Development of vibration sensors based on the polarization properties of light

Nicolas Linze¹, Pierre Tihon², Olivier Verlinden², Patrice Mégret¹ and Marc Wuilpart¹

¹ University of Mons, Electromagnetism and Telecommunications Department, Boulevard Dolez 31, 7000 Mons, Belgium
² University of Mons, Theoretical Mechanics, Dynamics and Vibrations Department, Boulevard Dolez 31, 7000 Mons, Belgium

The objective of this project is the conception of vibration sensors based on the polarization properties of light in optical fibers. It is composed of several parts: on the one hand an intrusion sensor is under development. It can be indeed considered as a simplified vibration sensor which does not need to recover the vibration spectrum. On the other hand a quasi-distributed sensor (the vibration spectrum is measured at some precise positions along the fiber) is being developed, based on the use of mechanical transducers that transform the vibration into a polarization modulation. This project is the result of a collaboration between two departments of the University of Mons.

Interest of fiber optics vibration sensor

Vibrations = health indicator of civil structures, industrial machines (modification of the vibration spectrum)
- safety (prevention of cracks and collapses)
- costs (less interruptions and maintenance costs)

Optical fibers have the ability of:
- giving quasi-distributed and distributed measurements
- being usable in harsh environments (high temperatures, nuclear, ...)

Polarization

Vibrations

Stress

Birefringence modification

SOP modification

Power modification

SOP = state of polarization

Quasi-distributed vibration sensor

Mechanical transducer

Optical fiber

Moving shaker

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