Structured illumination super-resolution phase microscopy

Duke File (IDF) Number

IDF #:T-004181

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Publication(s)

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External Link(s)

• Dr. Joseph Izatt's Research Website

Value Proposition

Many biologically relevant samples, such as live cells or micro-organisms, are transparent under visible illumination, and thus do not scatter or absorb light significantly. Thus, normal intensity imaging modalities, such as typical light or fluorescent microscopies, will result in low contrast images unless the samples are exogenously stained or tagged. However, it is noted that though such samples do not significantly change the intensity of the illumination, they do significantly affect the wavefront of the illumination light due to their intrinsic refractive index profiles, and thus can be viewed and imaged with high contrast as phase objects. To this end, phase contrast microscopy has quickly risen as a preferred method to image transparent samples and has found great success in imaging morphologies of live cells without exogenous contrast agents.

Apart from contrast, another metric to determine image quality is optical resolution. In conventional microscopes, the maximum achievable resolution is set by the limiting aperture in the system and is coined as the diffraction limit. In view of the foregoing, there is a need for improved microscopy systems and techniques that extend the typical super-resolution concepts towards application in non-fluorescent imaging.

Technology

A new technique, device and system has been developed that allows imaging at resolutions beyond the standard diffraction limit. This technique can be implemented with typical light microscopes (amplitude imaging). This technology allows high resolution, high contrast, imaging of phase objects, an ability that is NOT offered by conventional widefield imaging techniques. This allows this technique to visualize structures such as cellular nuclear material without exogenous staining, which has many applications and uses in biological research.

Applications

Provide super-resolved live cells via structured resolution