common way to study elasticity has always been through the equation of displacements in time domain, either in its irreducible or in mixed form. In the former, only the displacements are computed, whereas the latter involves the computation of two or more variables. However, with some simple manipulations, it is easy to reach a new equation where velocity is the main variable. This new equation can also either be presented in its irreducible form, which is completely analogous to the one for the displacements, or in its mixed form, where it is computed alongside the stress tensor [1]. One of the interests of the latter is that it is an analogous mixed vector-tensor form of the mixed scalar-vector wave equation [2], so it is, therefore, also a wave equation.

In this work we present a stabilized Finite Element Method, that belongs to the computational framework of Variational Multi-Scale methods, for this mixed velocity-stress elasticity equation. This is done for the time and frequency domain, which is obtained by doing a Fourier transform of the equation. The performance of the method is tested through two different numerical examples, one of which includes a convergence study.

REFERENCES

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