

Concept of Fiber Optic Shape Sensor



Overview

Shape sensing technology based on optical fibers is a new research direction in the field of optical fiber sensing. 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. Fiber Bragg Grating (FBG) sensors inscribed in multi-core optical fibers have been democratized over the years and nowadays offer a compact and robust platform for shape reconstruction. In this work, we propose a novel, computationally efficient method for determining the 3D tip position of a bent. This work explores the potential of a nearly commercial fiber optic shape sensor (FOSS) and presents the first demonstrations of a monolithic, multicore FOSS integrated into the structure of a fiber-reinforced soft actuator. In this pilot study, we report an open loop sensorized soft actuator.



Article Content

Hot

Review on optical fiber shape sensing technology

It systematically reviews the latest domestic and international research progress on this technology, as well as its key aspects. A detailed introduction is presented, and the major limiting

Sep 25, 2025 Hot

Fiber Optic Sensor

Fiber optic sensors are defined as devices that utilize optical fibers to measure a variety of stimuli, including mechanical, thermal, electromagnetic, radiation, chemical, and flow characteristics. They

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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

Jan 10, 2026 Hot

FIBER OPTIC FOR MEDICAL APPLICATIONS

Fiber optic for medical applications – The advent and development of fiber optic shape sensing technology rely on linearly continuous shape sensors and open

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Fiber-Optical 3D Shape Sensing | Springer Nature Link

Therefore, a temperature-compensated fiber-optical 3D shape sensor consists of several sensor planes with at least three independent FBGs per plane. One possible arrangement is shown

Jul 19, 2025 Hot

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

Feb 03, 2026 Hot

Fiber optic shape sensing

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

Apr 10, 2026 Hot

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

Jun 18, 2026 Hot

Fiber optic shape sensing

Fiber optic shape sensing has an outstanding capability to sense curvature and shape in 2D and 3D.

May 08, 2026 Hot

Introduction to Fiber Optic Sensors and their Types

Article provides different types of Fiber optic sensors and applications is a sensor that uses optical fibers for sensing the element (remote sensing).

Nov 10, 2025 Hot

Fiber Optic Sensors: Fundamentals and Applications

Presentation Focus The major focus of this presentation will be on distributive fiber optic sensors which has seen the greatest usage

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Fiber-Optic Shape Sensing Using Neural Networks Operating on ...

Application of machine learning techniques on fiber speckle images to infer fiber deformation allows the use of an unmodified multimode fiber to act as a shape sensor. This approach

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CHAPTER 09 FIBER OPTIC SENSORS

communication system via using fiber optics there was a great demand to measure and sense the rate of data transmission, change in phase, intensity, and wavelength and in the case of incentive

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Fiber Optic Sensors: Types, Working Principle

Explore fiber optic sensors: their working principles, types (intrinsic, extrinsic, hybrid), and diverse applications in mechanical, chemical, and structural health monitoring.

Feb 11, 2026 Hot

Optical Fiber Sensors Guide

Optical fiber sensors offer attractive characteristics that make them very suitable and, in some cases, the only viable sensing solution. Some of the key attributes of fiber sensors are summarized below.

Sep 07, 2025 Hot

Researching | Review on optical fiber shape sensing technology

Abstract Shape sensing technology based on optical fibers is a new research direction in the field of optical fiber sensing. In recent years, fiber shape sensors have used several optical fibers with a

Feb 18, 2026 Hot

Trends and Applications of U-Shaped Fiber Optic Sensors: A Review

Intrinsic U-shaped fiber optic sensors (FOSs) are well established in the field. With greater penetration depth and evanescent power, these sensors exhibit profound sensitivity and have supported a wide

Jan 22, 2026 Hot

Advances in fiber-optic-based 3D shape sensing technology

Abstract Fiber-optic 3D shape sensing technology, renowned for its immunity to electromagnetic interference and unparalleled spatial accuracy, is indispensable for real-time

May 27, 2026 Hot

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

Jun 14, 2026 Hot

What is a Fiber Optic Sensor?

A fiber optic sensor operates with an optical fiber cable connected to a dedicated light source. These sensors offer great mounting flexibility and can be used in a

Apr 11, 2026 Hot

Rapid and Accurate Shape-Sensing Method Using a

Fiber Optic Shape Sensing itself is mainly divided into two large sensor families: distributed and quasi-distributed optical fiber sensors. The first are

May 26, 2026 Hot

Fiber Optic Shape Sensing for Soft Robotics

This work explores the potential of a nearly commercial fiber optic shape sensor (FOSS) and presents the first demonstrations of a monolithic, multicore FOSS

Jun 24, 2026 Hot

Strip-Type Embeddable Shape Sensor Based on Fiber Optics for In

This study proposes a strip-type embeddable shape sensor based on fiber optics for in situ monitoring of consolidation deformation. The sensor consists of a thin, flexible sheet with optical

Oct 12, 2025 Hot

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

Jul 15, 2025 Hot

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

Jan 03, 2026

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