Tracking nonautonomous attractors in slow-fast systems of ODEs with dependence on the fast time

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Abstract: Coupled slow and fast motions generated by ODEs are considered, with dependence on the fast time:

$$\begin{cases} \dot{x} = f(x,y)\,, \\ \varepsilon\,\dot{y} = g\left(x,y,\dfrac{t}{\varepsilon}\right), \end{cases}$$

where $\varepsilon > 0$ is a small parameter. The autonomous case has received a lot of attention since the works by Tikhonov in the 1950s (see [**?**]), but a nonautonomous variation of the fast dynamics with respect to the fast time has not been introduced until the work by Artstein [**?**], with information on the asymptotical behaviour of the fast motion as $\varepsilon \to 0^+$ given in terms of statistical convergence. In this talk we present a new dynamical interpretation of the limit behaviour of the fast motion, by using the theory of nonautonomous attractors (see, e.g., [**?**]). Some simulations are presented to illustrate the results.

References:

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[4] A.N. Tikhonov, Systems of differential equations containing a small parameter multiplying the derivative (in Russian), *Mat. Sb.* **31** (1952), 575–586.