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Geometric Feature Extraction for Identification and Classification of Overlapping Cells for Leukaemia

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This paper is intended to assess the feature extraction technique for identification and classification of white blood cell due to overlapping condition in leukaemia disease. According to the data from SEER Cancer Statistics [1], leukaemia is one of the top ten most common types of blood cancer. In the year 2017, there are 62130 people are expected to be diagnosed and 24500 people are expected to die. In another word, approximately there are 1 person is diagnosed with a blood cancer in every 3 minutes. These data have shown how high the risk of leukaemia to be diagnosed. Therefore, an accurate image processing approach is proposed for diagnosis leukaemia.

After reviewed existing studies, there are a lot of related methods was proposed. However, most of existing methods or algorithms had encountered the accuracy problem in cell counting when overlapping cell occurs. Furthermore, the higher the degree of overlapping cells, the lower the accuracy of cell counting. Hence, the identification of overlapping cells is proposed in hope to improve the accuracy of cell counting. Moreover, the classification of overlapped cells was not conducted before. In this study, overlapped cells are grouped according to overlapping degree and number of cells overlapped. Accurate identification and classification of overlapping cells was expected to further increase the accuracy of WBC segmentation and counting by using an image processing approach.

There are 103 microscopic images used in this study are collected from a few online image databases, such as ASH Image Bank and Medical Stock Image. Another 164 real microscopic images are edited by using Adobe Photoshop CS6 to form different magnifications ranging from 100x to 500x and saved in in the JPEG format. Additionally, there are 100 artificial overlapping cells images are form by crop off the single WBC from real microscopic images to form additional overlapping cases with different number of cells. All images will be processed with MATLAB R2014a.

The general method for object counting contains four steps, namely image acquisition, image enhancement, image segmentation and object counting. The proposed method in this study has an additional step in between image segmentation and object counting, which is feature extraction (Figure 1). In the process of feature extraction, overlapping cells will be identified and classified into different group based on overlapping degree