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Survey on Segmentation of Partially Overlapping Objects

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Abstract - *Digital image segmentation is the process of partitioning an image into multiple segments or sets of pixels, also known as super-pixels. The goal of segmentation is to simplify change the representation of a digital image into something that is more meaningful and easier to analyze. It is typically used to locate objects and boundaries such as lines and curves to detect the relevant information in images. Efficient image segmentation is one of the most critical tasks in automatic image processing. Hence this literature survey studies various existing methods presents a segmentation of clustered partially overlapping objects.*

Key Words: Digital image segmentation, Overlapping objects, Cell nuclei, Histopathology.

1. INTRODUCTION

Segmentation of overlapping objects is an increasing amount of various computer applications such as Biomedical industry. Image segmentation is defined as a process of partitioning a digital image into homogenous groups such that each region is homogenous but the union of two adjacent regions is not homogenous. Also the image segmentation has been interpreted differently for different applications in image processing.

Image segmentation is a difficult area of research for image processing field. But it is still a challenging task for researchers and developers to develop a universal technique for image segmentation techniques. Digital image segmentation is used to differentiate different objects in the image. Since the image is divided into foreground and background, whereas foreground of image is related to the region of interest part in image and background is the rest of the image. Hence, image segmentation will separate these two parts from one another. In this paper different method for image segmentation in partially overlapping objects are studied.

2. LITERATURE SURVEY

In[1] Chanho Jung and Changick Kim proposed a novel watershed-based method for segmentation biomedical images. First apply the distance transform to the clustered nuclei. A marker extraction scheme based on the H-minima transform is introduced to obtain the feasible segmentation result from the distance map. The H-minima or H-maxima transform is a powerful mathematical tool to suppress undesired minima or maxima. Performing the H-minima transform on the inverse distance image can effectively decrease oversegmentation.

In[2] Yousef Al-Kofahi, Wiem Lassoued proposed an automatic segmentation, that is an essential step in biomedical image analysis. For progress analysis, there is a need to improve accuracy, speed, level of automation, and adaptability to new applications. This work presents a robust method for segmenting the cell nuclei. The image foreground is extracted using a graph-cuts-based binarization. Next, nuclear seed points are detected by a method, that combining multiscale Laplacian-of-Gaussian filtering. The multiscale LoG filtering is constrained by using a distance-map-based adaptive scale selection process. These points are used to perform an initial segmentation that is refined using a second graph-cuts-based algorithm. The graph based algorithm method combining the alpha expansions and graph coloring to reduce computational complexity.

In[3] Yan Nei Law, Hwee Kuan Lee proposed a variant of the Mumford-Shah model for the segmentation of a pair of overlapping objects with additive intensity value. The basic idea of using Mumford-Shah model is, it can handle gracefully complex situations and is very robust to noise. It does not only determine distinct objects in the image, but also recover the possibly multiple membership of the pixels. To accomplish this feature, some apriori knowledge about the smoothness of the object boundary is integrated into this model. Additivity is imposed through a soft constraint which allows the user to control the degree of additivity, and it is more accurate than the hard constraint. The main contribution in this work is to construct a relaxed additive model, called the soft additive model, which can overcome the problems of the hard additive model. Another contribution is to provide a stability analysis of the soft model to demonstrate the robustness.

In[4] Marina E. Plissiti and Christophoros proposed a segmentation method of overlapping nuclei, which combines the segmentation of an image with Active Shape Model and the representation of an object using modal analysis. Thus, a physical model is adopted in the training phase, in which the parameters are the variations of the modes of the model. The

attributes of objects in image such as, nuclei shapes are expressed in terms of modal analysis and in the training phase the modal distribution is estimated. Therefore, a more compact description of the shape model is obtained. Next, develop a framework for the deformation of an active physical model similar to ASM, for the detection of an unknown new nucleus in images containing two overlapped nuclei.

In[5] Fuyong Xing, David J. Foran proposed an biomedical image analysis of histopathology specimens that, provide support for early detection of breast cancer. Automated segmentation of the cells comprising imaged tissue microarrays (TMAs) is a prerequisite for quantitative analysis. The segmentation algorithm called touching cell segmentation is composed of two steps. It begins with a fast, accurate, reliable object center localization approach that utilizes single path voting followed by mean-shift clustering. Mean shift clustering provides accurate seed detection and robust touching object localization. Next, the contour of each cell is obtained by using a level set algorithm based on an interactive model.

In[6] Chiwoo Park, Member, IEEE, Jianhua Z. Huang proposed a method that enables automated morphology analysis of partially overlapping nanoparticles in electron micrographs. The method adopts a two-stage approach: The first stage executes the task of particle separation, that is, a modified ultimate erosion process is developed for decomposing a mixture of particles. The second stage simultaneously conducts the tasks of contour inference and the shape classification by using a set of evidences becomes inputs to a Gaussian mixture model.

In[7] Sahar Zafari, Tuomas Eerola proposed a segmentation of partially overlapping objects with a known shape that can be approximated using an ellipse. The method using the silhouette images requires only that the foreground and background objects can be distinguished from each other. The work makes two contributions; the first contribution of this work is the combined method of Bounded Erosion and Fast Radial Symmetry (BE-FRS) for seedpoint extraction from a group of partially overlapping objects. The second contribution is integration of the BE-FRS method into the segmentation of partially overlapping objects, that enabling some improvements compared to existing methods.

3. CONCLUSIONS

Different methods to reduce the variations such as pose, shape and size of partially overlapping objects are studied. Each method has different ways to analyze the overlapping objects. But the Influence of various variations is not yet eliminated. From this study recognized that the basic information is needed to analyze the overlapping objects such as, shapes. To overcome these, considered as an efficient method to segment multiple partially overlapping objects and detects its original shapes. From this efficient method we have to easily analyze the overlapping objects.

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