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TITLE

Method for calculating the volume of an object using digital holographic microscopy

INVENTORS

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DESCRIPTION

A digital optical microscopy method for 3D reconstruction of an object, comprising:

- transmitting an optical illuminating beam through at least one 3D object having a reference plane extending therethrough, the illuminating beam having an optical axis;
- rotating the at least one object so as to vary the angle subtended between the reference plane of the object and the optical axis of the illuminating beam;
- generating a plurality of interference figures during rotation of the object, each interference figure being obtained by the combination of a reference optical beam and the illuminating beam that transmitted through the object;
- optically acquiring the plurality of interference figures, during rotation of the object, on a single plane that defines the hologram plane, such that each interference figure is associated to a respective rotation angle θ of the object, describing the orientation of the object relative to the optical axis of the illuminating beam;
- generating a digital hologram for each interference figure;
- providing phase-contrast reconstruction of a plurality of images from a numerical reconstruction of the plurality of digital holograms;
- segmenting each image of the plurality of phase-contrast images, thereby generating a respective silhouette as an image comprising a region of interest defined by an isosurface that represents the two-dimensional projection of the object from an observation point at an angle θ against a background;
- reconstructing a 3D projection of the isosurface of each silhouette of the plurality of silhouettes, thereby obtaining a respective volume element originating from an observation point at angle θ, thereby obtaining a plurality of volume elements associated with a respective plurality of rotation angles;
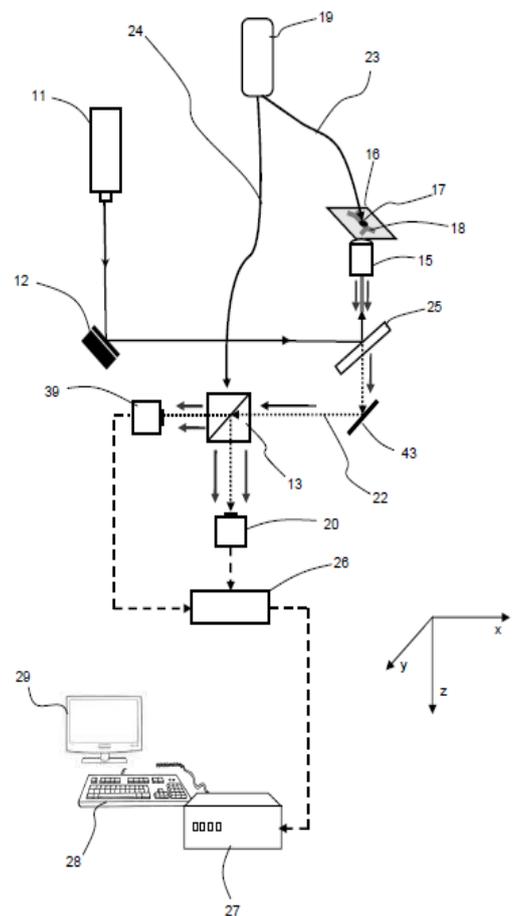
- calculating the volume of the object by reconstructing a visual hull of the 3D surface of the object, the visual hull being obtained from the plurality of volume elements.

APPLICATIONS

Microscopic equipment, biotechnological applications, material applications

KEYWORDS

Digital Holography, biovolume, 3D imaging, quantitative phase-contrast microscopy, optical tweezers, shape from silhouette

BIBLIOGRAPHIC DATA

Metodo di calcolo di volume di un oggetto mediante microscopia olografica digitale

Application Number	IT MI2014A000015
Priority Date	January 9, 2014
Applicants	Fondazione Istituto Italiano di Tecnologia, Consiglio Nazionale delle Ricerche, Istituto Sperimentale Italiano Lazzaro Spallanzani

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