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Sensitivity Based Robust Optimization Using 9 Level Orthogonal Array and Stepwise Regression

Authors : K. K. Lee, H. W. Han, H. L. Kang, T. A. Kim, S. H. Han

Abstract : For the robust optimization of the manufacturing product design, there are design objectives that must be achieved, such as a minimization of the mean and standard deviation in objective functions within the required sensitivity constraints. The authors utilized the sensitivity of objective functions and constraints with respect to the effective design variables to reduce the computational burden associated with the evaluation of the probabilities. The individual mean and sensitivity values could be estimated easily by using the 9 level orthogonal array based response surface models optimized by the stepwise regression. The present study evaluates a proposed procedure from the robust optimization of rubber domes that are commonly used for keyboard switching, by using the 9 level orthogonal array and stepwise regression along with a desirability function. In addition, a new robust optimization process, i.e., the I2GEO (Identify, Integrate, Generate, Explore and Optimize), was proposed on the basis of the robust optimization in rubber domes. The optimized results from the response surface models and the estimated results by using the finite element analysis were consistent within a small margin of error. The standard deviation of objective function is decreasing 54.17% with suggested sensitivity based robust optimization. (Business for Cooperative R&D between Industry, Academy, and Research Institute funded Korea Small and Medium Business Administration in 2017, S2455569)

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