



Multi-objective Approach for IIR Filter Design and Bit-Width Optimization

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Abstract

Digital filter design optimization counts as one of the most challenging problems in circuit development. Furthermore, the bit-width allocation has a crucial impact on the efficiency and accuracy of fixed-point digital filters. The conventional implementation procedure involves studying the bit-width allocation problem after determining the filter coefficients. This sequential procedure leads frequently to an excessive bit-width allocation, hence an extra implementation cost. The main contribution of this paper is to propose a new implementation procedure based on the simultaneous handling of both design issues and the bit-width optimization for the infinite impulse response filter. In this study, the problem is formalized by a multi-objective programming technique using the non-dominated sorting genetic algorithm II. The joint consideration of the two problems offers a better trade-off between design and bit-width allocation. The output of our approach is compared to the results of existing algorithms. Simulation

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