

# System enhancements for ophthalmic surgical microscope mounted optical coherence tomography

## Value proposition

Optical coherence tomography (OCT) has emerged as a promising imaging technique for micrometer-scale noninvasive imaging in ophthalmic applications. Intraoperative guidance of surgical procedures using OCT holds promise to aid surgeons in visualizing microscopic tissue structures in preparation for and during surgery. The microscope-mounted OCT system (MMOCT) provides a way to use OCT in a surgical setting, but a limitation remains with the acquisition and processing rates of OCT datasets.

## Technology

Duke inventors aim to address this issue through the microscope-integrated OCT (MIOCT) system. Duke's MIOCT integrates OCT imaging into the optical path of a surgical microscope for direct and OCT imaging. Specifically, MIOCT provides a feedback control system to localize OCT image data acquisition to the region of the tip of the surgical tool or tissue interaction site. This is accomplished by tracking a predetermined feature of interest on the surgical tool. It then uses that information to determine the relative position the OCT system. Then, the OCT image capture is controlled from this relative position to the feature of interest. The feedback systems for the surgeon may be optimized and integrated into the surgeon's control, eliminating the requirement of an assistant to operate the OCT driving software and manually adjust the reference arm. MIOCT imaging was performed in cadaveric porcine eyes and was demonstrated to successfully control image data acquisition.

## Advantages

- Feedback rapidly provided to the surgeon
- Provides control to surgeon, eliminating the need for an assistant to operate the OCT
- Less intrasurgical disruption than previous intrasurgical OCT protocols
- Near real-time intrasurgical imaging
- Provides critical depth-resolved information for ophthalmic surgery

# Duke

## LICENSING & VENTURES

### Duke File (IDF) #

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### Links

- [Dr. Joseph Izatt's Research Website](#)
- [Dr. Cynthia Toth's Research Website](#)

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## Publications

- [Tao, Y. K., Ehlers, J. P., Toth, C. A. & Izatt, J. A. Visualization of vitreoretinal surgical manipulations using intraoperative spectral domain optical coherence tomography. in Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine XV 7889, 78890F \(International Society for Optics and Photonics, 2011\).](#)
- [Ehlers, J. P., Tao, Y. K., Farsiu, S., Maldonado, R., Izatt, J. A. & Toth, C. A. Integration of a Spectral Domain Optical Coherence Tomography System into a Surgical Microscope for Intraoperative Imaging. Invest Ophthalmol Vis Sci 52, 3153-3159 \(2011\).](#)
- [US Patent Application 13/353,612](#)
- [US Patent Application 14/823,412](#)

## Patents

Patent Number: 14/823,412

Title: IMAGING AND VISUALIZATION SYSTEMS,  
INSTRUMENTS, AND METHODS USING OPTICAL  
COHERENCE TOMOGRAPHY

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