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Paper: Fiber Optic Sensors in Structural Health Monitoring (Tutorial Invited)
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Abstracts:Structural Health Monitoring (SHM) can be understood as the integration of sensing and intelligence to enable the structure loading and damage-provoking conditions to be recorded, analyzed, localized, and predicted in such a way that nondestructive testing becomes an integral part of them. In addition, SHM systems can include actuation devices to take proper reaction or correction actions. SHM sensing requirements are very well suited for the application of optical fiber sensors (OFS), in particular, to provide integrated, quasi-distributed or fully distributed technologies. In this tutorial, after a brief introduction of the basic SHM concepts, the main fiber optic techniques available for this application are reviewed, emphasizing the four most successful ones. Then, several examples of the use of OFS in real structures are also addressed, including those from the renewable energy, transportation, civil engineering and the oil and gas industry sectors. Finally, the most relevant current technical challenges and the key sector markets are identified. This paper provides a tutorial introduction, a comprehensive background on this subject and also a forecast of the future of OFS for SHM. In addition, some of the challenges to be faced in the near future are addressed.