A method to determine whether a cell shown in an immunofluorescence image acquired with a confocal microscope is a sick cell, a tumoral cell

KEYWORDS

- ❑ BIOMEDICAL APPLICATIONS
- ❑ TUMORAL DIAGNOSTICS
- ❑ CELLULAR ANALYSIS
- ❑ NEURAL NETWORKS
- ❑ MACHINE LEARNING

AREA

- ❑ BIOMEDICAL

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Priority Number
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Patent Type
Patent for invention.

Co-Ownership
Sapienza 50%, Ospedale Pediatrico Bambino Gesù 50%.

Inventors
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Industrial & Commercial Reference
Devices and systems for biomedical diagnostics.

Time to Market
The patented method is ready for use.

Availability
Cession and Licensing.

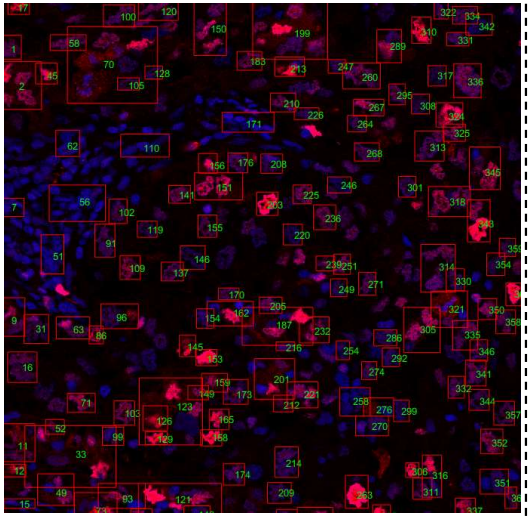
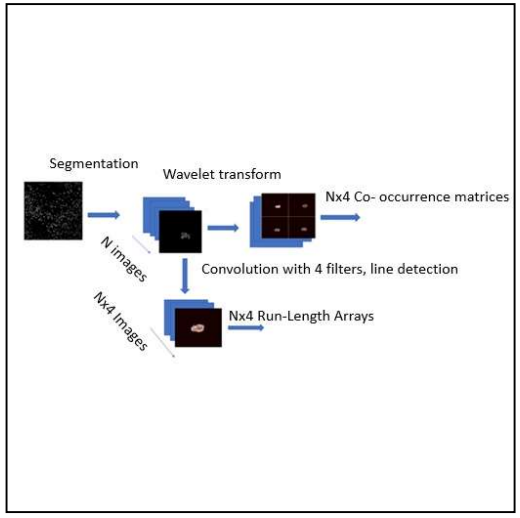


Fig. 1 Image of liver tissue, showing the diseased cells identified by the neural network.



Abstract
A method and a system to determine whether a cell shown in an immunofluorescence image from a confocal microscope is sick, tumoral.
It is based on the application of a discrete wavelet transform to a reference matrix associated to a reference image of the cell to obtain four further matrices, the reference image is obtained inserting a segmented image of the cell on a background of a given color, and on the creation of a co-occurrence matrix for each of the four matrices, as well as on the results of a plurality of predetermined statistical functions characterizing the cell and calculated from each co-occurrence matrix, the results are provided as an input for a neural network.

Fig. 2 First part of the neural network created.

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Technical Description

The method can automatically identify in any human body tissue possible sick cells (even tumoral) starting from a confocal-microscope image of cellular nuclei marked with immunofluorescence. More in particular, the method is conceived to determine whether a cell of interest is sick or healthy based on results obtained applying a plurality of statistical functions chosen to characterize the morphology of the cell of interest, in which such statistical functions are calculated starting from a co-occurrence matrix which characterizes the texture or magnitude of the cell. The immunofluorescence image contains a plurality of cells, whose nuclei have been marked with the immunofluorescence technique.

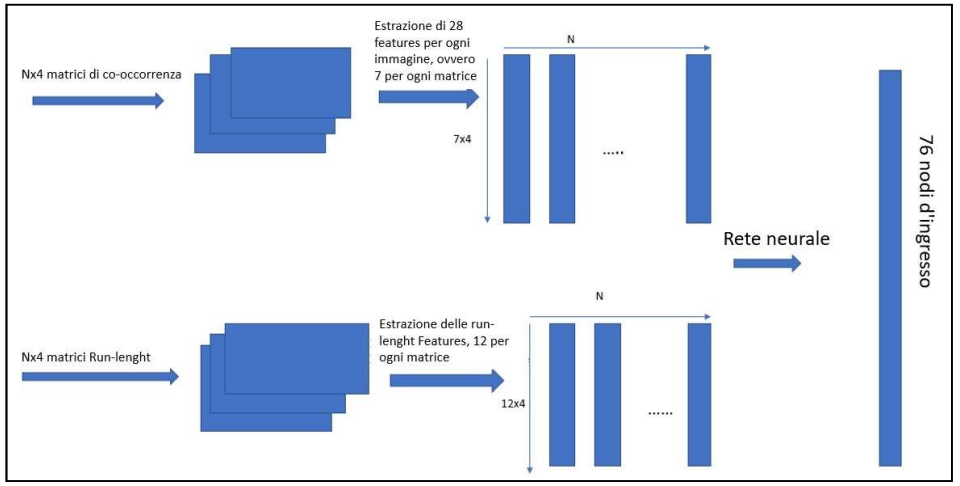
Technologies & Advantages

Compared to the state of the art, the patented methodology is unique because it can classify healthy and diseased cells of hepatocarcinoma on images of liver tissue, thus allowing an early diagnosis of the neoplasm. The diagnosis, in fact, does not occur by identifying changes in the color of the tissues but on the morphological alteration and the variation of texture of the single cell. The algorithm divides the images of diseased / healthy cells into special folders on the desktop so that they can be subsequently checked by the pathologist for any diagnostic confirmations. This machine learning-based algorithm is very simple to use in pathology labs without running computers.

Applications

The areas of application are many, in fact in every area in which a morphological anomaly of the cell is to be revealed this patented method can be applied: an example is that of research in Biology or Pharmacology, in the same way it can be applied in medicine for the recognition of diseased cells.

Fig. 3 Second part of the neural network created.



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