

INITIAL TIME DIFFERENCE BOUNDEDNESS CRITERIA AND LAGRANGE STABILITY

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Abstract. This paper investigates initial time difference boundedness criteria and Lagrange stability by employing Lyapunov-like functions to establish comparison result.

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1 Introduction

The method of Lyapunov functions has been employed with great success in a wide variety of investigations to understand qualitative and quantitative properties of dynamic systems for many years. The application of Lyapunov's second method in boundedness theory [2, 4] has the advantage of not requiring knowledge of solutions. Variation of parameters techniques [1] have wide application in boundedness as well. In this paper, we apply these effective and fruitful techniques with Lyapunov-like functions [4] to obtain boundedness and Lagrange stability criteria for nonlinear differential systems with an initial time difference. We give sufficient condition for boundedness and Lagrange stability, for a perturbed differential system with respect to an unperturbed differential system that differs both in initial time and initial position. In Section 2, we give the definitions necessary for our analysis of initial time difference boundedness and Lagrange stability. In section 3 and 4, comparing classical boundedness and Lagrange stability with ITD boundedness and Lagrange stability and main result are given, respectively. Then, in section 5, we present an example to illustrate the main idea.

2 Notation and Definitions

Let us consider the nonlinear differential systems