

Robotic Arm Fiber Optic Sensor



Overview

This article introduces a collision monitoring system for a robotic arm based on fiber-optic sensing.

Key Takeaways

Fiber optic sensors enable robotic arms to achieve high-precision force sensing, tactile feedback, and shape perception, enhancing dexterity and control in complex tasks. Force and Tactile Sensing

Fiber optic sensors are widely used in robotic arms to detect contact forces and tactile information. Modular robotic skins equipped with fiber optic strain sensors can measure both the magnitude and location of applied forces, providing resolutions as fine as 1.45 N for force and approximately 1.85–1.91 mm for contact localization in horizontal and vertical directions. These sensors mimic biological mechanoreception, allowing robots to perceive their environment and adjust grip or motion dynamically. Such tactile feedback is crucial for dexterous manipulation, enabling robots to handle delicate objects or perform precise operations in hazardous environments.

Fingertip and Grasping Applications

Advanced fiber optic tactile sensors, such as those using macro-bending Sagnac interferometers, can be integrated into robotic fingertips. These sensors detect subtle actions like pressing, sliding, pinching, and gripping, with high sensitivity (0.05 N) and fast response times.

Article Content

Low-Cost Angle Sensor for Robotics Applications Using Plastic Optical ...

Therefore, we have developed an angle sensor based on step-index profile plastic optical fiber (SI-POF), which is cost-effective and

Fiber optic sensor embedded in robotic systems for 3-D orientation ...

Overall, a three-dimensional rotational sensor based on polymer optical fiber is a useful tool for measuring the

Collision Localization for a Robotic Arm Based on Fiber-Optic Sensing ...

This article introduces a collision monitoring system for a robotic arm based on fiber-optic sensing. The system

Low-Cost Angle Sensor for Robotics Applications Using Plastic Optical ...

Therefore, it can be a good option as a sensor for measuring angles when applied to joint parts such as robot arms in an extreme

Fibertouch: A novel fiber-optic tactile sensor with deep learning ...

This article presents a novel soft tactile force sensor based on seven FBGs, introducing an innovative force sensing

Soft and Highly-Integrated Optical Fiber Bending Sensors for ...

We propose a semi-automated printing process where plastic optical fibers are embedded with readout electronics in

Optical Fibre Based Angle Measurement for Robotic Joints

Abstract: A multiplexed array of optical fibre based angle sensors for deployment on multiple joints of a robotic arm is demonstrated.

Fiber-Optic Force Sensing of Modular Robotic Skin for Remote and ...

In this study, we propose the design of modular robotic skin, capable of detecting the magnitude and the location of a contact force

Fiber optic sensor embedded in robotic systems for 3-D orientation ...

The present work is considered to installed sensor system to the robotics system. The structure of 3-D rotational

Optical Force and Torque Sensor for Flexible Robotic Manipulators

Force and torque sensors integrated into the STIFF-FLOP soft manipulator: fiber optic and optoelectronic technologies

Movement Detection in Soft Robotic Gripper Using Sinusoidally

Fiber Bragg grating (FBG)-based sensors are very popular among various fiber optic sensors, but their stiff nature

(PDF) A Bioinspired Robotic Finger for Multimodal Tactile Sensing ...

A Bioinspired Robotic Finger for Multimodal Tactile Sensing Powered by Fiber Optic Sensors Baijin Mao, Kunyu Zhou,

Color-Coded Fiber-Optic Tactile Sensor for an Elastomeric Robot

Abstract—The sense of touch is essential for reliable mapping between the environment and a robot which interacts physically with

Fiber-Optic Force Sensing of Modular Robotic Skin for Remote and ...

A force applied to the skin cover causes the bending of the beam, which is detected by fiber optic strain sensors. The

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Alternative miniature sensor types include optical light intensity-based sensors, for example fibre optics or optoelectronic sensors.

Fiber Optic Sensors in Tactile Sensing: A Review

Fiber Optic Sensors in Tactile Sensing: A Review Abstract: Tactile is an important source of information for people to explore the

Fiber-optic-based force and shape sensing in surgical robots: a review ...

With the increasing development of the surgical robots, the opto-mechatronic technologies are more potential in the

Single-ended robotic arm pose sensor based on a multimode fiber

We propose and demonstrate a single-ended multimode fiber (MMF)-based shape sensor for robotic arm pose estimation. Swept

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