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Title: Control properties of Viscoelastic materials with large memory
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Abstract: A viscoelastic material (of the Maxwell-Boltzmann type) is described by a Volterra integrodifferential equation

$$w'' = \mathcal{L}w + \int_0^t M(t-s)\mathcal{L}w(s)\,\mathrm{d}s \qquad \textbf{(A)}$$

where $\mathcal{L}$ is a suitable elliptic operator (the Laplacian, the bilaplacian, the Lame' operator...) and $M(t)$ is a memory kernel with suitable properties. Here $w = w(x,t)$ with $t > 0$ and $x \in \Omega$ (a suitable region whose boundary we assume smooth). Equation **(A)** has to be supplemented with initial conditions (in a suitable *state space*) and boundary conditions on $\partial\Omega$.

We assume that the system described by **(A)** is controlled using a boundary control of Dirichlet type (possibly acting on a part of the boundary) and we study the controllability properties, i.e. we study whether every element of the *state space* can re reached, using a square integrable boundary control, from the rest (equivalently, from every initial condition).

We shall illustrate the most recent results, when $\mathcal{L}$ is either the Lame' operator or the bilaplacian.

Eq. **(A)** is also encountered in the thermodynamics of systems with memory, often written in integrated form

$$w' = \int_0^t N(t-s)\mathcal{L}w(s)\,\mathrm{d}s \qquad \textbf{(B)}\,.$$

A companion equation is the equation

$$w' = \mathcal{L}w(t) + \int_0^t N(t-s)\mathcal{L}w(s)\,\mathrm{d}s \qquad \textbf{(C)}\,.$$

whose control properties will be contrasted with those of **(B)**.