PURDUE INNOVATES | Office of Technology Commercialization

Novel Method for Extending the Resolution of Microscopes Beyond the Diffraction Limit

A novel, easily implemented optics set enables super-resolution imaging for existing microscopes and telescopes by creating interference patterns to localize light sources beyond the diffraction limit.

The resolution for microscopes and other optical devices is limited by the diffraction limit, which is a result of the scattering of light at the aperture. Techniques have been developed that provide resolution greater than the diffraction limit, but they require complex illumination schemes, specialized fluorescent molecules, or complex optics. These requirements add to the price and limit the applications of the techniques.

Researchers at Purdue University have developed a novel solution to achieve super resolution by inserting a set of optics between the microscope and camera. The choice of optics is flexible and used to create interference patterns that allow for localization of light sources at resolutions greater than that of the base microscope. This technique could be used to locate and image fluorescently tagged cell organelles or track microscopic fluorescent particles in fluid. Telescopes could also benefit from this technology by increasing their resolution of faint targets.

Advantages:

-Library of existing MEMS devices

-Increased productivity

-Easy to use

Potential Applications:

-Microscopes

-Telescopes

TRL: 5

Technology ID
2012-WERE-66167

Category
Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

Authors
Craig Snoeyink
Steven Wereley

Further information
Parag Vasekar
psvasekar@prf.org

View online

Intellectual Property:

Provisional-Patent, 2012-12-07, United States | Utility Patent, 2013-12-09, United States

Keywords: Super resolution, diffraction limit, optical devices, microscope resolution, telescope resolution, interference patterns, light sources localization, fluorescently tagged, cell organelles, microscopic particles, Electrical Engineering, Mechanical Engineering, Optics