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On the dynamics of an electronic circuit in moderate dimensions

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We consider the cyclic system of differential equations

$$\dot{x}_n = -x_n + \alpha\sigma(x_{n-1}) + \beta\sigma(x_{n+1}), \quad n = 1, 2, \ldots, N \tag{1}$$

with parameters in

$$\mathcal{R} = \Big\{(\alpha, \beta) \in \mathbb{R}^2 \mid \alpha > 0 \ \text{ and } \ \beta \in (0, \alpha]\Big\}$$

and the saturated, piecewise linear sigmoid nonlinearity

$$\sigma(x) = \frac{1}{2}(|x+1| - |x-1|) \quad \text{for each } x \in \mathbb{R} \tag{2}$$

modeling a Chua–Yang ring of N electrical oscillators with two–sided nearest neighbor couplings.

Comments on periodic and heteroclinic orbits are made. Numerical aspects are not trivial, too. Equilibrium patterns are discussed by using generalized Fibonacci–Lucas polynomials.

This is ongoing joint work with Miklós Koller