

Structural Bending Sensor Using Fibre GratingsProc. SPIE, Vol 2292
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1994**M. G. Xu, J.-L. Archambault, L. Reekie and J. P. Dakin**Optoelectronics Research Centre, University of Southampton
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e-mail mgx@orc.soton.ac.uk**Submit to "Fiber Optic and Laser Sensors XII" (Conference Chair: Ramon P. DePaula)
at San Diego'94****Oral Presentation****Abstract**

Surface-mounted optical fibre strain gauges are showing promise for real-time monitoring of structural integrity. Engineering applications, where it is required to measure strain at a point, will benefit from having a strain gauge of small dimensions. Fibre Bragg grating sensors are particularly well suited for measuring strain, pressure and temperature. Engineering systems in which it is desired to monitor bending are often addressed by determining the surface strain in a bent structure.

However, the undesirable temperature sensitivity of the fibre grating strain sensor will, in general, complicate its application as a strain gauge. In this paper, we present a novel yet simple method of compensating for ambient temperature changes using a surface-mounted fibre grating pair. The gauge configuration involves two fibre Bragg gratings, surface-mounted on opposite surfaces of a bent mechanical structure. If two fibre gratings have the same thermal sensitivity and the mechanical beam on which they are surface-mounted is a good thermal conductor, then the difference in Bragg wavelength is thermally-independent. ie The combination is temperature compensated. In addition, the system is sensitive to bending rather than to linear strain. Experimental results using a cantilever beam are presented, which were found to be in excellent agreement with the expected strain sensitivity. A strain resolution of 9 μ strain has been obtained using this configuration, showing excellent thermal compensation.

Key Words Fibre optic sensors, strain sensing, bending Sensor, Fiber Gratings**Biography**

Ming Gang Xu is a research student at Southampton University, pursuing his PhD, having particular interests in optical fibre sensors and their interrogating systems. He is the author of 10 technical and scientific papers, and one UK patent application.