



Existence of a Regular Solution to Quasilinear Implicit Integrodifferential Equations in Banach Space

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Abstract: In the present work, we establish first the existence of a unique local mild solution using contraction mapping theorem and after that the existence of a local classical solution to a class of quasilinear implicit integrodifferential equations in a Banach space. Finally, we demonstrate one application of the results established.

Keywords: *quasilinear evolution equation; mild solution; classical solution; contraction mapping theorem; C_0 -semigroups.*

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1 Introduction

Let X and Y be two real Banach spaces such that the embedding $Y \hookrightarrow X$ is dense and continuous. Consider the following quasilinear implicit integrodifferential equation in X

$$\frac{du(t)}{dt} + A(t, u(t))u(t) = f(t, u(t), G(u)(t)), \quad 0 < t \leq T, \quad u(0) = u_0, \quad (1)$$

where $0 < T < \infty$, $A(t, u)$ is a linear operator in X for each u in an open subset W of X , G is a nonlinear Volterra integral operator defined from $C(J, X)$ into $C(J, X)$ where $J = [0, T]$ and the nonlinear map f is defined from $J \times W \times W$ into X . We follow the approach of T. Kato [13, 16, 17] to establish the existence of a unique *classical solution* to (1) under the assumptions (H1)-(H8) to be stated in the next section.

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