شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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HANAA ALY

APPLICATIONS OF FRACTIONAL ORDER ELEMENTS AND MEM-ELEMENTS IN ELECTRONIC CIRCUITS

By

Nariman Abdo Khalil Hussein

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
DOCTOR OF PHILOSOPHY
in
Electronics and Communications Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:
Applications of fractional order elements and mem-elements in electronic circuits
Keywords:
Fractional order elements emulator; Fractional order memelements emulator; Fractional filter and inverse filter; Chaotic system

Summary:
This work aims to apply the fractional-order elements and mem-elements in analog circuit design. A general prototype fractional-order filter based on a two-port network concept with four external impedances is investigated. Ten possible generalized topologies are introduced where the necessary network conditions and the critical frequencies are presented. Besides, a generalized prototype topology of fractional order inverse filters (FOIF) is presented based on operational trans-resistance amplifiers and second-generation current conveyor. The fractional-order parameters increase design flexibility and controllability, which is validated experimentally. The fractional-order systems are extended to memristive element modeling. The realization of grounded and floating fractional-order mem-elements (FOMEs) using the generalized emulator. Two- and three-port mutators are used to realize different FOMEs employing different combinations of impedances. The FOMEs are applied to Chau's circuit showing the effect of fractional-order on the chaotic behavior. Circuit simulations and experimental results for the presented circuits are introduced to validate the theoretical findings.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification to any other university or institute.

I further declare that I have appropriately acknowledged all the used sources and have cited them in the reference section.

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Table of Contents

List of Tables

List of Figures