

CHAPTER 16

ELECTRONICS AND COMMUNICATION ENGINEERING

Doctoral Theses

090. ATTIMARAD (Girish Veerabhadra)
Study of Discontinuities in Open Waveguide.
Supervisor : Prof. Asok De
Th 14206

Abstract

The Scattering parameters for the two dimensional open waveguide step junction will help the design engineer to develop the highly accurate and reliable circuit. If we can avoid any mode conversion, we might then be able to design the structure to enlarge the cross section of particular mode in a slow and controlled manner. The taper would then acts as a beam expander, for use as a matching section between two different open waveguides.

Contents

1. Introduction. 2. Introduction to Open Waveguides. 3. Analysis of Single Step Discontinuity in Open Waveguide. 4. Analysis of Two Dimensional Taper in Open Waveguide. 5. Analysis of Two Dimensional Exponential Taper and Taper with Triangular Distribution. 6. Discussion & Conclusion. References and Appendixes.

091. GUPTA (S S)
Realisation of Some Classes of Linear / Nonlinear Analog Electronic Circuits Using Current-mode Building Blocks.
Supervisor : Prof. Raj Senani
Th 14329

Abstract

The classes of circuits considered include voltage-mode and current-mode filter networks, single resistance controlled oscillators (SRCO) and chaotic nonlinear oscillators. The building blocks that have been employed to realise various

signal processing / signal generating circuits are Current Conveyors, Current feedback operational amplifiers (CFOA), unity-gain voltage followers and current followers and other related elements. Because of their several advantages, current-mode circuits and techniques have attracted considerable attention during the past two decades as alternatives to the traditional voltage-mode techniques. In several cases, current-mode circuits provide attractive alternatives to their voltage-mode counterparts in terms of better accuracy, higher operational frequency range, large dynamic range, better linearity etc. The thesis is concerned with the realisation of Chua's chaotic oscillator circuit using CFOAs. Firstly, a new implementation of Chua's diode using CFOAs has been presented which has the advantage that it requires a very small number of resistors. A novel synthetic inductor employing CFOAs has been then devised. Employment of these results in a new inductorless CFOA-based Chua's circuit which offers a number of advantages over traditional op-amp-based Chua's chaotic oscillators. The proposed realisation has been experimentally verified using commercially available AD844 type CFOAs and also by PSPICE simulations. Double-scroll and Rossler attractors have been observed. It has been noticed that these attractors are obtained by varying either of the component values of R, L, and C. The second contribution is the realisation of a mixed-mode chaotic circuit which employs novel CFOA-based inductors and can work as an autonomous or a non-autonomous (driven by a voltage source) system. The workability of this circuit has also been verified by simulations.

Contents

1. Introduction. 2. Some contributions to the realisation of Universal Biquad Filters. 3. Synthesis of Single Resistance Controlled Oscillators Using CFOAs : A State-Variable Approach. 4. Synthesis of SRCOs Using Some Other Building Blocks : Extension of the State-Variable Approach. 5. Realisation of Chaotic Nonlinear Circuits Using CFOAs. 6. Conclusion.

092. MEHTA (Shashi Bhushan)
Soft Computing Techniques for the Analysis of Magnetic Resonance Images for Medical Diagnosis.
 Supervisors : Prof. A Bhattacharyya, Dr. L Mathew and
 Prof. Santanu Chaudhury
 Th 14207

Abstract

Presents different soft computing based approaches to improve the diagnostic value of the MR images. Proposes a novel neuro fuzzy based interactive visualization scheme for analyzing and generating different interpretations of 2D MR image for diagnosis and monitoring therapy progression. Presents a fuzzy rule based approach for the identification of different tissue types in T2 weighted MR images of normal brain. Using novel intensity distribution and spatial neighborhood based features. Experimental results have shown that his rule-based method can segment these images fairly accurately when compared the results with manual segmentation by radiologists. However, if the imaging parameters change due to pulse sequence, modalities change, change of RF coils etc. the nature of rules will undergo change. The possibility of using learning to make the system adaptive so that rule can be generated for different imaging modalities making the approach adaptive. A novel Genetic algorithm based Machine Learning system (GBML) for generating rules is presented. It shows segmentation results on image obtained by two different pulse sequences FSE and SE. Experimental results have shown that learnt fuzzy rules can segment images correctly. Use of evolutionary learning for devising a MR image segmentation scheme is a novel contribution. The results with manual and rule based segmentation were compared and verified with radiologists. A novel demyelination diagnostic tool based on GBML is proposed which generated fuzzy rules based on the training data set. The training data set is generated from the MR scan acquired for the same patient at different instants i.e. before radiation and after radiation at same slice location. To validate the accuracy of the tool, we performed leave one out test. Used connectionist network based unsupervised learning for feature extraction. We have used fuzzy features for making the system robust against uncertain variations. Exploited evolutionary learning for acquiring diagnostic knowledge from training data. Although knowledge based system have been designed in the past for aiding MR image based diagnosis, our approach of using evolutionary learning and fuzzy rules for designing a useful diagnosis system indicates an alternate and fruitful approach.

Contents

1. Introduction. 2. MR Imaging Revisited. 3. Soft computing based Visualization Tool for MR Images. 4. Brain Tissue Type Identification. 5. Use of Evolutionary Learning for Pixel Classification in Mr Brain Images. 6. A Diagnostic Tool : Early Detection of White Matter Changes due to Radiation Therapy in Tumor Cases. 7. Epilogue. 8. Bibliography.