CHAPTER 5

Conclusion

We proposed the unsupervised algorithm for detecting and counting CD4+ lymphocyte based on three images, i.e. bright field, green fluorescence and red fluorescence images. The CD4+ lymphocytes present in both green and red fluorescence images. The corresponding bright field image contained WBCs is used to address the possible location of CD4+ lymphocytes and thus, guarantees the reliability of CD4+ lymphocytes detection method. The proposed algorithm for detecting WBCs in bright field image operates automatically and it is capable of detecting WBCs in the typical and difficult scene which also contain RBCs, debris and artifacts with a good sensitivity and PPV. For the false positive which frequently caused by debris, it should be noted that the additional rules probably filter this out since the content is darker than cell. Besides, the intensity enhancement by multi-scale top-hat transform is capable of enhancing the various sizes of spots in fluorescence image with the appropriate range of structure element size. However, we suggest that the thresholding value should be selected manually in order to provide the satisfaction of expert and increase the effectiveness of the algorithm. Moreover, shifted-cell tracking should be taken into account in further study in order to increase the sensitivity of the algorithm.

For further application, our proposed algorithm can be applied to the other related problems on cell detection and counting especially in low resolution images. Not only for white blood cells, but any types of cell whose shape is round can also be detected. Also, our approach is capable of detecting cells in bright field image alone, or with one or more corresponding fluorescence images.

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