COMPUTER-ASSISTED ALL, AML, CLL, CML DETECTION AND COUNTING FOR DIAGNOSIS OF LEUKEMIA

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ABSTRACT:
Leukemia could be a cancer of white blood cells (WBCs) which damages blood and bone marrow of shape. It can be fatal illness if not diagnose at earlier stage. Typically complete blood count (CBC) or morphological image analysis is employed to manually diagnose the malignant neoplastic disease cells. These ways are time consuming and fewer correct that must be mounted. In this paper we've got planned an automatic technique for the detection of acute lymphocytic leukemia (ALL), acute myeloid leukemia (AML), Chronic lymphocytic leukemia (CLL), Chronic myeloid leukemia (CML) by microscopic blood image analysis. This approach initial section out the various kinds of cells from the image i-e.White blood cells, red blood cells and platelets. Afterward Lymphocytes are separated from the white blood cells. Then form and color options are extracted from these lymphocytes that are given to SVM classifier to classify the cells into traditional and blast. After that the counting of the WBC cells are also detected for accurate diagnosis. This automated malignant neoplastic disease detection system found to be more practical, fast and correct as compare to manual identification ways.

INTRODUCTION:

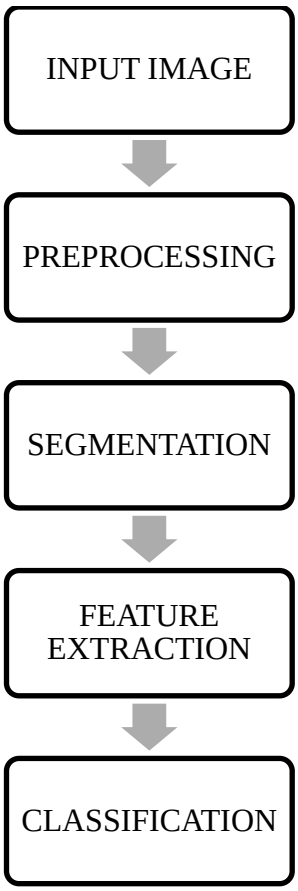
Acute lymphoblastic leukemia is a type of cancer associated with blood in which leukocytes (WBCs) start growing abnormally. These abnormal cells strike the blood and bone marrow due to which immune system of human body become vulnerable. Furthermore, it suppresses the production of normal red blood cells and platelets hence lead towards anemia, the blood deficiency. Moreover, these abnormal leukocytes predominantly spread into the human blood swiftly and can also capture other different body parts like kidney, liver, spleen, brain and lymph nodes. Leukemia is classified as either Lymphoblastic or Myelogenous depending on the type of white blood cells being infected. If the infected cells are granulocytes and monocytes, then the leukemia will be classified as Myelogenous (AML) and if the infected cells are lymphocytes, then the leukemia will be classified as Lymphoblastic (ALL) . According to French American British (FAB) classification, ALL is further categorized into 3 subtypes, which are L1, L2 and L3. L1 type cells are normally small in size and are homogeneous with little cytoplasm. Their nucleus is discoid and well structured. L2 type cells have shape dissimilarity and are over-sized as compared to L1. Their nucleus is not regular and contains variations in their cytoplasm. L3 type cells are of identical shape and normal size with round or oval nucleus. They have adequate amount of cytoplasm which includes vacuoles. They are usually larger in size than L1.

LITERATURE REVIEW:

Detection of Acute lymphoblastic leukemia, Acute myeloid leukemia, Chronic lymphocytic leukemia, Chronic myeloid leukemia from microscopic blood images by using image processing techniques. Preprocessing was applied over the images to remove any noise, and then segmentation is performed to detect lymphocytes from the image. Watershed is used to separate the grouped lymphocytes for counting of cells, after extracting shape and color features; SVM is used to classify normal and blast cells.Watershed segmentation is used

to segment the areas of leukemia. For leukemia feature extraction we have extracted **shape** and **color features** to obtain the relevant information from the blood images. We can extract the shape features by using area, perimeter and etc. The color features we have used are mean, variance, standard deviation and kurtosis.By using the accurate shape and size of the WBC cells we have to differentiate the healthy and cancer cells.Detection of cancer cells and counting the number of WBC cells helps doctor for diagnosis. The output accuracy is more when compared to the existing systems.

METHODOLOGY:



- In **preprocessing**we have first transformed the blood images from **RGB (red green blue) to CMYK (cyan, magenta, yellow and black)**color model. This highlights the WBCs from the other cells present in the blood image. Histogram equalization is a very common method that uses the image histogram to tune the contrast of image. Therefore in preprocessing step we have applied histogram equalization over the blood image to overcome different lightning effects during image grabbing.

- The **WATERSHED SEGMENTATION can be a powerful technique for separating overlapping objects.**

- For leukemia detection we have extracted **shape** and **color features** to obtain the relevant information from the blood images. We can extract the shape features by using area, perimeter and etc. The color features we have used are mean, variance, standard deviation and kurtosis.

- **Support Vector Machine (SVM)classifier** and blood cell features related to statistical analysis, the system was built. The pressure is on selection and generation of features for getting out the best recognition.

HARDWARE REQUIREMENTS:

- Processor : Pentium Dual Core 2.00GHZ
- Hard Disk : 500 GB
- RAM : 4GB (minimum)
- Keyboard : 110 keys enhanced

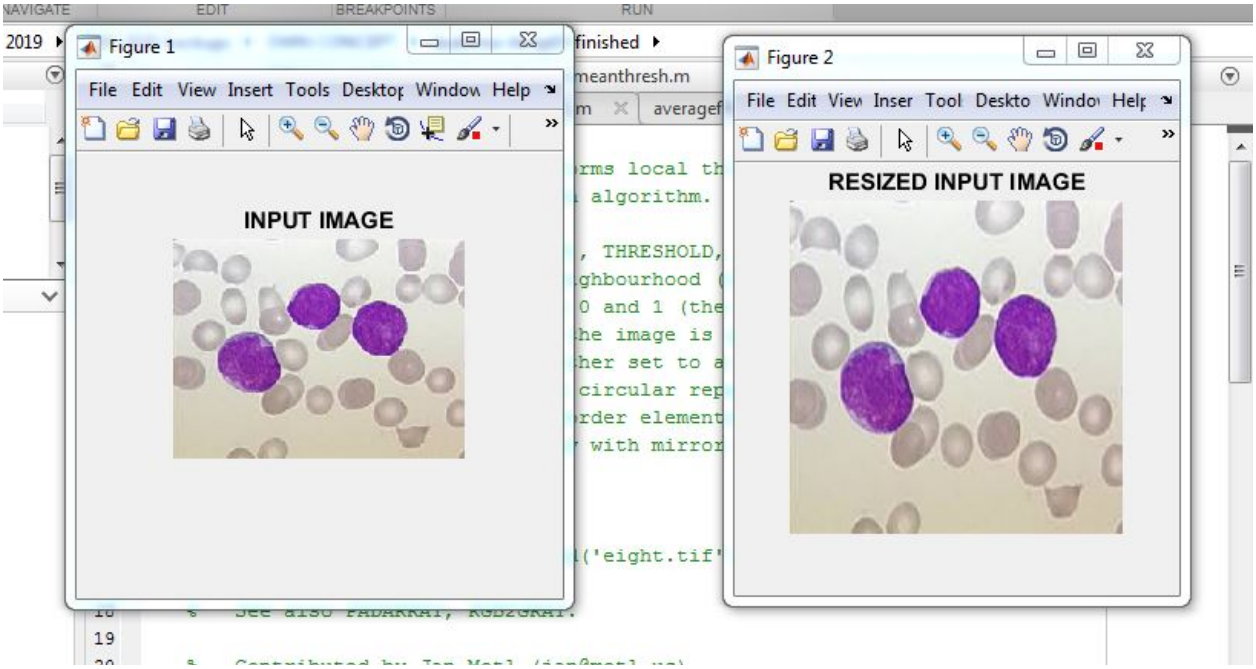
SOFTWARE REQUIREMENTS:

- MATLAB 8.6 Version R2016a

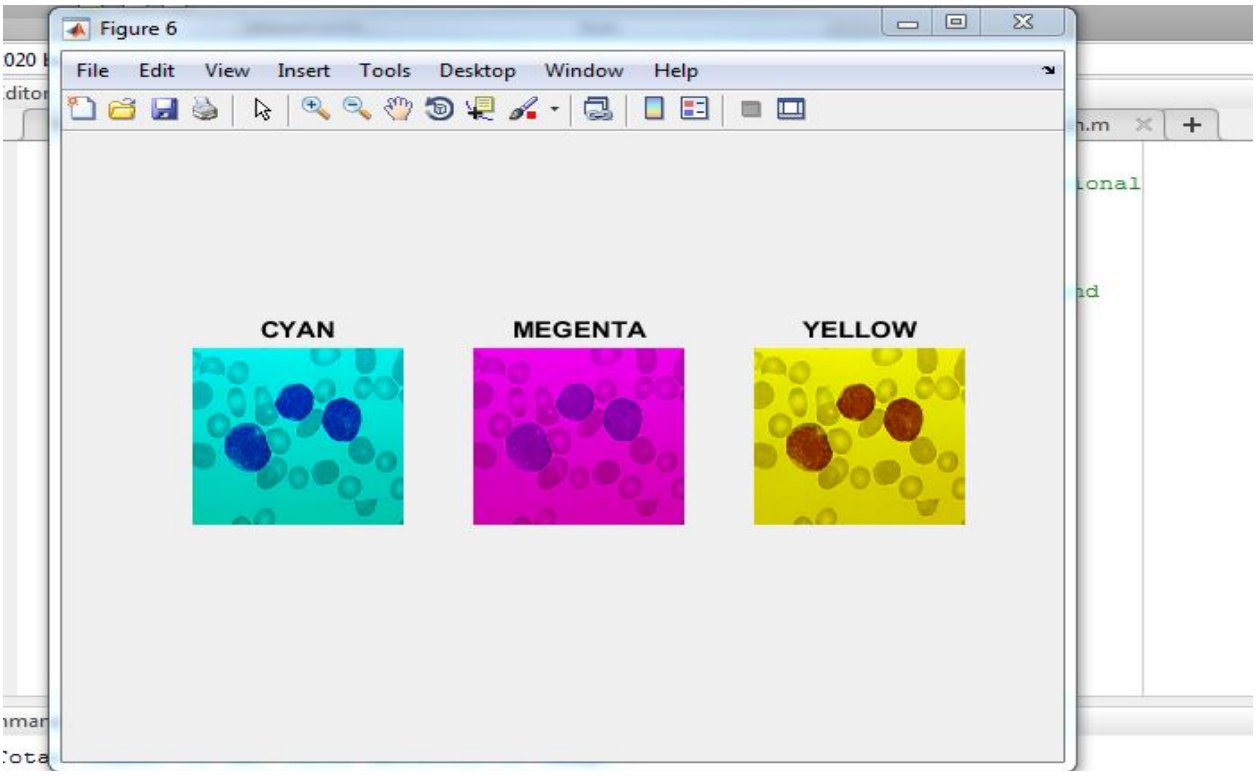
RESULTS AND ANALYSIS:

FOR CANCER BLOOD CELL

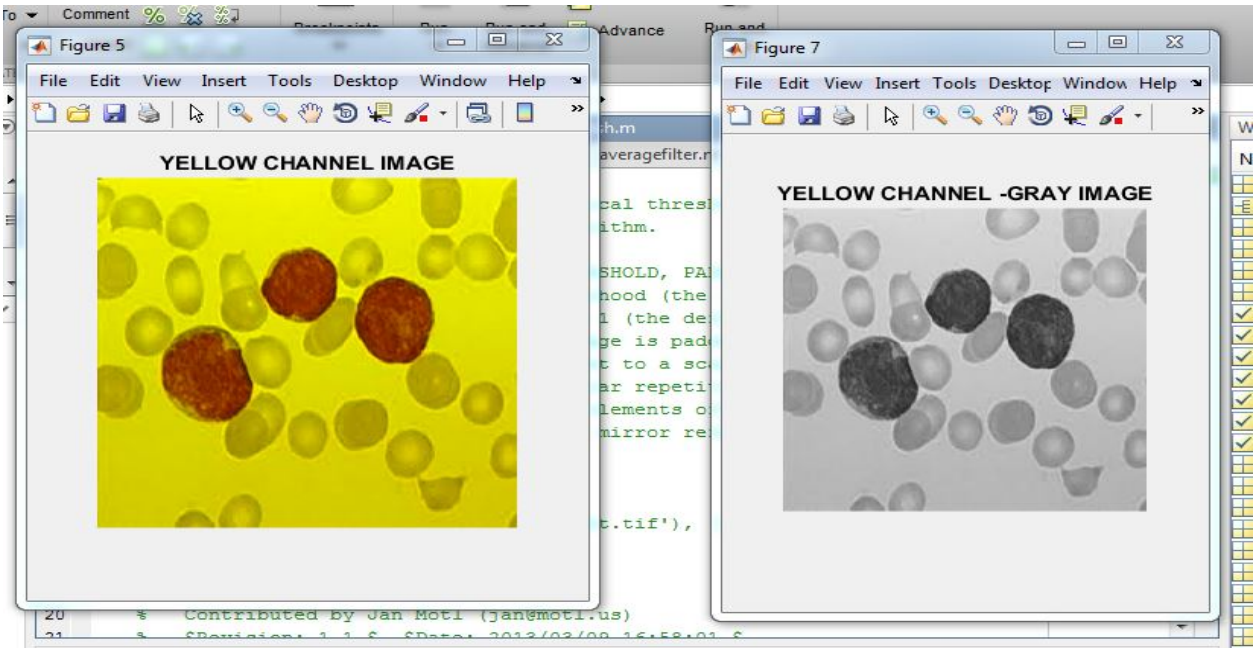
1. INPUT IMAGE **2.RESIZED IMAGE**



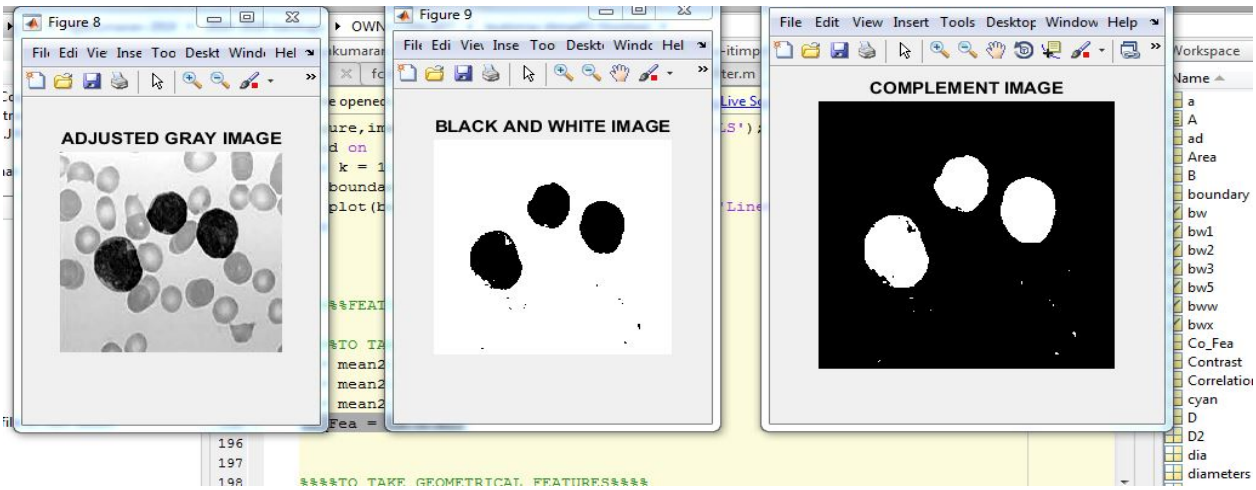
3.RGBTOYCBCR COLOR SPACE IMAGE



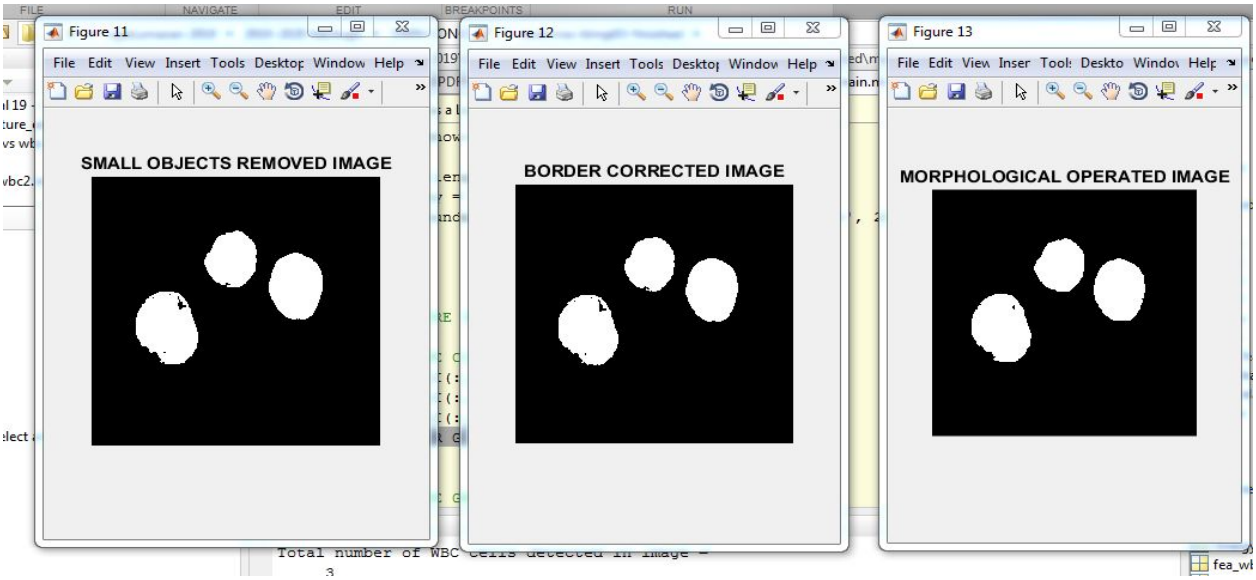
4.SELECTED Y-CHANNEL & GRAY CONVERTED Y-CHANNEL



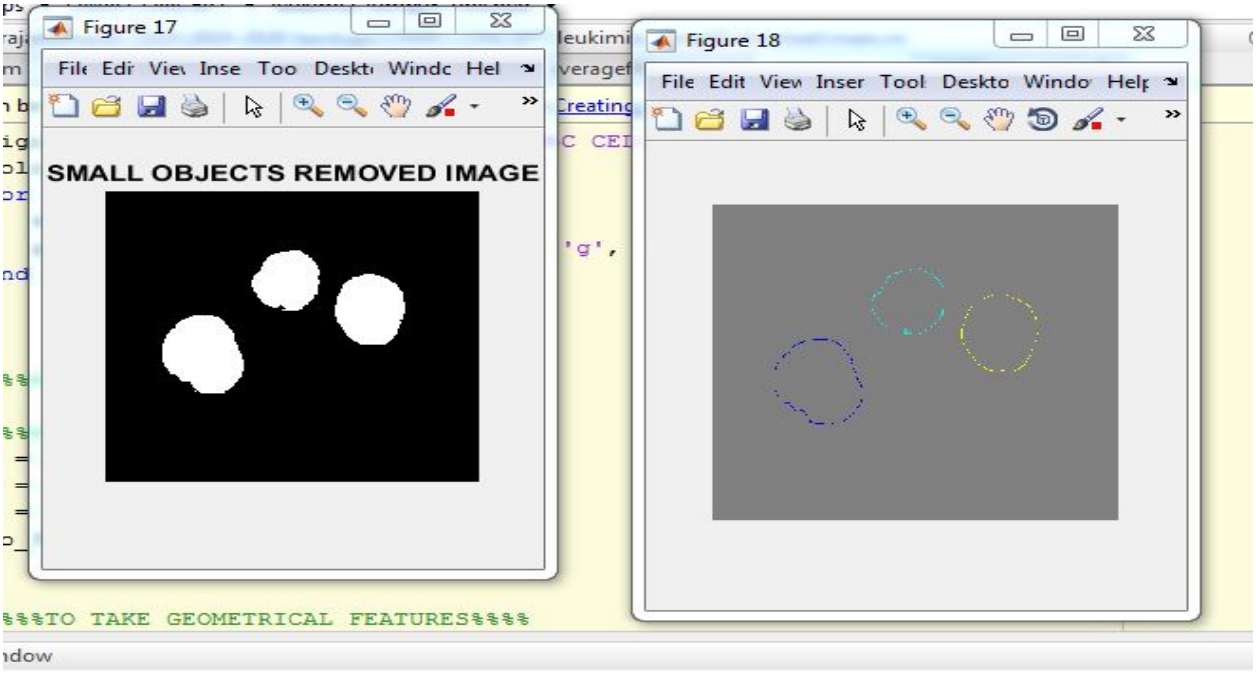
5.ADJUST& BW & COMPLEMENT IMAGES



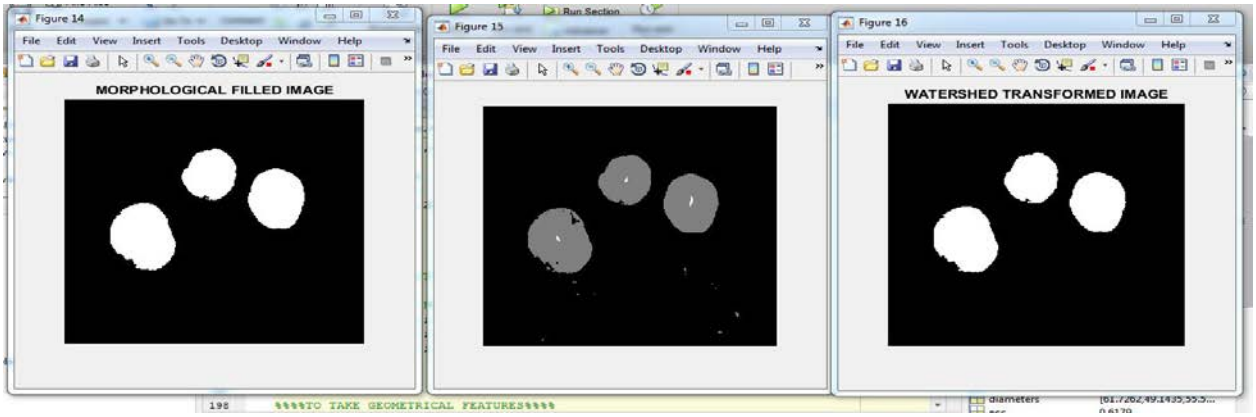
6.MORPHOLOGY OPERATED IMAGES



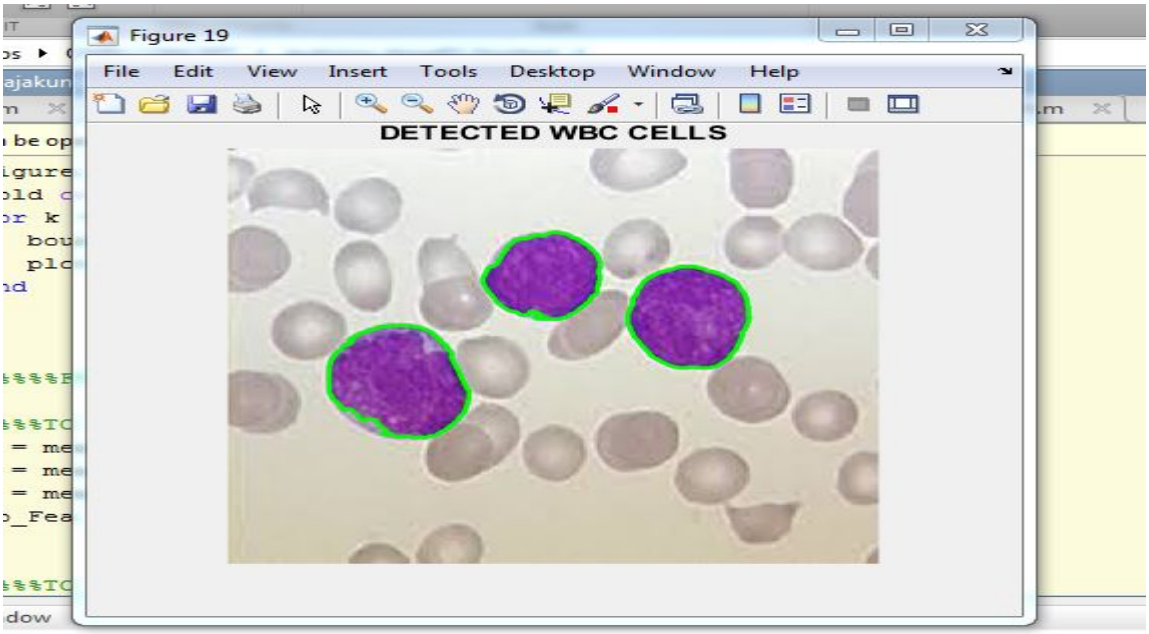
7.MORPHOLOGY OPERATED IMAGES



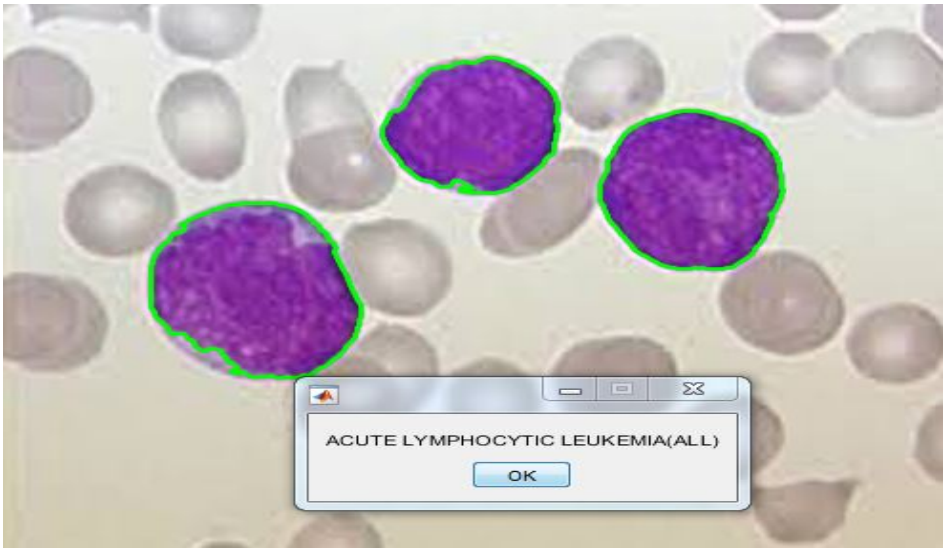
8. WATER SHED TRANSFORMED IMAGE



9. SEGMENTED IMAGE



10. FINAL OUTPUT IMAGE

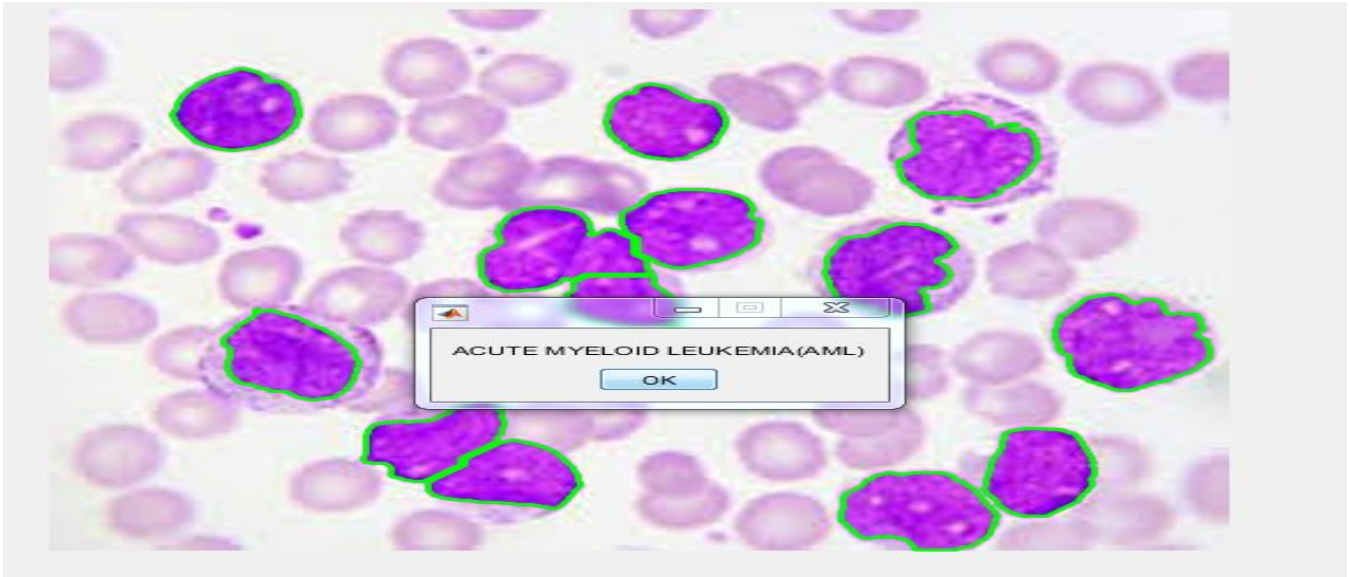


11. TOTAL NUMBER OF WBC CELLS

ommand window

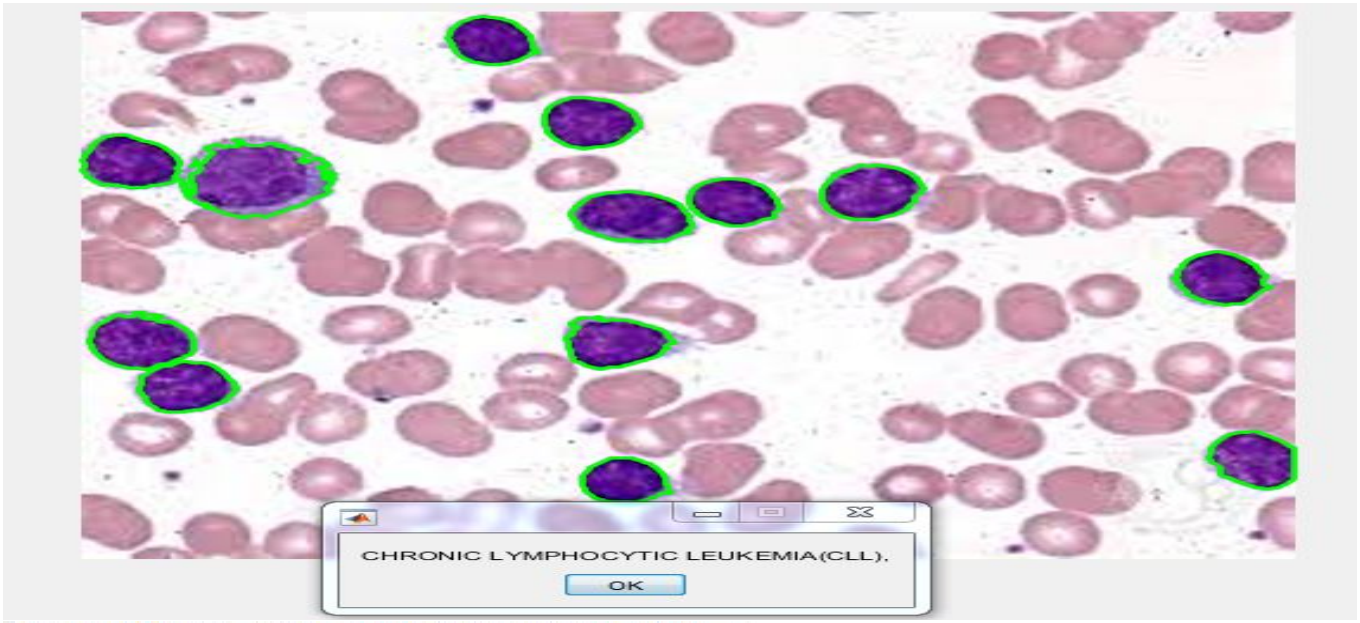
```
Total number of WBC cells detected in image =

     3
```

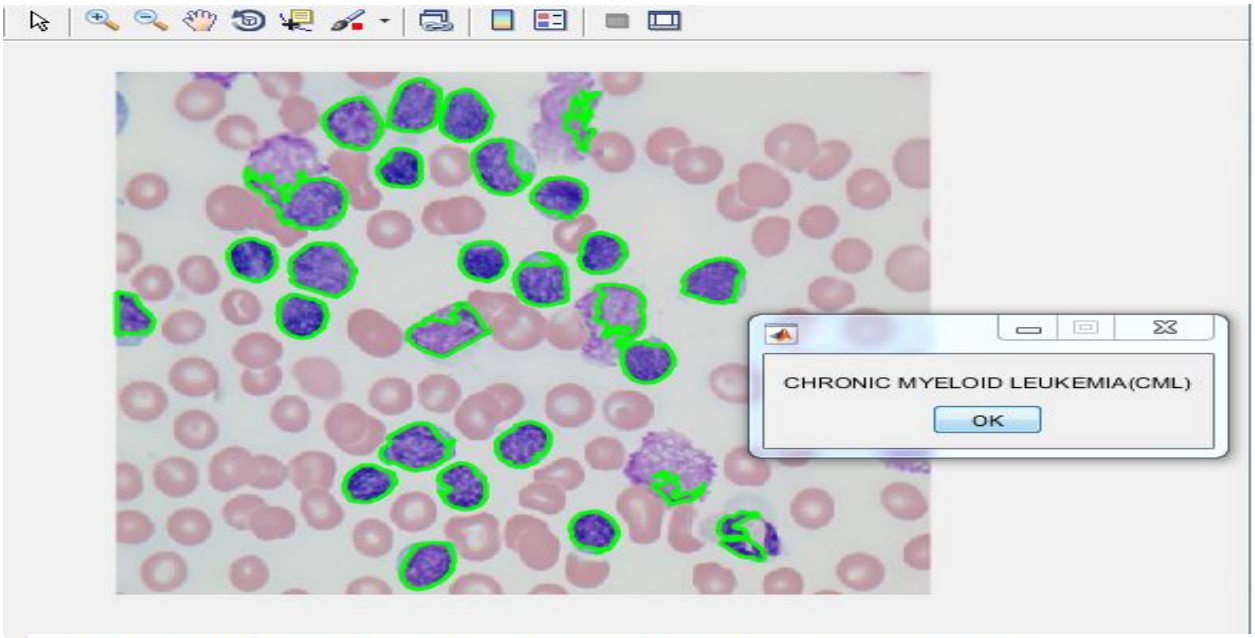



```
Total number of WBC cells detected in image =

    13
```




```
Total number of WBC cells detected in image =
    13
```




```
Total number of WBC cells detected in image =
     28
```

The output involves the preprocessing of the input images, feature extraction from the processed images and classification of the images into the different types of leukemia namely Acute Lymphotic leukemia(ALL),Acute Myeloid leukemia(AML),Chronic Lymphotic leukemia(CLL) and Chronic Myeloid Leukemia(CML).Along with the count of WBC cells which helps the doctor during diagnosis.

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