www.elsevier.com/locate/ijmecsci

An Investigation on the Ring Thickness Distribution of Disk Resonator Gyroscope with High Mechanical Sensitivity

Xin Zhou, Yulie Wu, Dingbang Xiao, Zhanqiang Hou, Qingsong Li, Dechuan Yu, Xuezhong Wu

PII: S0020-7403(16)30197-7
DOI: http://dx.doi.org/10.1016/j.ijmecsci.2016.08.020
Reference: MS3400

To appear in: *International Journal of Mechanical Sciences*

Received date: 29 January 2016
Revised date: 29 August 2016
Accepted date: 29 August 2016

Cite this article as: Xin Zhou, Yulie Wu, Dingbang Xiao, Zhanqiang Hou, Qingsong Li, Dechuan Yu and Xuezhong Wu, An Investigation on the Ring Thickness Distribution of Disk Resonator Gyroscope with High Mechanical Sensitivity, *International Journal of Mechanical Sciences* http://dx.doi.org/10.1016/j.ijmecsci.2016.08.020

An Investigation on the Ring Thickness Distribution of Disk Resonator Gyroscope with High Mechanical Sensitivity

Xin Zhou, Yulie Wu, Dingbang Xiao*, Zhanqiang Hou, Qingsong Li, Dechuan Yu, Xuezhong Wu

College of Mechatronics Engineering and Automation, National University of Defense Technology, Changsha, 410073, China

*Corresponding author. College of Mechatronics Engineering and Automation, National University of Defense Technology, Changsha, 410073, China. E-mail address: dingbangxiao@nudt.edu.cn (Dingbang Xiao)

Abstract

In this paper, we present the mechanical sensitivity improvement of a disk resonator gyroscope (DRG) by optimizing the thickness distribution of the nested rings. We calculate the mechanical sensitivity of the DRG with some given ring thickness distributions by using finite element analysis (FEA). The comparison results suggest that the ring thickness distribution has great influence on the mechanical sensitivity of the DRG. Then we introduce the bio-inspired particle swarm optimization (PSO) to study the ring thickness distribution. The globally optimized ring thickness distribution providing the maximal mechanical sensitivity is obtained and detailedly discussed. Based on this, we study how do basic structure parameters of the DRG affect the optimum ring thickness distribution. The results of this investigation can give detailed ring thickness design rules for designing series of DRGs providing the maximal