CAUCHY SYSTEMS OF TYPE RAO-NAKRA SANDWICH BEAM WITH FRICTIONAL DAMPINGS OR INFINITE MEMORIES: SOME $L^q(\mathbb{R})$-NORM POLYNOMIAL STABILITY ESTIMATES ($q \in [1, +\infty]$)

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Abstract. The objective of this work is to study the stability of two systems of type Rao-Nakra sandwich beam in the whole line $\mathbb{R}$ with a frictional damping or an infinite memory acting on the Euler-Bernoulli equation. When the speeds of propagation of the two wave equations are equal, we show that the solutions do not converge to zero when time goes to infinity. In the reverse situation, we prove some $L^2(\mathbb{R})$-norm and $L^1(\mathbb{R})$-norm decay estimates of solutions and theirs higher order derivatives with respect to the space variable. Thanks to interpolation inequalities and Carlson inequality, these $L^2(\mathbb{R})$-norm and $L^1(\mathbb{R})$-norm decay estimates lead to similar ones in the $L^q(\mathbb{R})$-norm, for any $q \in [1, +\infty]$. In our both $L^2(\mathbb{R})$-norm and $L^1(\mathbb{R})$-norm decay estimates, we specify the decay rates in terms of the regularity of the initial data and the nature of the control. Applications to some Cauchy Timoshenko type systems will be also given. The proof is based on the energy method combined with the Fourier analysis (by using the transformation in the Fourier space and well chosen multipliers).

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For the details, see the following papers:

A. Guesmia, Some $L^q(\mathbb{R})$-norm decay estimates ($q \in [1, +\infty]$) for two Cauchy systems of type Rao-Nakra sandwich beam with a frictional damping or an infinite memory, J. Appl. Anal. Comp., 12 (2022), 2511-2540.

A. Guesmia, On the stability of a linear Cauchy Rao-Nakra sandwich beam under frictional dampings, Taiwanese J. Math., DOI: 10.11650/tjm/230502.

A. Guesmia and S. Messaoudi, Some $L^2(\mathbb{R})$-norm and $L^1(\mathbb{R})$-norm decay estimates for Cauchy Timoshenko type systems with a frictional damping or an infinite memory, J. Math. Anal. Appl., DOI: 10.1016/j.jmaa.2023.127385.