

ABSTRACT

Tolerance, representing permissible variation of a dimension in an engineering drawing, is synthesized by considering assembly stack-up conditions based on manufacturing cost minimization. Tolerance (stack-up) analysis is performed by approximating, with a convex polytope, the volume under a multivariate probability density function constrained by nonlinear stack-up conditions. Using the notion of a reliability index, the tolerance synthesis problem is simplified to a deterministic nonlinear programming problem. An algorithm is then developed, and is proven to converge to the global optimum through an investigation of the monotonic relations among tolerance, the reliability index, and cost. Also an automation procedure of tolerancing in computer-aided design is discussed.