基 最大的 基座的拓 化

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Abstract

In order to satisfy the requirements of modern range measuring technology, photoelectric theodolites gradually develop towards lightweight and minitype design. As a consequence, the mobile theodolite is becoming a hot spot recently. New requirements are raised for the theodolite base (Figure1), which is an essential part of photoelectric theodolites. Namely, the eigenfrequencies should be high enough to satisfy the characteristics of vibration of the whole system, which is also the difficulty of research.
The topology optimization of theodolite base is presented in this article in order to improve the fundamental eigenfrequency. A mathematical model whose objective is the fundamental eigenfrequency is established based on SIMP topology optimization method. The optimization model is solved using Structural Mechanics Module of COMSOL Multiphysics® software. The sensitivity analysis is realized using the Subdomain Expressions with the formulation derived from the vibration equation. Combined with filtering methods, a clear topology structure is obtained. The numerical example demonstrates the fundamental eigenfrequency of the optimized theodolite (Figure2) base is about 28% higher than before, Additionally, the first five natural frequencies of the theodolite base are all improved to some extent, proving the validity of the design.

Reference

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[3] Sigmund, O. A 99 line topology optimization code written in Matlab [J]. Struct Multidisc Optim 21, 120–127 (2001).

Figures used in the abstract

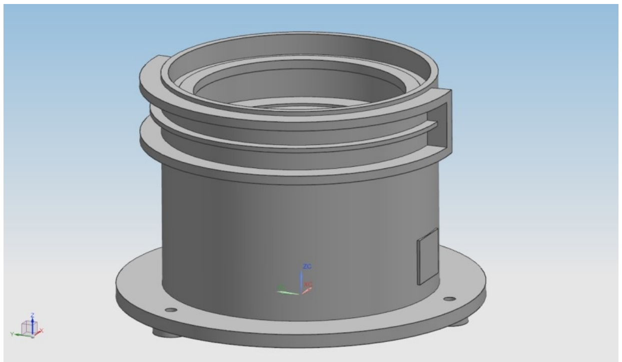

Figure 1: Theodolite base

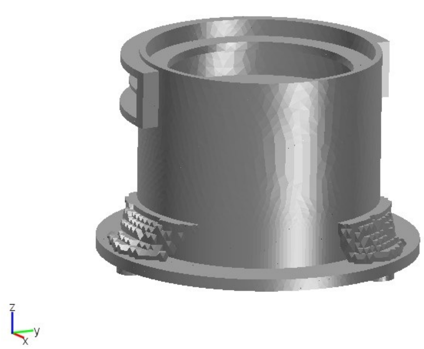

Figure 2: Topology structure

Figure 3

Figure 4