Full-Angle OCT Probe for 360-Degree View in Endoscopic Scanning

Published date: May 14, 2019

Technology description

Broadens Scanning Angle to Capture Full Circumferential Optical Scan in One Insertion of the Probe, Reducing Patient Discomfort

This optical coherence tomography (OCT) probe uses an electrothermal microelectromechanical systems (MEMS) mirror kept in liquid to increase the optical scan range and shock resistance of OCT probes. OCT is a medical imaging technique that captures real-time, cross-sectional images from within tissue, which is vital for detecting cancers early, since most originate from within internal organs. OCT eliminates the risk of ionizing radiation, a problem with available imaging techniques, and produces high resolution images revealing detail down to micrometers. Electrothermal MEMS mirrors are useful in endoscopic OCT image probes because of their small size, high fill factor and low driving voltage. These mirrors, however, only offer a 60-degree scanning angle. This poses a problem in the case of bronchial scans, for example, which require a 360-degree full circumferential optical scan. Available MEMS OCT probes require multiple insertions of the probe inside the trachea in order to capture a full circumferential optical scan, which causes significant pain or discomfort for patients. To address this, University of Florida researchers have developed a MEMS OCT imaging probe that scans a full internal circumference in one insertion. The MEMS mirror immersed in liquid produces a Snell's window effect that amplifies the optical scan range and increases the shock resistance of the probe.

Technology

Available MEMS mirrors cannot work properly in liquid. The mirrors developed by University of Florida researchers have a large gap under the mirror plate in the substrate, which allows liquid to fill in while reducing the squeeze-film damping. The gap also allows the mirror plate to rotate in the liquid without causing stiction. When these mirrors are kept in liquid, the refraction of the light through the liquid creates a Snell’ s effect that significantly amplifies the optical scan angle. This effect is very similar to the effect of a fisheye lens, and allows an OCT probe to view a full-circumferential image of a bronchi or other tubular organ with only one insertion into the patient.

Application area

An OCT probe with a broad scanning angle that can capture a full-circumferential image of a tubular organ such as the bronchi with only one insertion

Advantages

Increases the OCT probe’ s scanning angle to fully capture the image of an interior circumference in one insertion, eliminating the need for multiple uncomfortable insertions of the probe
Houses the MEMS mirror in liquid, improving durability and shock resistance of the probe
Produces high resolution endoscopic images, detecting cancers that originate from within internal organs

Institution

University of Florida

Inventors

Sanjeev Koppal
Assistant Professor
ELECTRICAL / COMPUTER ENG

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com