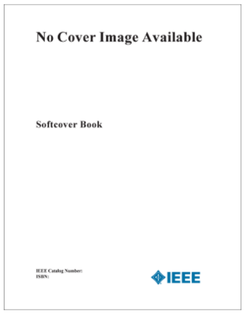

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Date : 05 OCT 2024 / Time : 8:45 AM - 10:45 AM TRACK- B1: Antennas & Propogation, Control, Instrumentation and Automation/ Power Electronics / Signal & Image Processing
Hall Name:ECE-02
Session coordinator:Mrs.Naghma Anjum
Session Chair : Dr.A.PramodKumar

Sr.No.	Paper ID	Corresponding Author Name	# Paper Title	Start time	End Time
1	554	G, Veena*; S, Bhavya Sree; Vinod, Ceron Ann ; R, Deeraj ; D, Krishnadaya	Customer Segmentation And Churn Prediction Using K Means Fuzzy And Multi-Layer Perceptron Algorithm	8.45 AM	9.00 AM
2	639	Sugganapalya Rajanna, Vinaya Kumar*; T, Venkatesh ; Tharehalli Rajanna, Puneeth Kumar	Characteristic Mode Analysis of Wideband Patch Antenna Using Dual-Mode Resonance	9.01 AM	9.15 AM
3	659	J, Elumalai*	Optimizing Inter-Cell Resource Partitioning in Network Slicing: A Game-Theoretic Approach	9.16 AM	9.30 AM
4	728	MADIWALAR, Shweta*	Designing A 8-Bit Pipeline ADC Using Cadence Virtuoso	9.31 AM	9.45 AM
5	729	M, Dinesh; C S, Sabarish; S, Yogeshwaran; John Joseph, Adri Jovin *	Network Anomaly Detection Using Borderline SMOTE Algorithm and Support Vector Machines	9.46 AM	10. 00 AM
6	749	Ravi Teja, Redagani *; Jeyanthy, P Aruna; Vishnu Vardhan Reddy, Nagireddy; Reddy , Rohini Gujula; S, Kannan ; Gowthami, Kotha Reddy Gowthami	Design Of Efficient Smart Solar-Powered Mixed Grinder For Smart Home Management	10.01 AM	10.15 AM
7	755	Kulkarni, Uma Anil*; Bhat, Vallabh; Ingale, Aditya	Design and Development of High Speed Multiplier Block for DSP Applications	10.16 AM	10.30 AM
8	759	Kandala, Mahita; M, Kaushik; G S, Vignesh; Pati, Peeta Basa*	Border Detection for Camera-Captured Document Images Using Transformers	10.30 AM	10.45 AM

Date : 05 OCT 2024 / Time : 11:30 AM- 1.30 PM TRACK- B2: Antennas & Propogation, Control, Instrumentation and Automation/ Power Electronics / Signal & Image Processing
Hall Name:ECE-02
Session coordinator:Mrs.Pallavi Singh
Session Chair : Dr Deekshitha S Nayak

Sr.No.	Paper ID	Corresponding Author Name	# Paper Title	Start time	End Time
1	761	Challapalli, Ramana Babu*	Evaluation of Various Optical Filters and Novel Modulation Technique in a 5th Generation Free Space Optical System	11.30 AM	11.45 AM
2	769	Jaya Naga Sai Manikanta, Kurakula; Kora, Madhusudhan Rao*; Guttikonda, Manideep; Kudumu, Vara Prasad	Design of UWB MIMO Antennas with Enhanced Isolation for Wearable Applications	11.45 AM	12.00 PM
3	778	Bhattacherjee, Sarbesh*; Mohapatro, Sankarsan	Experimental Comparison of High Voltage Pulse and AC Excited DBD Reactor Configurations for Diesel Exhaust Treatment	12.00 PM	12.15 PM
4	788	Priya J, Lakshmi*	Cross Wind Stabilization Using Motor Control	12.15 PM	12.30 PM
5	941	Mahata, Shibendu*; De Maity, Ritu Rani	Optimal Design of (1+α)-order Bessel Filter and its Realization using DVCC	12.30 PM	12.45 PM
6	943	Shankar, Venkatesh Gauri ; Shrivastava, Bhavya ; Devi, Bali*	An Efficient Unified System for Product Rating Prediction and Content-based Personalized Recommendations Using Amazon Data	12.45 PM	1.00 PM
7	944	Thiyagarajan, Muthamizhan*	A Solar PV fed High Gain Quasi-Resonant SEPIC Converter using LQR Controller	1.00 PM	1.15 PM
8	959	Rathnayake, Oshada*;	Ego Vehicle Speed Estimation Using Optical Flow Analysis	1.15 PM	1.30 PM

Optimal Design of (1+α)-order Bessel Filter and its Realization using DVCC

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***Abstract*—This paper presents the optimal design of fractional-order Bessel filter of order (1+α), where, $\alpha \in$ (0, 1). The optimal values of the gain term and the coefficients of the pole polynomial are determined using two efficient metaheuristics, namely the marine predators algorithm (MPA) and the geometric mean optimizer (GMO). MATLAB simulations are carried out to evaluate the fractional-order Bessel filter functions for nine distinct values of α. Comparisons between MPA and GMO based designs regarding the fitness error, execution time, and algorithm convergence profile, are presented. Comparisons with the literature highlight improved modeling accuracy for the proposed approach. Implementation of the proposed MPA-based 1.5th order Bessel filter is carried out with the differential voltage current conveyor being used as the active circuit element.**

***Index Terms*—analog circuit, analog filter, Bessel filter, fractional-order filter, marine predators algorithm, geometric mean optimizer**

I. Introduction

The extension of Newtonian calculus, namely the fractional calculus [1], has made in-roads in various practical applications. Since the fractional calculus is a generalized version of the classical calculus, hence, significant flexibility is provided in system modeling using fractional-order differential equations over the conventional approach. Corresponding applications can be found in domains such as computer vision [2], signal processing [3], epidemic modeling [4], control [5], artificial neural networks [6], chaos theory [7], etc.

Fractional-order (FO) filters provide a precise control in frequency response that may not be possible to attain using the classical filters. For example, recall that the magnitude rolls-off at –20n dB/dec for an nth-order filter, where, n is an integer number. In case of an FO filter, the roll-off is theoretically –20($n + \alpha$) dB/dec, where, α is a fractional number [8]. Application domains of FO filters include biomedical engineering [9], acoustics [10], etc.

Several works have achieved the frequency-domain characteristic of the FO filter by approximating the FO transfer function using higher integer order function (rational approximation technique) [11]–[13]. Techniques from optimization, mathematical curve-fitting, etc., have been explored for this purpose. However, direct realization of FO filters from the FO transfer function is more intuitive and reduces the overall hardware overhead. The FO Butterworth filter [14], FO Chebyshev filter [15], FO elliptic filter [16], etc., have been already realized using such a direct approach. Differential voltage current conveyor (DVCC) based realization of FO Butterworth filter was demonstrated in [17]. FO transitional filters of the Butterworth-Chebyshev, Butterwoth-Sync-tuned, and Chebyshev-Sync-tuned types were also recently implemented using current feedback operational amplifiers as an active element [18].

The optimal design of FO Bessel filter has been recently reported in [19], [20]. The filter optimization was carried out using the interior search algorithm (ISA) in [19], whereas, the simulated annealing (SA), nonlinear least squares (NLS), and firefly algorithm (FFA) were employed in [20]. The circuit realization of the FO Bessel filter was carried out using the Tow-Thomas biquad filter and the KHN biquad topologies, respectively, in [19] and [20]. While both [19], [20] dealt with the design of Bessel filter of order $(1 + \alpha)$, [21] presented the design of $(2 + \alpha)$ order Bessel filter using the same optimization algorithms considered in [20]. The group delay behavior of FO Bessel filter was studied in [22]. The Gm-C block was used to realize the FO Bessel filter of order $(1+\alpha)$ using inverse follow-the-leader feedback topology in [23].

Based on the above literature review, it may be concluded that only few works have dealt with the design and implementation of FO Bessel filter. In particular, the modeling accuracy of the existing FO Bessel filters designed using primitive algorithms such as SA, ISA, and FFA, or curve-fitting method (e.g., NLS), may be improved by employing the recently reported global-search metaheuristic algorithms. In this paper, the effectiveness of two recent metaheuristic optimization techniques, namely the marine predators algorithm (MPA) and the geometric mean optimizer (GMO), have been investigated for the design of (1+α)-order Bessel filter. The choice for selecting the two algorithms are based on the fact that MPA is a swarm-intelligence based bio-inspired algorithm, whereas, GMO is a mathematics-inspired algorithm. Thus, the two algorithms possess different search strategy mechanisms. The performances of the two algorithms have been compared regarding the fitness error, execution time, and convergence characteristic. Comparisons with the published literature [19], [20] highlight an improved accuracy for all the considered orders of the proposed filters designed

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