OPTIMAL CONTROL OF SYSTEMS DETERMINED BY STRONGLY NONLINEAR OPERATOR VALUED MEASURES

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Abstract

In this paper we consider a class of distributed parameter systems (partial differential equations) determined by strongly nonlinear operator valued measures in the setting of the Gelfand triple $V \hookrightarrow H \hookrightarrow V^*$ with continuous and dense embeddings where $H$ is a separable Hilbert space and $V$ is a reflexive Banach space with dual $V^*$. The system is given by

$$dx + A(dt,x) = f(t,x)\gamma(dt) + B(t)u(dt), \quad x(0) = \xi, \quad t \in I \equiv [0,T]$$

where $A$ is a strongly nonlinear operator valued measure mapping $\Sigma \times V$ to $V^*$ with $\Sigma$ denoting the sigma algebra of subsets of the set $I$ and $f$ is a nonlinear operator mapping $I \times H$ to $H$, $\gamma$ is a countably additive bounded positive measure and the control $u$ is a suitable vector measure. We present existence, uniqueness and regularity properties of weak solutions and then prove the existence of optimal controls (vector valued measures) for a class of control problems.

Keywords: evolution equations, strongly nonlinear operator valued measures, existence of solutions, regularity properties, optimal control.

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