Neutral Functional Equations with Causal Operators on a Semi-Axis

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Received: February 28, 2008; Revised: September 15, 2008

Abstract: This paper is concerned with the global study of a certain class of functional differential equation involving causal (abstract Volterra) operators on a certain function space $E(R_+, R^n)$. It is closely related to our previous joint papers, listed in the References, the difference being motivated by the fact that we consider new function spaces on the half-axis $R_+$. The approach in this paper is also somewhat different than in preceding papers, by C. Corduneanu, the results being also different. A dynamical interpretation is also indicated.

Keywords: Neutral functional equations; causal operators; global existence.

Mathematics Subject Classification (2000): 34K05, 34K25, 34K40.

1 Statement of the Problem

Let us consider the functional differential equation

\[
\frac{d}{dt} \left[ \frac{dx(t)}{dt} - (Lx)(t) \right] = (Vx)(t), \quad t \in R_+,
\]

where $x \in R^n$, $n \geq 1$ is an integer, and $L, V$ are causal operators acting on the function space $C(R_+, R^n)$, consisting of all continuous maps from $R_+$ into $R^n$, the topology/convergence being defined by the family of semi-norms $\{ |x|_k : k \geq 1 \}$, with

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