Numerical analysis of a thermoelastic problem of Moore-Gibson-Thompson type with history dependence

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Abstract:

In this talk, we will consider, from the numerical point of view, a thermoelastic problem where the heat conduction is described by a history dependent version of the Moore-Gibson-Thompson equation [2]. The analytical results were obtained recently in [1]. First, we will study the thermal problem (without mechanical components), introducing a fully discrete approximation by means of the finite element method and the implicit Euler scheme. The discrete stability of its solution will be proved, and an a priori error analysis will be provided, which will lead to the linear convergence under suitable regularity conditions. Secondly, we will consider the natural extension to the thermoelastic case. Following the analysis of the thermal problem, similar results will be shown. Finally, we will present some one-dimensional numerical simulations for both problems which will demonstrate the accuracy of the approximations and the behavior of the discrete energy.

References:

[1] M. Conti, V. Pata, R. Quintanilla, Thermoelasticity of Moore-Gibson-Thompson type with history dependence in the temperature, Asymptotic Anal., 120 (2020), 1–21.

[2] R. Quintanilla, Moore-Gibson-Thompson thermoelasticity, Math. Mech. Solids, 24 (2019), 4020-4031.