

NONCONSTANT PERIODIC SOLUTIONS OF A NONLINEAR DELAY EQUATION

Pham Le Bach Ngoc

University of Szeged, Szeged, Hungary

The delay differential equation

$$x'(t) = -ax(t) + bf(x(t-1)) \quad (\text{E})$$

is considered where $a > 0$, $b > 0$ and a continuously differentiable function $f : \mathbb{R} \rightarrow \mathbb{R}$ satisfying $f(0) = 0$, $f'(\xi) > 0$ for $\xi \in \mathbb{R}$. It is well-known that if 0 is hyperbolic then it has a neighborhood in which there exists no nontrivial periodic orbit. By using the exponential dichotomy constants, we focus on the estimation of the optimal size of this neighborhood. The aim is to construct the neighborhood as large as possible in order to be able to carry out a verified numerical step for equation (E).

- [1] O. DIEKMANN, ET AL., *Delay Equations: Functional-, Complex-, and Nonlinear Analysis*, Applied Mathematical Sciences, Vol. 110, Springer-Verlag, New York, 1995.
- [2] A. B. FERENC, T. KRISZTIN, A. VÍGH, Stable periodic orbits for the Mackey–Glass equation, *J. Differ. Equ.* **296** (2021), 15–49.
- [3] J. HALE, S. M. V. LUNEL, *Introduction to Functional Differential Equations*, Vol. 99, Springer-Verlag, New York, 1993.
- [4] T. KRISZTIN, H. O. WALTHER, J. WU, *Shape, Smoothness and Invariant Stratification of an Attracting Set for Delayed Monotone Positive Feedback*, American Mathematical Society, Vol. 11, Rhode Island, 1999.
- [5] T. KRISZTIN, Periodic solutions with long period for the Mackey–Glass equation, *Electron. J. Qual. Theory Differ. Equ.* **83** (2020), 1–12.