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Qualitative properties of the semigroup associated with some interacting elastic systems.

Joint work with Kaïs Ammari & Louis Tebou

Abstract. We examine regularity and stability issues for two damped abstract elastic systems. The damping involves the average velocity and a fractional power θ, with θ in $[-1, 1]$, of the principal operator. The matrix operator defining the damping mechanism for the coupled system is degenerate:
Let H be a Hilbert space and let A be a positive unbounded self-adjoint operator on the Hilbert space H. For positive constants a, b and γ, we consider the evolution system

$$\begin{aligned} &y_{tt} + aAy + \gamma A^{\theta}(y_t + z_t) = 0 \text{ in } (0, \infty) \\ &z_{tt} + bAz + \gamma A^{\theta}(y_t + z_t) = 0 \text{ in } (0, \infty) \\ &y(0) = y^0 \in V, \quad y_t(0) = y^1 \in H, \quad z(0) = z^0 \in V, \quad z_t(0) = z^1 \in H. \end{aligned}$$

The main objective is to analyze how the interplay of the dynamic of the coupled systems affects the regularity or stability of the underlying semigroups.
To prove our results, we use the frequency domain method, which relies on resolvent estimates. Optimality of our resolvent estimates is also established. Some examples of application are provided.