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Inclined Single Plane Imaging Microscope Box (iSPIM Box)

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OTHER INFORMATION

KEYWORDS

imaging, microscope, 3D, bioinformatics

CATEGORIZED AS

- » **Biotechnology**
 - » Bioinformatics
- » **Imaging**
 - » 3D/Immersive
- » **Medical**
 - » Imaging
- » **Research Tools**
 - » Bioinformatics
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BRIEF DESCRIPTION

Researchers at University of California, Irvine, have responded to the worldwide growing demand for fast 3D microscopy in bioimaging, by creating iSPIM Box (Inclined Single Plane Imaging Microscope Box), an adapter for commercial body microscopes, which can be used to achieve high spatial and temporal resolution in live cell imaging with only simple sample preparation in common culture dishes.

FULL DESCRIPTION

iSPIM Box is intended for imaging biological samples with a fast volumetric acquisition and offers numerous advantages over existing technologies, such as the confocal microscope principle which has been combined with spinning disk technology and very fast laser scanning microscopes to yield 3D microscopy images, but results in problems with photo-bleaching and energy load.

Light-sheet microscopy techniques decrease the photo-bleaching and energy load problems inherent in confocal microscopes, but introduce new disadvantages. Specifically, selective plane illumination microscopy (SPIM), a method based on illumination of a sample from the side with a sheet of light, can be very complicated and require extensive sample preparation, to achieve a cylindrical shape which must be obtained by embedding the specimen in an agarose gel filled cylinder. Additionally, the entire sample must usually be rotated and translated for imaging. This particular sample preparation and processing issue has greatly limited the use of SPIM.

Many issues have been simplified somewhat through oblique light sheet microscopes (OLSM), which use a single objective to excite and collect the light. The single objective system requires only translational stage movement, a common microscope feature, for scanning through the sample volume. OLSM maintains the basic optical path of conventional microscope bodies, avoids additional mechanical components for sample rotation, and can utilize simple non-cylindrical samples.

iSPIM Box, is a single-sided, microscope add-on module that can make the benefits of SPIM available worldwide without the shortcomings inherent in other systems. iSPIM Box can be used with virtually any microscope. All of the necessary components are contained in a small box which is pre-aligned and plugged into the microscope using an optical adapter. There is no building required to be performed in the lab.

The microscope stage is automated and programmable for size, distance, cell array, and dwell time. It automatically optimizes acquisition by considering exposure time, read out, dwell time, and time to reach next position on the stage. The acquisition protocol has been simplified by programming a user friendly Graphical User Interface that guides the user along the acquisition steps. Algorithms for mosaic/tiled acquisition have also been implemented for large samples. The optical components are chosen with the perspective of multi-color imaging, which yields the possibility to image multiple channels.

In addition to the simplified pre-built mechanical components, which require no specialized microscopy training to connect, only standard sample preparation, and standard horizontal positioning of the sample are required. Thus, iSPIM Box preserves all of the benefits of 3D microscopy technology, but eliminates the problems which have kept the technology from becoming as widespread as demand would predict.

SUGGESTED USES

- » 3D volumetric acquisition microscopy imaging of biological samples
- » 3D fast imaging adapter for commonly used microscopes
- » Obtain images to perform Florescence Correlation Spectroscopy

ADVANTAGES

- » Live cell imaging
- » High spatial and temporal resolution
- » Possible to distinguish structures inside the nucleus
- » Adaptable to commonly used microscopes
- » Increased performance of conventional microscopes
- » Simplified sample preparation/No particular form necessary/Can utilize common culture dishes
- » Automated data acquisition, including mosaic/tiled
- » Simplified control through intuitive Graphical User Interface

RELATED CASES

2012-439-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,874,736	01/23/2018	2012-439

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