Laser Scanner for Fluorescence Imaging, Guided Surgery, and Ablation in Stereomicroscopy

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SUMMARY

UCLA researchers in the Department of Physiology have developed a laser scanning attachment for common main objective (CMO) stereomicroscopes to aid in fluorescence imaging, ablation, and guided surgery.

BACKGROUND

A stereoscopic microscope is a magnifying device that allows for three-dimensional visualization of a specimen. It is used extensively in biological sciences research, dissection, guided microsurgery, and electronics fabrication. Within the medical field, these microscopes are typically only used in the operating room during microsurgical procedures. Recent advances in stereomicroscope technology have led to the development of fluorescent stereomicroscopes for fluorescent-guided surgery. Unfortunately, applications of this technology for healthcare are quite limited and can only be used in fluorescent-guided microsurgery.

INNOVATION

Researchers at UCLA have developed a laser scanning attachment for CMO stereomicroscopes to deliver laser scanning illumination. Pulsed-laser infrared illumination can be utilized for two-photon stereomicroscopy or for single-photon image rendition. The image formed is at the focal plane of the stereomicroscope and has minimal flickering for enhanced surgical purposes. Fluorescent objects can be visualized with brighter intensities than state-of-the-art fluorescent stereomicroscopes. Additionally, this attachment allows for beams from multiple laser sources to be simultaneously launched and can deliver high-intensity laser illumination capable of ablation and/or burning desirable regions within tissues without compromising the stereomicroscope.

APPLICATIONS

- Fluorescent imaging and dissection in biological sciences research
- Fluorescent-guided surgery
- Laser ablation

ADVANTAGES

- Increased fluorescent intensities than state-of-the-art fluorescent stereomicroscopes
- Minimal flickering at the focal plane of the stereomicroscope
- Ability to ablate or burn desirable regions of interest through high-intensity laser illumination without damage to apparatus

STATE OF DEVELOPMENT

The technology has been fully implemented and tested using two types of CMO Zeiss stereomicroscopes (fixed stage and surgical). Stereoscopic visualization has been performed on short mammalian skeletal muscles cells stained with fluorescent dyes and focusing the beam with increased laser intensity on stained muscle cells results in rapid cell death.

PATENT STATUS

Patent Pending

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OTHER INFORMATION

KEYWORDS

Fluorescent stereomicroscopy, fluorescent-guided microsurgery, fluorescent-guided laser ablation, stereomicroscopy

CATEGORIZED AS

- **Optics and Photonics**
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