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Shear Wave Based Elasticity Imaging Using 3D Segmentation For Ocular Disease Diagnosis

Tech ID: 31731 / UC Case 2018-518-0

BRIEF DESCRIPTION

Retinal diseases, such as age-related macular degeneration (AMD), are the leading cause of blindness in the elderly population. Since no known cures are currently present, it is crucial to diagnose the condition in its early stages so that disease progression is monitored. Systems and methods for detecting and mapping the mechanical elasticity of retinal layers in the posterior eye are disclosed herein. A system including confocal shear wave acoustic radiation force optical coherence elastography (SW-ARF-OCE) is provided, wherein an ultrasound transducer and an optical scan head are co-aligned to facilitate in-vivo study of the retina. In addition, an automatic segmentation algorithm is used to isolate tissue layers and analyze the shear wave propagation within the retinal tissue to estimate mechanical stress on the retina and detect early stages of retinal diseases based on the estimated mechanical stress.

US patent application no. 20190335996

FULL DESCRIPTION

Age-related macular degeneration (AMD) is a progressive disease of the retina and is the leading cause of severe vision loss in the western population over 50 years of age. AMD most often induces drusen formation in the dry form, and neovascularization in wet AMD. Drusen often acts as an early sign of AMD whereas neovascularization occurs when excess blood vessels leak into the layers of the retina, signifying a later stage of disease. Current methods of diagnosis include fundus photography, which provides surface structural information of the retina, and fluorescein angiography, which is used to visualize blood vessels and leakages if neovascularization is suspected. For more accurate visualization of the entire depth of the retinal layers, optical coherence tomography (OCT) is used for non-invasive optical imaging. OCT angiography is also used to produce en face images of retinal blood vessels and diagnose abnormal regions. Once AMD is diagnosed, there is currently no known cure so disease management is necessary in various forms, including antiangiogenic drugs, radiation and laser treatments, and photodynamic therapy. Since it is important to slow down the progression of the disease through treatment, early diagnosis is essential. Although it is possible to see anatomical changes that occur with drusen formation and neovascularization, it is very difficult to diagnose in the early stages before structural changes are evident.

Due to the difficulty in penetrating the posterior globe through the anterior eye and vitreous, combined with the need for high sensitivity and resolution, a solution that addresses the aforementioned issues is needed. The present invention proposes a confocal shear wave acoustic radiation force optical coherence elastography (SW-ARF-OCE) system that enables in-vivo imaging of the mechanical properties of the retina, e.g., retinal elasticity, where an ultrasound ring transducer and optical scan head are co-aligned. The present invention may be used for the quantification and diagnosis of ocular diseases in vivo.

SUGGESTED USES

CONTACT

Alvin Viray
aviray@uci.edu
tel: 949-824-3104.



OTHER INFORMATION

CATEGORIZED AS

- » **Imaging**
 - » Medical
- » **Medical**
 - » Diagnostics
 - » Disease:
Ophthalmology and Optometry

RELATED CASES

2018-518-0

ADVANTAGES

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,540,714	01/03/2023	2018-518

UCI Beall Applied Innovation

5270 California Avenue / Irvine, CA
92697-7700 / Tel: 949.824.2683



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