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Abstract

In this paper, we investigate the existence, the stability and the numerical approximation of a multidimensional dynamic contact problem modeling the evolution of displacement and temperature in a viscoelastic body that may come into contact with a deformable foundation. The viscoelastic body is assumed to behave according to Kelvin-Voigt constitutive law with added thermal effects under the Green-Lindsay theory. We prove that the presence of viscoelastic terms in the equations provides additional regularity and then an existence and uniqueness result is obtained using the Faedo-Galerkin method. An energy decay property is also shown under the assumption of radial symmetry. Then, a numerical approximation based on the finite element method is proposed. A stability result is proved from which the decay of the discrete energy is deduced. A priori error estimates are shown from which the linear convergence is derived under suitable additional regularity conditions. Finally, some numerical experiments are described to support our results.