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Global stability for a nonlinear differential system with infinite delay and applications to BAM neural networks

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In this presentation, we give sufficient conditions for the global asymptotic stability of the following family of functional differential equations with finite delays in the linear terms and infinite delays in the nonlinear terms,

$$x_i'(t) = -a(t)x_i(t-\tau_i(t)) + h_i\Big(t, x(t-\tau_{i1}(t)), \ldots, x(t-\tau_{im}(t))\Big) + f_i(t, x_t),$$

with $t \geq 0$ and $i \in \{1, \ldots, n\}$.

The main stability criterion depends on the size of the delay on the linear part and the dominance of the linear terms over the nonlinear terms.

The general results are applied to obtain new global asymptotic and global exponential stability of a Bidirectional memory (BAM) neural network type model with delays which generalizes models recently studied. In the same way, some answers are given to open problems left by Berezansky et al. in 2014 [1].

A numerical example is presented to illustrate the effectiveness of the new results.

[1] L. Berezansky, E. Braverman, L. Idels, New global exponential stability criteria for nonlinear delay differential systems with applications to BAM neural networks, *Appl. Math. Comput.*, **243**(2014)