VON NEUMANN ANALYSIS OF GENERALIZAED REPRODUCING KERNEL REGULARIZAION IN STRAIN LOCALIZATION PROBLEMS

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The moving least-squares (MLS) and reproducing kernel (RK) approximations possess intrinsic nonlocal properties. These nonlocal properties can be embedded into a strain smoothing equation, leading to an effective localization limiter for strain localization problems [1]. It has been shown that by imposing appropriate reproducing conditions in the RK regularization, the method can recover gradient models of any order without dealing with the boundary condition and regularity issues in the conventional gradient methods.

Localization limiters such as gradient models and reproducing kernel regularization introduce dispersion to the continuum problem [2]. In this work, a von Neumann dispersion analysis is introduced to study the dispersion properties of reproducing kernel regularization of various orders. The dispersion properties of RK regularization are analyzed for one dimensional wave propagation. Both continuum and semi-discretization forms of RK regularization are considered. The effects of internal length scale and the order of regularization on the dispersion characteristics of RK regularizations are studied, and the results are compared to those of the gradient models.

References

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