Automated classification of white blood cells from microscopic images

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ABSTRACT

The application of computational techniques is rapidly growing, improving the quality of laboratory analysis and diagnosis. Visual analysis of peripheral blood samples is an important test in the procedures for diagnosing leukaemia. Acute Lymphocytic Leukemia is fatal if left untreated due to its rapid spread into the bloodstream and other vital organs. Early diagnosis of the disease is crucial for the recovery of patients, especially in the case of children. The current practice of reading medical images is labour-intensive, time-consuming, costly, and error-prone. It would be more desirable to have a computer-aided system that can automatically make diagnosis and treatment recommendations. This paper presents a set of preprocessing and segmentation algorithms and features that can recognize and classify different types of normal white blood cells from digital microscopic images. We created a multi-step procedure that included extracting a region of interest from a larger image around threshold cell nuclei, segmenting that image into a cell and non-cell regions using Canny edge detection and a circle identification algorithm, and extracting a feature set based on cell colour, size, and nuclear morphological information, and applying a classifier. The number of classifiers was used for 101 images of white blood cells. The instance-based classifier performed well with 91% classification accuracy. The results of these analyses can be used as a reference for evaluating patients by medical teams.

Keywords: Instance-based classifier, Microscopic images, White blood cell classification.