



Automatic recognition of white blood cells

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Overview



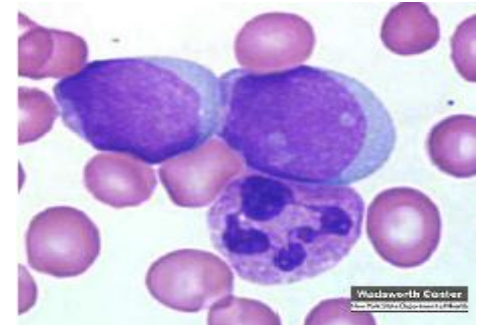
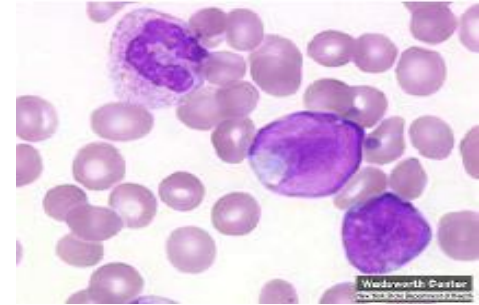
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Introduction

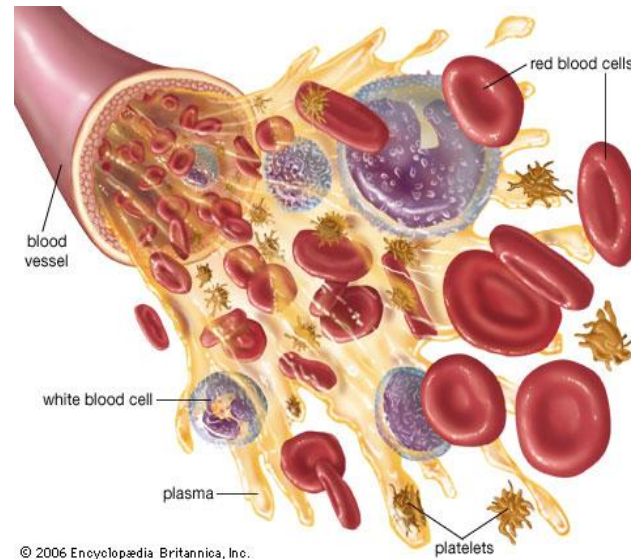
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- The microscopic images of the blood cells are observed to find out many diseases.
- Identification of blood disorder is through visual inspection of microscopic images by examining changes like texture, geometry, color and statistical analysis



Introduction (Cont.)

Blood Cell consists of



Introduction (Cont.)

□ Red Blood Cells

Red cells contain a special protein called hemoglobin, that gives blood its red color and enables it to carry oxygen from the lungs and deliver it to all body tissues.

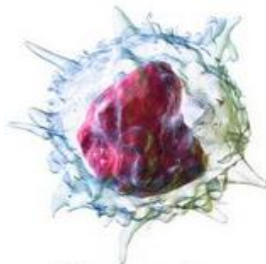


Red Blood Cells

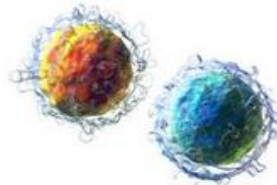
Introduction (Cont.)

□ White Blood Cells

White blood cells protect the body from infection and there are five main types of white blood cells.



Monocyte



Lymphocytes



Eosinophil



Basophil



Neutrophil

White Blood Cells



Introduction (Cont.)

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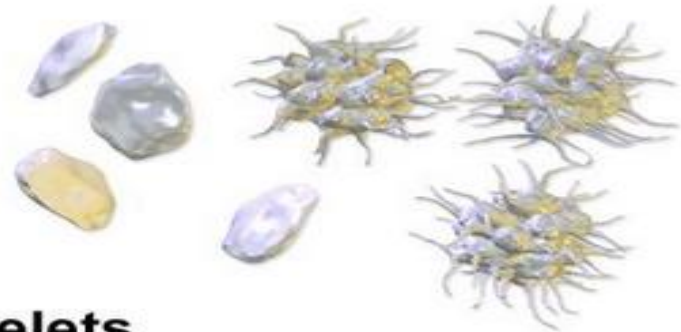
- ❑ **Neutrophils**, the most numerous type, help protect the body against infections by killing and ingesting bacteria.
- ❑ **Lymphocytes** consist of three main types: T cells and natural killer cells, which both help protect against viral infections and can detect and destroy some cancer cells, and B cells, which develop into cells that produce antibodies.
- ❑ **Monocytes** ingest dead or damaged cells and help defend against many infectious organisms.
- ❑ **Eosinophils** kill parasites, destroy cancer cells, and are involved in allergic responses.
- ❑ **Basophils** also participate in allergic responses

Introduction (Cont.)

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□ Platelets

Small fragments of cells, help the blood clotting process by gathering at the site of an injury.



Platelets



Introduction (Cont.)

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□ Plasma

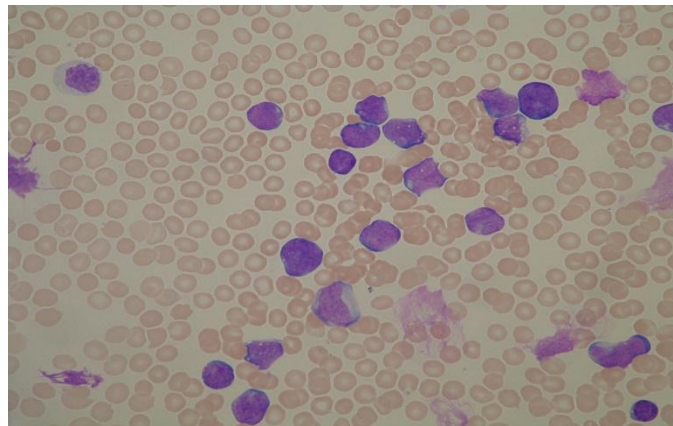
The liquid component of blood , a mixture of water, sugar, fat, protein, and salts.

The main job of the plasma is to transport blood cells throughout body ,that help maintain the body's fluid balance.

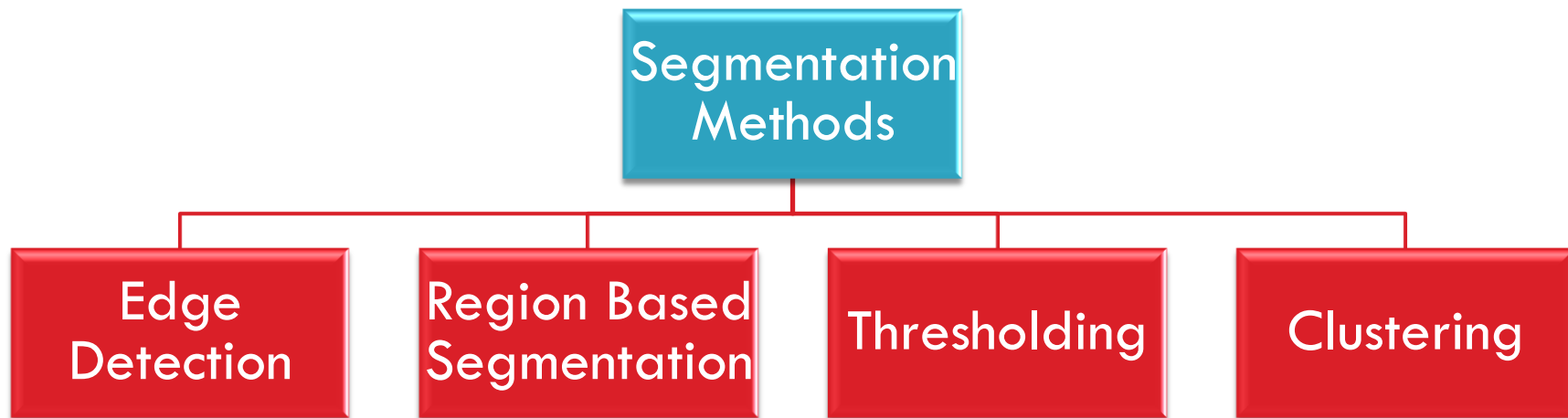
Problem Statement

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- ❑ Too many particles in the image so we need to extract and separate them in order to identify and analyze the objects.
- ❑ Blood cells may be overlapped and their edges very close.



Related Work



Related Work (Cont.)

Edge Detection:

- two main edge based segmentation methods- gray histogram and gradient based method.
- Aim at identifying points in a digital image at which there is an abrupt change in image brightness or has discontinuities or where there is a jump in intensity from one pixel to the next.
- Gradient based method works well. This method involves convolving gradient operators with the image.

Related Work (Cont.)

Region Based Segmentation (Watershed):

- The basic idea of region growing method is a collection of pixels with similar properties to form a region . For region growing, seeds can be automatically or manually selected .
- Region growing can also be sensitive to noise, causing extracted regions to have holes or even become disconnected .
- In Region Splitting and Merging, the image Subdivided into a set of arbitrary disjoints regions and then merge and/or split the region according to the given condition for segmentation.

Related Work (Cont.)

Thresholding :

- Image segmentation by Thresholding is a simple but powerful approach for segmenting images having light objects on dark background
- The segmentation is done by grouping all pixels with intensity between two such thresholds into one class
- As per the selection of Thresholding value, two types of Thresholding methods are in existence, global and local Thresholding.

Related Work (Cont.)

Clustering:

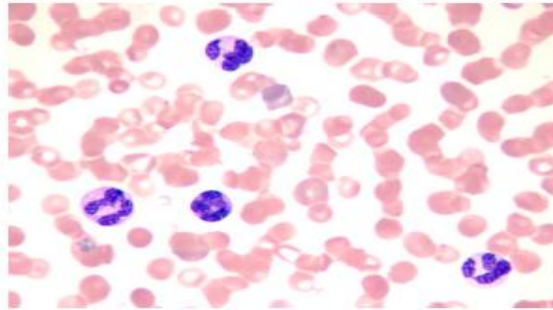
- Two methods mainly used for clustering based segmentation.
- **K-Means** is one of the simplest unsupervised learning algorithms. In K means objects are classified as belonging to one of k groups exclusively. The main idea is to define k centroids, one for each cluster . These centroids should be placed in a cunning way because of different location causes different result .
- **Fuzzy C-Mean (FCM)** is an unsupervised clustering algorithm . Fuzzy C-means (FCM) algorithm is one of the most popular fuzzy clustering methods.

Results

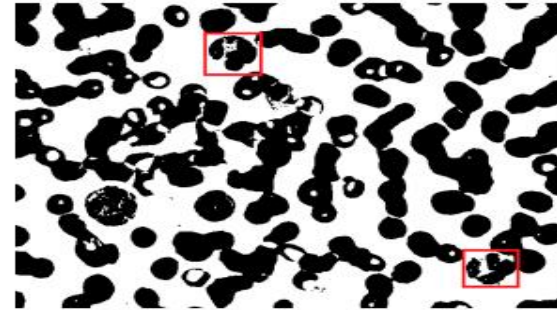
- Segment (WBC) into morphological components

Methods	Neutrophil	Lymphocyte	Monocyte	Eosinophil	Basophil
Threshold-based method	88.7%	90.1%	92.3%	87.2%	83.9%
Learning-based method	94.4%	95.6%	97.3%	87.2%	85.0%
K-Mean Color-based method	97.6%	97.0%	97.8%	89.4%	89.7%

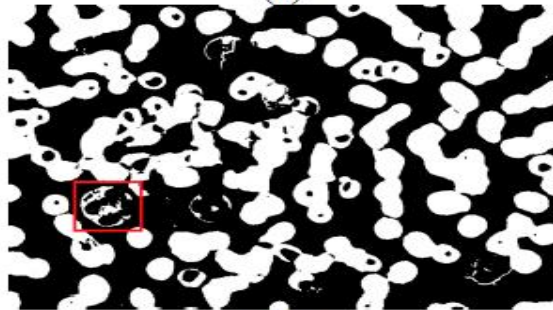
Results



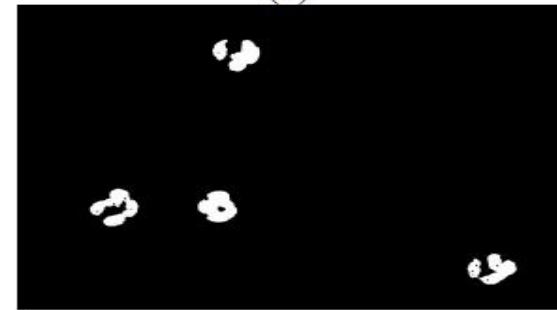
(a)



(b)



(c)



(d)



Conclusion

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- Extract blood cells from a complicated background and segment every cell into morphological components help in show the changes in blood condition and the development of diseases in an individual and help experts in diagnosis of blood cells disorder such as malaria, leukemia, cancer

Thanks and Acknowledgement



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