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MONOTONE TECHNIQUE FOR SYSTEM OF CAPUTO FRACTIONAL DIFFERENTIAL EQUATIONS WITH PERIODIC BOUNDARY CONDITIONS

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Abstract. Monotone technique is developed for weakly coupled system of Caputo fractional differential equations with periodic boundary conditions by introducing the notion of lower and upper solutions. Two monotone convergent sequences are constructed one which is monotone increasing and bounded below and another one which is monotone decreasing and bounded above. This method is applied to obtain existence and uniqueness of solution of periodic boundary value problem for Caputo fractional differential equations.

Keywords. Fractional Differential Equations, Monotone Iterative Technique, Periodic Boundary Value Problem.

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1 Introduction

Fractional models and the applications of the fractional differential equations are found in the following two monographic works by Podlubny [14] and Kilbas, Srivastava and Trujillo [5] and references therein. There are some good methods for studying fractional differential equations such as power series method, compositional method and transform method (see details in [2, 5, 14] and references therein). The monotone iterative technique [6] is an effective technique that offers theoretical as well as constructive results in a closed set, namely the sector. It is also useful for the investigation of qualitative properties of solutions. Differential inequality approach [10, 11] is successfully applied to develop basic theory of fractional differential equations involving Riemann-Liouville fractional differential operators [8] of arbitrary order $q\,(0 < q < 1)$. The general existence and uniqueness of solutions of initial value problem for Riemann-Liouville fractional differential equations are proved in [9], which exhibits the idea of comparison principle.Lakshmikantham and Vatsala [7] have developed the monotone method