

#### Duke File (IDF) Number

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#### Meet the Inventors

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#### External Link(s)

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

## Stereoscopic heads-up display for displaying surgical data in a Surgical Microscope

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### Value proposition

Typically, microsurgical systems have a console for controlling surgical parameters or visualizing imaging data. In ophthalmic surgeries, the consoles can be used to display Optical Coherence Tomography (OCT) data, which enables great improvements in imaging but which the surgeon cannot see without looking away from the microscope. To address this, a heads-up display (HUD) was designed to allow the surgeon to visualize OCT images and microscope images simultaneously. Until now, the HUD only provided 2D data, greatly limiting a surgeon's depth perception during surgery. Duke's new stereoscopic HUD allows for volumetric imaging of OCT data. In this novel HUD, the 3D data of OCT images is provided real-time with intraoperative feedback to guide surgeries.

### Technology

Duke's stereoscopic HUD is a compact design that displays stereoscopic images utilizing a single organic light-emitting diode (OLED) or similar micro display for Microscope Integrated OCT (MIOCT) in ophthalmic microsurgical procedures. Two beam splitters are rotated relative to each other in order to direct different halves of the micro display to different oculars in the HUD. Then, when the HUD shows corresponding images for the two oculars, the user's brain is able to fuse the images together to create stereoscopic images. This enables real-time volumetric OCT imaging. The overall direction of view is rotatable by a commercial foot joystick by surgeon while operating in real time. Further, the HUD allows for incorporating with Swept-Source MIOCT (SS-MIOCT), thereby enabling real-time volumetric imaging of 3D images during surgical maneuvers. The presented invention may also be adapted to be integrated with head mounted display or with other microscopes to display stereoscopic volumetric images of many other types of samples. To date, at least five ophthalmic surgeons have used the HUD during simulated surgeries or human vitreoretinal surgeries and reported the ability to see prominent stereoscopic effect when looking in both oculars.

### Advantages

- Displays volumetric (i.e., 3D) data during ophthalmic surgery
- Allows for real-time processing
- Control of positioning is simple and easy

