The Optimization of a Wind Tunnel Balance

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Abstract:

In the wind tunnel test, the force of the wind tunnel balance is very complex because it serves as the measuring element and also the supporting mechanism. Structure of wind tunnel balance should make the different components obtain ideal output signal while the mutual interference between the measuring components is small. Wind tunnel balance designing is a very difficult problem for the stiffness and sensitivity of the balance is a pair of contradiction. This paper is trying to solve this problem of conventional six components wind tunnel balance through the use of global optimization idea based on the genetic algorithm. This paper established a wind tunnel balance mathematical model based on global optimization of the genetic algorithm, analyzed the main variables of the balance. Finally, we showed some initial values according to some prior knowledge, optimized design and the optimization results. Static calibration results verified the superiority of this optimization.

Keywords: wind tunnel balance, genetic algorithm, global optimization, signal-to-noise ratio.