

## 考慮設計參數變異性的最佳化研究

黃琮翰 黃峻賢<sup>1</sup> 廖國偉<sup>2</sup>

### 摘要

以可靠度為基礎的最佳化設計(Reliability-based design optimization, RBDO)將設計變數(參數)的變異性納入最佳化的設計流程。如此,所求得之最佳化設計將有更高的機會是在允許(feasible)的設計空間。應用 RBDO 最大缺點之一為其計算的費用高昂,這在實際的問題中常造成很大的困擾。本論文首先比較現行的幾種 RBDO 方法的優缺點,如雙迴圈的 RBDO(double-loop RBDO),依序最佳化與可靠度評估(Sequential Optimization and Reliability Assessment, SORA);其次,針對 SORA 提出改良(Efficient SORA, ESORA),以克服高計算量的缺點。ESORA 基本上利用單迴圈程序的優點,再配合一簡單的可靠度分析;達到符合設計目標及節省計算時間的效果。ESORA 將以一懸臂梁的數值問題加以驗證其可行性。

關鍵字: 可靠度, 最佳化, 變異性

## Reliability-Based Design Optimization in Civil Engineering

Chung-Hang Huang, Chiun-Hsian Huang<sup>1</sup> and Kuo-Wei Liao<sup>2</sup>

### ABSTRACT

Reliability-based design optimization (RBDO) incorporates probabilistic analysis into optimization process so that an optimum design has a great chance of staying in the feasible design space when the inevitable variability in design variables/parameters is considered. One of the biggest drawbacks of applying RBDO to practical problem is its high computational cost that is often impractical to industries. In search of the most suitable RBDO method for industrial applications, we first evaluated several existing RBDO approaches in detail such as the double-loop RBDO and the Sequential Optimization and Reliability Assessment (SORA). Then, based on the needs of practical problem and existing tools of optimization and reliability analysis, we proposed a more practical RBDO approach which is basically a single-loop process noted as ESORA here. Effectiveness of the ESORA is demonstrated using a simple cantilever beam problem.

Keywords: Reliability, Optimization, Variability