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Searching for the most stable switching laws of linear switched systems via antinorms

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We deal with discrete-time $linear\ switched\ system$ of the form
x(n+1) = A$_{\sigma(n)}$ $x(n)$, $\sigma : \mathbf{N} \longrightarrow \{1, 2, \ldots, m\}, where x(0) \in \mathbf{R}^k$, the matrix $A_{\sigma(n)} \in \mathbf{R}^{k\times k}$ belongs to a finite family
cal F=$\{A_i\}_{1\leq i\leq m} associated to the system and \sigma$ denotes the $switching\ law$.

It is known that the $most\ stable\ switching\ laws$ are associated to the so-called $spectrum\text{-}minimizing\ products$ of the family $calF$. Moreover, for a family $calF$ of matrices that share an invariant cone K and is normalized (i.e., its $lower\ spectral\ radius\ \check{\rho}(calF)$ is equal to 1), for any initial value $x(0)$ in the interior of K the $most\ stable\ trajectories$ lie on the boundary of the $unit\ antiball$ of a so-called $invariant\ Barabanov\ antinorm$. Under suitable conditions, a canonical constructive procedure for Barabanov antinorms of polytope type has been recently proposed by Guglielmi Z. (2015).

Still for families sharing an invariant cone K, in this talk we first show how to provide lower bounds to $\check{\rho}(calF)$ by a suitable adaptation of the Gelfand limit to the setting of antinorms, which could be of some practical interest when the above mentioned constructive procedure fails.

Then we consider a family of matrices $calF$ that share an $invariant\ multicone\ K_{mul}$ (see the recent papers by Brundu & Z. (2018, 2019)) and show how to generalize some of the known results on antinorms from the case of families sharing
an invariant cone. These generalizations are of interest because invariant multicones may well exist when invariant cones do not.

This is a joint work with N.Guglielmi, Gran Sasso Science Institute, Italy

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