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SHAPE OPTIMIZATION OF INSIDE-HOLE IN TRIANGULAR RIBBED PLATE

**Abstract**

Ribbed plate is commonly used in satellite structure, and mass is the key point in satellite structure design. So it's necessary to reduce structure mass under the premise of satisfaction of mechanical property. This paper took a triangular plate with inside-hole as the study object, and made shape optimization for the inside hole to reach the target that the structure has least mass but can also satisfy mechanical property.

The shape optimization model of the triangular plate with inside-hole was built as follows: taking the structure mass as optimization target and structure intensity as constraint condition and the boundary shape of inside-hole was described as a ellipse and some independent points on the ellipse was taken as optimization variables. Considering that sequential quadratic programming (SQP) can get global solution and is better than other optimization method, so SQP was chosen as the optimization method. The analytic expression of structure mass about optimization variables was derived, and the first derivation and second derivation of structure mass about optimization variables were gotten through the expansiveness of the Taylor series. The analytic expression of the structure maximum stress about optimization variables was fitted by the method of response surface methodology (RSM). In that way, the mathematical model of SQP was built. Build the analysis model in finite element analysis software, and adjust the structure in the process of iteration and get the final optimization result. The result shows that this method can effectively reduce the structure mass, and the optimization result has stability and accuracy in some degree.

Keywords: Shape optimization; Plate with inside-hole; SQP; RSM