UNIVERSITY OF WATERLOO

TECHNOLOGY SUMMARY

Ophthalmic and Microscopy Imaging Technology

Background

Imaging technologies are being increasingly used in biomedical applications, such as in ophthalmology to image the fundus of the eye for diagnosis and treatment. A demand for ophthalmic-related imaging is growing, linked to demographics of an aging population with rising incidences of eye diseases and disorders such as age-related macular degeneration. Demand will grow further if these imaging technologies are integrated with new therapeutic treatments.

Description of the invention

The University of Waterloo has developed a scanning laser apparatus incorporating a polarimeter and scanner. It can be applied to tissue diagnosis when coupled to a scanning laser microscope or Macroscope configuration or in ophthalmology with a patient's eyeball as object. In the eye, it can be used with scanning laser ophthalmoscopes, confocal scanning laser ophthalmoscopes, and Optical Coherence Tomography (OCT) devices. Applications potentially include biometrics, where techniques have already been developed in fingerprint recognition and eye imaging. The apparatus and method involve polarimetry and matrix-based image reconstruction of the object, in particular the fundus of the eye. Improvement over current technologies is achieved by manipulating the properties of the light source and basing analysis on key image quality measurements: signal to noise ratio (SNR), contrast, resolution, and other novel metrics.

Advantages

Maximum SNR and higher contrast and resolution provide much better reconstructed images. In a scanning microscope configuration, data for original compared to the best reconstructed images give a difference in SNR of 45% to 48% for specular reflection and 70% for diffuse reflection. In addition, light may be pre-corrected and pre-shaped in space and time so that after passing through the optics of the eye, the energy of the beam is localized at the rear of the eye in depth and laterally, further improving contrast and resolution. At Waterloo a ferrofluidic mirror has been used as the wavefront-shaping device with good results.

Potential applications

Circularly polarized light and combinations of polarized states provide earlier and more accurate diagnosis compared to commonly used randomly or linearly polarized light sources.

Reference

8810- 7221

Inventor(s)

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Patent status

Issued U.S. patent # 6,927,888,
issued Canadian patents
2,407,918 & 2,428,628

Stage of development

Sets of imaging data have been produced to compare original patterns of the fundus of the eye with reconstructed patterns using the apparatus and method

Contact

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