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Periodic solutions for nonlinear dynamic equations via topological degree

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The theory of dynamic equations on time scales is very recent in the literature, it was introduced by Stefan Hilger in 1988 in his PhD thesis and, through the years, it has been attracting the attention of many mathematicians. On the other hand, the investigation about global bifurcation for dynamic equations on time scales is still very scarce. In the talk, we present a global bifurcation result, recently obtained in [1], for nonlinear dynamic equations on time scales with Dirichlet boundary conditions, and depending on a real parameter λ, of the form

$$\begin{cases} x^{\Delta}(t) + \lambda\phi(t, x(t), x^{\Delta(t)}) + \lambda\psi(t, x(t)) = 0 \\ x(0) = x(T), \end{cases} \tag{1}$$

where

- $x^{\Delta}(t)$ is the so-called Δ–derivative of x;
- the variable of x belongs to a periodic time scale $\mathbb{T}$ of a positive period $T \in \mathbb{T}$;
- $\phi : \mathbb{T} \times \mathbb{R}^n \times \mathbb{R}^n \to \mathbb{T}^n$ and $\psi : \mathbb{T} \times \mathbb{R}^n \to \mathbb{R}^n$ are T-periodic with respect to the first variable and continuous in the domain.

(Other suitable conditions are assumed, here omitted for reasons of conciseness.) The approach is topological and based on a notion of topological degree for compact perturbations on nonlinear Fredholm maps in Banach spaces.

The result is in collaboration with J.G. Mesquita and A. Pereira.

References

[1] Benevieri Pierluigi, Mesquita Jaqueline, Pereira Aldo, *Global bifurcation results for nonlinear dynamic equations on time scales*, J. Differential Equations. 269 (12) (2020), 11252–11278.