UCA Universidad de Cádiz

Programa de Doctorado en Matemáticas

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Maximal regularity in l_p spaces for fractional lattice models

a cargo de

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Resumen: In this talk, we present a new method based on operator-valued Fourier multipliers to characterize the existence and uniqueness of ℓ_p-solutions for discrete time fractional models in the form

$$\Delta^{\alpha} u(n,x) = Au(n,x) + \sum_{j=1}^{k} \beta_j u(n-\tau_j, x) + f(n, u(n,x)),$$

$$\text{with } n \in \mathbb{Z}, x \in \Omega \subset \mathbb{R}^N, \beta_j \in \mathbb{R} \text{ and } \tau_j \in \mathbb{Z},$$

where A is a closed linear operator defined on a Banach space X and Δ^{α} denotes the Grünwald-Letnikov fractional derivative of order $\alpha > 0$. If X is a UMD space, we provide this characterization only in terms of the R-boundedness of the operator-valued symbol associated to the abstract model. In the nonlinear situation, we prove a useful criterion for existence of ℓ_p-solutions based on the implicit function theorem. We introduce the discrete fractional Fisher and Nagumo equations with small external forcing term and we prove the existence of solutions for such equations in the setting of Lebesgue spaces of sequences and in terms of the size of the coupling coefficient. To illustrate our results, we derive new qualitative properties of nonlinear difference equations with shiftings, including fractional versions of the logistic and Nagumo equations.

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