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ANALYSIS OF A DYNAMIC CONTACT PROBLEM INVOLVING A NONLINEAR THERMOVISCOELASTIC BEAM WITH SECOND SOUND

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In this presentation, we present the results obtained in the study of a dynamic contact problem between a nonlinear thermoviscoelastic beam and two deformable obstacles located near its right end. The contact is modelled by using the well-known normal compliance contact condition and, moreover, the so-called second sound effect is included (see, for instance, [1, 2]).

This problem is written as a nonlinear coupled system of partial differential equations in terms of the displacement field, the temperature field and the heat flux. An existence and uniqueness result is proved by using the Faedo-Galerkin scheme, obtaining some a priori estimates and passing to the limit. The limit case, leading to the classical Signorini contact conditions, is also considered. An exponential decay of the energy is also shown. Then, fully discrete approximations are introduced by using the finite element method and the implicit Euler scheme to approximate the spatial variable and the time derivatives, respectively. An a priori error estimates result is shown, from which the linear convergence of the approximation is derived under suitable additional regularity conditions. Finally, some numerical simulations demonstrate the behaviour of the solution and the accuracy of the numerical algorithm.

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