EXISTENCE AND UNIQUENESS OF SOLUTIONS OF NONLINEAR IMPLICIT FRACTIONAL DIFFERENTIAL EQUATIONS

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Abstract. In the present paper, we study the existence and uniqueness of solution for system of nonlinear implicit fractional differential equations. The fixed point theory is successfully applied to obtain the results.

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1   Introduction

Fractional differential equations have numerous applications in nonlinear waves of earthquake, modeling the seepage flow in porous media and in fluid dynamics, memory mechanism and hereditary properties of materials (see for details [11, 19, 21] and references therein). Some recent existence-uniqueness results of solutions for fractional differential equations with initial condition, periodic boundary conditions, integral boundary conditions and nonlinear boundary conditions can be found in [1]-[4],[5]-[8],[12]-[7],[20, 22, 23].

In this paper, we study the existence and uniqueness for the following nonlinear initial value problem (IVP) for system of implicit fractional differential equations

$$\begin{cases} \mathfrak{D}_1^\alpha x(t) = f(t, x(t), \mathfrak{D}_1^\alpha x(t)), & t \in J = [1, T], T > 1, \\ x^{(k)}(1) = x_k, & x_k \in \mathbb{R}^n, \quad k = 0, 1, \cdots, m - 1, \end{cases} \tag{1}$$