



TECHNOLOGY

Coherence-gated Doppler: A fiber sensor for precise localization of blood flow

OVERVIEW

Coherence Gated Doppler (CGD) is an optical fiber sensor technology that combines the strengths of two optical technologies, the laser Doppler flowmetry (LDF) and the optical coherence tomography (OCT). The current LDF technology remains highly sensitive but suboptimal for localization of flow signals while the OCT and its Doppler variant, DOCT, has confocal capability but lacks an effective detection zone limiting its ability to detect weak signals. The CGD is a hybrid of these two optical technologies with an audio output similar to that of Doppler, but optimized to detect an intermediate size region. The CGD enables highly sensitive detection within a localized region of interest. The CGD technology is applicable for use in detection and quantification of flow in the vessels of living tissue utilizing a sensor probe. Current proof-of-concept studies are ongoing for the detection of blood flow in the root of teeth to assess tooth vitality. Other applications may be used in conjunction with catheters and needles within the medical field. Additional advantages of the CGD include simpler operation, small size, and increased durability than either of its parent technologies. These characteristics endow the CGD with the ability to serve multiple biomedical applications. (e.g. real-time guidance in interventional radiology and minimally invasive surgery)

APPLICATIONS

One important application for the CGD device is the detection of tooth vitality during routine dental procedures, best determined by the presence or absence of blood flow within the root of a tooth. Current methods rely on the sensitivity of pulpal nerves to thermal/electrical stimuli, and that method is unreliable. The practice of passive monitoring for changes in the tooth can result in inflammatory root reabsorption, loss of the tooth, and need for bone graft before any subsequent implant procedure. The CGD device addresses current deficiencies in endodontic diagnosis – by reliable and non-invasive means – to determine tooth viability, identify cases with irreversible pulpal pathology and prevent the development of acute dental emergencies. The target market for the CGD device are the nearly 200,000 dentist offices that perform crown and filling procedures and the estimated 15 million endodontic procedures performed each year.

ADVANTAGES

- *In dentistry*: Non-invasive measurement of tooth pulp vitality
- Blood vessel detection during "blind" medical interventions
- Determination of front of probe or catheter during a medical intervention (i.e. tissue, fluid)
- Determination and measurement of flow at the sensor tip

STAGE OF DEVELOPMENT

Prototype developed - testing and optimization ongoing

R&D REQUIRED

N/A

LICENSING POTENTIAL

UM seeks to develop and commercialize by an exclusive or non-exclusive license agreement and/or sponsored research with a company active in the area.

CONTACT INFO

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Additional Information

INSTITUTION

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PATENT STATUS

US patent 9,486,140 issued 11/8/2016

LICENSE STATUS

Available for licensing

CATEGORIES

- Devices
- Surgical devices

INVESTIGATOR(S)

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ATTACHMENTS

-  [Download CT-2013-008.pdf](#)

EXTERNAL RESOURCES

- [Coherence-gated Doppler: a fiber sensor for precise localization of blood flow.](#)

CT-2013-008