

MONOTONE ITERATIVE TECHNIQUE FOR FRACTIONAL DIFFERENTIAL EQUATIONS WITH NONLINEAR BOUNDARY CONDITIONS

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Abstract. The aim of this paper is to develop the monotone iterative technique by introducing the notion of upper and lower solutions. Under suitable initial iterations two monotone sequences are constructed. It is shown that these two sequences converge monotonically from above and below respectively to maximal and minimal solutions of nonlinear fractional differential equations which leads to existence and uniqueness of solution of nonlinear boundary value problem for Riemann - Liouville fractional differential equations.

Keywords. Nonlinear boundary value problem, Fractional differential equation, Upper and lower solutions, Existence and uniqueness results

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1 Introduction

Fractional differential equations play an important role in the field of science and engineering (see [9]-[11],[17] and references therein). The existence and uniqueness of solution of fractional differential equations under different boundary conditions are studied by various researchers in [1]- [8],[12]-[15],[18]-[25]. The monotone technique is constructive and computational technique used in the study of existence and uniqueness of solution of various problems for fractional differential equations. We develop monotone technique and prove existence and uniqueness of solution of nonlinear boundary value problem (NBVP) for Riemann - Liouville fractional differential equation.

We organize the paper as follows. Section 2 deals with upper and lower solutions of nonlinear boundary value problem for Riemann-Liouville fractional differential equation. Some basic but useful lemmas are also given. In section 3 existence and uniqueness of solution of nonlinear boundary value problem for Riemann - Liouville fractional differential equation are proved.