Abstract

Low complexity and reconfigurability are reported to be the key features in a software defined radio (SDR). To obtain these features, a reconfigurable architecture based on frequency response masking (FRM) technique can be used for the implementation of the channel filters in the SDR. The frequency response masking approach is proved to be a good candidate for the realization of a sharp digital finite impulse response (FIR) filter with low complexity. To reduce the complexity and power consumption for hardware realization, a design method which makes the channel filters totally multiplierless is proposed in this paper. Continuous filter coefficients are first converted to finite precision coefficients using signed power of two (SPT) space to obtain a multiplier-less filter. The representation of the FRM filter coefficients in the SPT space can degrade the filter performance. This calls for the use of a suitable optimization technique. The classical gradient based optimization techniques cannot be deployed here, because the search space consists of integers. In this context, meta-heuristic algorithm is a good choice as it can be tailor made to suit the problem under consideration. They are especially useful in finding near optimal solutions in multimodal, multidimensional space. Several meta-heuristic algorithms are modified in this paper to be used for the discrete optimization.
Design of Multiplier-less Reconfigurable Non-uniform Channel Filters using Meta-heuristic Algorithms

References


Index Terms

Computer Science Circuits And Systems

Keywords

Frequency Response Masking Canonic Signed Digit Metaheuristic Optimization
Algorithms Genetic
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Gravitational Search Algorithm