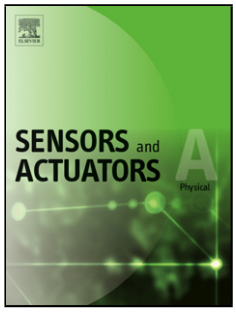

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All Fiber Torsion and Displacement Sensor Based on Image Detection

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Abstract

We propose an all-fiber-optic sensor for simultaneous rotation and displacement measurement based on elastic-optic effect in a dual mode fiber. LP_{01} and LP_{11} modes are both excited in the fiber and are distinguished using wavelength-scanning Spatially and Spectrally resolved imaging technique (S2 Imaging) to accomplish rotation and displacement detection. Mode rotation is characterized by the LP_{11} mode rotation using elastic-optic theory; a displacement area of 120 μm × 120 μm is detected and measured by recording the trace of LP_{01} mode pattern. Balance between the detection range and resolution of the sensor is adjustable by simply changing the fiber length or adjusting the relative position of fiber-end, lens and the CCD camera. Real-time detection at ∼ 0.5s per measurement speed is achieved, and twist rate and moving velocity can also be measured.

Keywords: Few mode fiber, Rotation sensor, Displacement, Fiber application, Fiber characterization

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