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

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

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

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,

$$y(t) = f(t) + \int_{-\infty}^{t} F(t, s, y(s), \mathcal{W}[S[y]](s))\, ds, \quad 0 \le t \le T, \tag{1.1}$$

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