

Accepted Manuscript

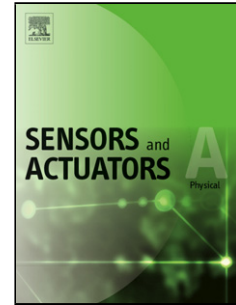
Title: Multi-axis dynamic displacement measurement based on a strain shunt structure

Authors: Qingfeng Xia, Haihu Liu

PII: S0924-4247(17)31661-8
DOI: <https://doi.org/10.1016/j.sna.2018.01.045>
Reference: SNA 10600

To appear in: *Sensors and Actuators A*

Received date: 14-9-2017
Revised date: 22-1-2018
Accepted date: 24-1-2018



Please cite this article as: Xia Q, Liu H, Multi-axis dynamic displacement measurement based on a strain shunt structure, *Sensors and Actuators: A Physical* (2018), <https://doi.org/10.1016/j.sna.2018.01.045>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Multi-axis dynamic displacement measurement based on a strain shunt structure

Qingfeng Xia¹, Haihu Liu^{2*}

¹Department of Engineering Science, University of Oxford, Parks Road, Oxford, OX1 3PL, United Kingdom

² School of Energy and Power Engineering, Xi'an Jiaotong University, 28 West Xianning Road, Xi'an 710049, China

* E-mail: haihu.liu@xjtu.edu.cn

Highlights

- An innovative multi-axis displacement sensor is proposed;
- The sensor has advantages of low-cost, low power consumption, fast response;
- Sensitivity is derived analytically from key geometrical parameters;
- The linearity of strain measurement to displacement has been experimentally validated;
- Sensor structure and gauge position are optimised by finite element analysis.

Abstract:

Transient gap or crack width monitoring is essential for structural health monitoring and failure analysis of large civil structures. In this paper, an innovative multi-axis displacement sensor, which utilises metal foil strain gauges on a strain shunt structure, has been proposed. This displacement sensor has the advantages inherited from metal foil strain sensing, such as low cost, high precision, fast dynamic response and low power consumption, and can also measure displacement in two axes independently. The working principles and sensitivity are derived theoretically from key geometrical parameters of the shunt structure, and the linear response of strain values to the given displacement of two translational axes has been demonstrated experimentally. Furthermore, modal response, stress concentration, optimal gauges installation positions and bending deformation due to moment of the third axis are studied numerically.

Download English Version:

<https://daneshyari.com/en/article/7133622>

Download Persian Version:

<https://daneshyari.com/article/7133622>

[Daneshyari.com](https://daneshyari.com)