Yield Maximization Technique for Microwave Circuits using NEWUOA and Space Mapping Algorithm

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Abstract

An efficient yield optimization technique for the microwave circuits is introduced. Generally, the classical design an optimization problem seeking one single point, in the designable parameter space which satisfies the design specifications. This solution is impractical from the manufacturing point of view since there are manufacturing tolerances and uncertainties (i.e., statistical fluctuations of the circuit designable parameters about their nominal values).These fluctuations may reduce parametric yield which is the percentage of the circuits in the manufacturing processes satisfying the design specifications. In this paper, reducing the undesirable effects of these statistical fluctuations is achieved.

Yield optimization of microwave circuits is obstructed by the high expense of electromagnetic simulations required in the yield estimation process in addition to the absence of any gradient information; see Abdel-Malek *et. al.* (2006). In this paper, Space Mapping (SM) surrogates using the generalized space mapping (GSM) technology; see Koziel *et. al*. (2006) is integrated with a derivative-free trust region optimization method (NEWUOA: new unconstrained optimization algorithm); see Powell (2006). Moreover, a variance reduction technique is used in the sampling process. Implementing VRT reduces the number of samples required to estimate acceptable yield values. In this paper the Latin Hypercube sampling (LHS) is employed in the sampling process; see McKay *et. al*. (1979). The technique exploits a SM-developed surrogate using minimax optimizer in the yield maximization process. Our novel approach is illustrated by practical examples showing its efficiency.

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