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Ali Masoudi

Optoelectronics Research Centre - University of Southampton, UK

Distributed acoustic sensors: Evolution and applications

The volume of research on distributed optical fibre vibration sensor, also known as distributed acoustic sensor (DAS), has increased substantially in the recent years. DAS systems owe their rising popularity to their capability of mapping vibrations along tens of kilometres of fibre. Sensing fibres can be installed in inaccessible spaces and can be engineered to withstand harsh environmental conditions. The sensing principle of DAS allows the interrogation unit of such systems to be kept at a safe distance while the sensing fibre connected to the interrogation unit can be encapsulated in several protective layers to withstand harsh conditions. The rising demand for DAS systems stem from a number of sectors including structural health monitoring (SHM) in aviation industry and civil engineering, borehole monitoring in geophysical sciences and oil industries, and real-time monitoring of complete rail and road networks for rapid decision and response. In this presentation, the principle of distributed optical fibre vibration sensor is explained. It is shown how different sensing systems use the phase of Rayleigh backscattered light to map vibrations along tens of kilometres of optical fibre. The sensing setup of the DAS system developed at the Optoelectronics Research Centre (ORC) and its operation is discussed. Finally, the results obtained from a number of field trials such as submarine-cable condition monitoring and traffic monitoring is presented.

Biography

Ali Masoudi is a Postdoctoral Research Fellow in the Optoelectronics Research Centre (ORC) at University of Southampton with broad experience in distributed optical fibre sensing systems. He received his PhD in 2015 for his work on distributed optical fibre dynamic strain sensors. He is currently working on an EPSRC grant to develop a distributed fibre optic acoustic sensor for railway signalling and health monitoring as well as RAEng seed grant for smart city project. His research interest includes distributed optical fibre sensors (DOFS) including distributed acoustic sensors (DAS), distributed shape sensing, distributed optical fibre magnetic field sensing, and micro-fibre and nano-fibre current sensors. He has published >15 papers in international scientific journals/conferences, authored 2 patents and given 5 invited talks.

A.Masoudi@soton.ac.uk

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