

How Fiber Optic Sensors Measure Shape



Overview

Fiber optic shape sensing uses embedded sensors to measure the full 3D shape of a flexible surgical device along its entire length in real time. By sensing the device itself from the inside, it provides continuous awareness of how the device bends, twists, and turns as it moves. Fiber optic shape sensing has an outstanding capability to sense curvature and shape in 2D and 3D. The technology will enable cutting-edge applications in the fields of robotic and standard minimally invasive surgery – such as real-time position tracking, instrument and catheter navigation, force. In this work, we propose a novel, computationally efficient method for determining the 3D tip position of a bent multi-core FBG-based optical fiber using a second-order polynomial approximation of the fiber's shape.



Article Content

Deep learning-based approach for high spatial resolution fibre shape ...

These findings are the preliminary steps toward a low-cost yet accurate fiber shape sensing solution for detecting complex multi-bend deformations.

Highly Accurate Position Detection and Shape Sensing

NASA's novel method was developed to more accurately measure the position and shape of optical fibers. Multi-core optical fibers contain multiple light-guiding

Fiber Optic Shape Sensors: A comprehensive review

Fiber Optic Shape Sensing is an innovative Optical Fiber Sensing Technology that uses a fiber optic cable to continuously track the 3D shape and position of a dynamic object (with unknown

Fiber optic shape sensing

The biomedical sector is currently the main integrator of fiber optic shape sensing systems. It has already found many disciplines mostly in catheter navigation and position tracking.

2D and 3D Shape Sensing Based on 7-Core Fiber Bragg Gratings

A fiber-optic shape sensing based on 7-core fiber Bragg gratings (FBGs) is proposed and experimentally demonstrated. The investigations are presented for two-dimensional and three

Rapid and Accurate Shape-Sensing Method Using a Multi-Core Fiber

In this work, we propose a novel, computationally efficient method for determining the 3D tip position of a bent multi-core FBG-based optical fiber using a second-order polynomial

Highly Accurate Position Detection and Shape Sensing with Fiber Optics ...

NASA's novel method was developed to more accurately measure the position and shape of optical fibers. Multi-core optical fibers contain multiple light-guiding cores arranged symmetrically. Sensors,

Recent developments in fibre optic shape sensing

Optical fibre sensors have experienced tremendous growth from simple bend sensors in 1980s to full three-dimensional FOSSs using multicore fibres in recent years. Following a short

Rapid and Accurate Shape-Sensing Method Using a

In this work, we propose a novel, computationally efficient method for determining the 3D tip position of a bent multi-core FBG-based optical fiber using

Deep learning-based approach for high spatial

Although the state-of-the-art fiber optic shape sensing mechanisms can provide sub-millimeter spatial resolution for off-axis strain measurement and

Structure shape measurement method based on an

In this paper, a cross-orthogonal measurement method based on optical fiber shape sensors is proposed to meet the shape measurement

Shape Sensing

This paper describes the influence of sensor distance on the accuracy of the probe and thus on the quality of the shape reconstruction. It compares four fibers with different sensor spacings and shows

Deep learning-based approach for high spatial

These findings are the preliminary steps toward a low-cost yet accurate fiber shape sensing solution for detecting complex multi-bend

The Shape Sensing Company | Fiber Optic Shape Sensing for

Fiber optic shape sensing uses embedded sensors to measure the full 3D shape of a flexible surgical device along its entire length in real time. By sensing the device itself from the inside, it provides

Fiber Optic Shape Sensors: A comprehensive review

A Fiber Optic Shape Sensor (FOSS) can be defined as fiber optic cable with multiple cores and embedded strain sensors. The working principle is the following: in each instrumented section

Structure shape measurement method based on an optical fiber shape sensor

In this paper, a cross-orthogonal measurement method based on optical fiber shape sensors is proposed to meet the shape measurement requirements of freeform surfaces.

Fiber Optic Sensors | Precision, Speed & Versatility in

Fiber Optic Sensors: Revolutionizing Precision, Speed, and Versatility in Measurement Technologies Fiber optic sensors represent a

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