ON SOLVABILITY OF URYSOHN-VOLterra
EQUATIONS WITH HYSTERESIS
IN WEIGHTED SPACES

MOHAMED ABDALLA DARWISH

ABSTRACT. This paper concerns the unique solvability of the nonlinear integral equations of the second kind with hysteresis of the form

\[ y(t) = f(t) + \int_{-\infty}^t F(t, s, y(s), W[S[y]](s)) \, ds, \quad 0 \leq t \leq T \]

in weighted spaces. Also we have treated the case of nonlinear integral equations of the first kind with hysteresis.

1. Introduction. There are various ways in which hysteretic behavior of a system can be related to an integral equation. One particular setting, which has been studied by many authors, is using a convolution integral to describe the memory of a given system. The memory is characterized by the convolution kernel and thus the evolution depends on all past values of the state; typically, as one goes back in time, the influence of the past values of the present evolution decreases. There are, however, several hysteretic phenomena which cannot be treated by this method; in particular, it cannot be used to describe a hysteretic system whose hysteresis loops do not depend on the speed with which they are traversed. This property is called rate independence and is inherently nonlinear. In [2]–[4] we discuss systems where a Urysohn-Volterra integral equation is coupled to a rate independent hysteretic process. For more information about hysteresis, for instance, see [1], [6], [9].

In this paper we consider a nonlinear integral equation of the second kind with hysteresis, namely,

\[ y(t) = f(t) + \int_{-\infty}^t F(t, s, y(s), W[S[y]](s)) \, ds, \quad 0 \leq t \leq T, \]

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