Application of Structured Illumination for in vivo Human Retinal Imaging

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Technology description

Summary

In structured illumination microscopy, an object is illuminated by sinusoidally patterned light, rather than conventional uniform illumination. Digital image processing is then done to obtain axial sectioning (3D imaging) and super-resolution (imaging at frequencies beyond the normal diffraction cutoff of the optical system).

Description

In structured illumination microscopy, an object is illuminated by sinusoidally patterned light, rather than conventional uniform illumination, and digital image processing is done to obtain axial sectioning (3D imaging) and super-resolution (imaging at frequencies beyond the normal diffraction cutoff of the optical system). The technique can be used in microscopes for imaging both fluorescent and non-fluorescent objects, such as tissues, cells and micro-structures such as semiconductor chips, in both in vitro and in vivo applications. A key in vivo application is retinal imaging of the human eye. Retinal imaging is used to diagnose retinal disease, such as diabetic macular edema, retinitis pigmentosa, age-related macular degeneration (AMD) and glaucoma. Structured illumination imaging has been used before in in vitro fluorescent microscopy to obtain super resolution but this is the first time this is being done in vivo on a constantly moving subject, such as a living human eye, and for non-fluorescent objects. Applied to the human eye, this technology enables the imaging of individual cells and retinal structures smaller than 2 microns, such as rods, foveal cones, fine blood capillaries and ganglion cell axions, which are difficult to resolve in vivo because the patient

Institution

University of Rochester

联系我们

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com