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A PROCEDURE TO EVALUATE RELIABILITY OF MEASUREMENTS IN A SMART STRUCTURE

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Summary: Fiber optic strain sensors, such as Fiber Bragg Gratings (FBG), have a great potential in the use in smart structures thanks to their small transversal size and the possibility to make an array of many sensors. They can be embedded in carbon fiber structures and their effect on the structure is nearly negligible.
This paper introduces the use of these sensors to increase the reliability of feedback measurements in smart structures designed to actively control vibration.
As known, one of the main drawbacks of these structures is the robustness of the control when one or more sensors do not work properly. In these cases the performance in reducing vibration can be seriously limited and problems of instability may occur.
The use of FBG sensors can overcome this limit thanks to the large number of available measurements. This paper introduces some different control alghorithms to suppress vibration and discusses the reliability of feedback measurements when failures on sensors happened. Theoretical results are supported by experimental tests on a large flexible system made of a thin cantilever beam with 14 longitudinal FBG sensors and three piezoelectric actuators (PZT).