Saddle-node bifurcation of periodic orbits for a delay differential equation

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At the beginning of the talk we give a brief introduction to delay differential equations, and then we consider the scalar delay differential equation

$$\dot{x}(t) = -x(t) + f_K(x(t-1))$$

with a nondecreasing feedback function f_K depending on a parameter K. We verify that a saddle-node-like bifurcation of periodic orbits takes place as K varies: there exists a threshold parameter K^* such that the equation has no periodic orbits for $K < K^*$, it has exactly one for $K = K^*$, and it admits two periodic orbits for $K > K^*$.

The nonlinearity f_K is chosen so that it has two unstable fixed points (hence the dynamical system has two unstable equilibria), and these fixed points remain bounded away from each other as K changes. The generated periodic orbits are of large amplitude in the sense that they oscillate about both unstable fixed points of f_K.

[1] Sz. Guzsvány, G. Vas, Saddle-node bifurcation of periodic orbits for a delay differential equation, in preparation.

[2] T. Krisztin, G. Vas, Large-amplitude periodic solutions for differential equations with delayed monotone positive feedback. *J. Dynam. Differential Equations* **23** (2011), no. 4, 727 – 790.