



Stability in Terms of Two Measures for Matrix Differential Equations and Graph Differential Equations

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Abstract: In this paper, an attempt has been made to study the qualitative theory of MDEs and its associated GDEs using the Lyapunov function and the concepts of stability in terms of two measures. The theory is well supported with examples. Further, a comparison method wherein the Lyapunov function is used to simplify the complicated MDE is given.

Keywords: *matrix differential equations; graph differential equations; stability in two measures.*

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1 Introduction

Any natural or manmade systems involve interactions between its constituents, which can be considered as interconnections between them. These interconnections form a network, which can be expressed by a graph [12, 2]. Also, graphs arise naturally when one models organizational structures in social sciences [10]. It has been observed that while many social phenomena change with respect to time, modeling them using static graphs has limited the study. Thus a dynamic graph, a graph that changes with time was introduced [12]. This also led to the concept of a rate of change of a graph with respect to time and a graph differential equation [12]. These concepts were introduced and successfully utilized to study the stability of complex dynamic systems through its associated adjacency matrix [12].

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