CHALLENGES IN MEDICAL IMAGING

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ABSTRACT

Medical imaging is a branch of artificial intelligence that focuses on the development of algorithms that extract important information from multimedia elements, including both images and videos. While advances in biology and medicine are growing rapidly, the need to process and gather information from biomedical images faces limitations in nano- and microscale cell image analysis due to experimental conditions. Cell images may vary widely, depending on the type of microscopy and staining used, as well as the cell type and cell density. Although a plethora of algorithms are developed, none can give perfectly accurate information and there is a need to always optimize the parameters depending on the quality of the image, on the relative size of the objects to be detected, on the shape of the object etc. Image segmentation is used to identify object of interest or relevant information. A correct segmentation is the most important step in medical image analysis. The difficulties that increase the complexity in segmentation steps are the edge information loss, the overlap of multiple structures, the interference with often challenging background, the clustering of aimed targets etc [1]-[2]. An important information that needs to be preserved is the edge information. During the preprocessing of the images, the edges become less distinct after the application of classical filters. Often experiments are conducted on patterned surfaces and these surfaces provide a challenging background that interferes with the edge information of the objects to be analyzed. Often the cells are localized on surfaces containing grooves with a certain order as shown in figure 1. When the grooves are found with a certain repetitive pattern, the analysis and modifications in the transform domain of the images can be used to remove the regular patterns. Once the grooves are removed then the objects that we aim to analyze are more easily segmented. The modification involves the removal of the respective (repetitive) frequency of the grooves in the transform domain. Once the features of the grooves are removed, parameters such the number of cells, and the total area covered by the cells can be calculated more accurately.

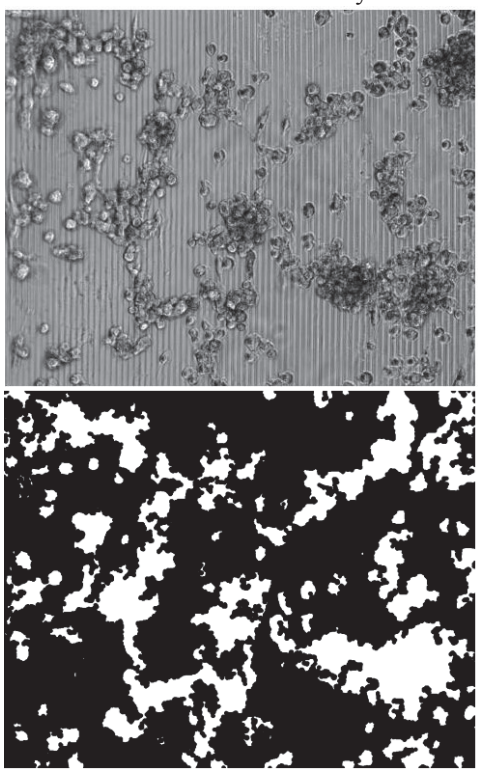

Fig 1. Original image (up), segmentation after the modification in the Fourier domain (down)

Keywords: Segmentation, edge preservation, cell detection

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