

Detection of White Blood Cancer from Bone Marrow using CNN

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Abstract – . This paper is based on integration of the biomedical field and computer science. Paper contains the study of bone cancer and features to predict the type of the same. Related work to find cancer in human body using computer vision is discussed in this paper. Image segmentation technique like sobel, prewitt, canny, K-means and Region Growing are described in this paper which can be stimulated. Paper also shows the result of edge based and region based image segmentation techniques applied on image to detect osteosarcoma cancer present on bone using MATLAB. Finally, paper concluded by finding best suited segmentation method for grey scaled image with future aspects.

Key Words: Image processing, tumors, medical imaging, machine learning.

1. INTRODUCTION

The microscopic The microscopic inspection of blood provides diagnostic information concerning patients' health status. The differential blood count inspection results reveal a wide range of significant hematic pathologies. For example, the presence of infections, leukemia and certain specific types of cancers can be diagnosed based on the classification results and the white blood cell count. Experienced operators perform the traditional method for differential blood count. They use a microscope and count the percentage of each type of cell that is counted within a area of interest.This manual process of counting is obviously very tedious and slow. Furthermore, the classification and accuracy of the cell may depend on the operators ' capabilities and experiences. Consequently, the need for an automated system of differential counting becomes inevitable. Recently, a number of different approaches have been proposed to implement a white blood cell recognition system based on image processing. White blood cell classification usually involves the following three stages: a white blood cell segmentation from an image, the extraction of effective features, and a classifier design.to some extent, the performance of an automatic white blood cell classification system depends on a good

segmentation algorithm to segment white blood cells from their background.

Bone cancer occurred in four stages:

Stage 1	Only tumor detected and not spread out of the bone.
Stage 2	In aggressive stage.
Stage 3	Tumor started growing in another multiple places.
Stage4	Cancer has reached other parts of the body.

2. METHODOLOGY

In this paper a method is introduced to detect bone cancer by using machine learning algorithm. The main objective is to detect the tumor present in the bone, but most of the times it happens that in methods of tumor detection the images obtained comes up with the greater noise factor which restrict the area to operate as it doesn't give the exact location of tumor and the affected tissues. Hence in this paper a novel approach have been proposed which will comprised of the number of stages which will ultimately lead to the proper detection of enchondroma tumor i.e. bone tumor. A simple flow chart for the proposed system as follows:

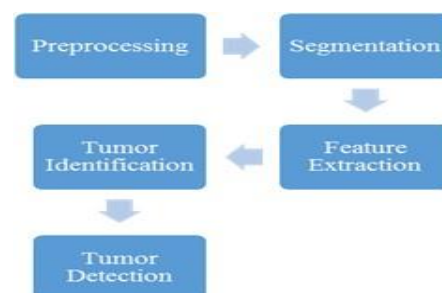


Fig. Process Flow Chart

2.1 Preprocessing

The images which are taken may have some noise, blurriness etc. In this part of image processing we are trying to remove those unnecessary things for making the images more suitable for the next step of computational process. Pre-processing techniques usually include enhancing contrast, removing noise, isolating regions etc. The median filtering technique is used here to remove noise. And for removing blurriness from the image wiener filter is used.

2.2 Segmentation

Image segmentation is the process of dividing the image into the partitions on the basis of regions with similarities. This is one of the most important part in the image processing technique. To identify and count white blood cells separation from the other cells are very much important. Through segmentation separation is done. Segmentation can be done in many way but we are using here the K-means clustering technique for segmentation. Here K-means clustering gives the best result because WBCs are well separated from the other cells in blood sample image. When the images are converted into gray scale images the WBCs are become the darkest region of the images. After that we are applying histogram equalization and Zack algorithm for grouping of white blood cells.

2.2 Feature Extraction

In this part some features are extracted from the processed image. In this phase we are trying to find out the features of the nucleus of the leucocytes(WBCs).Feature extraction is the process of collecting some data from the image so that we can check these values of data with the standard value so that we can differentiate easily that the image has cancerous cells or not.

2.3 Tumor Identification

The bone tumor is identified by simply calculating the mean pixel intensity of segmented image.

Mathematically, the mean pixel intensity can be calculated as:

$$\text{Mean pixel intensity} = \frac{\sum \text{intensities for extracted tumor part}(s)}{\text{No. of pixels for extracted tumor part}(N)}$$

2.4 Tumor Detection

After the tumor identification process it is last step to detect the tumor which can be carried out by using the MATLAB function for connected components which will simply select out the area with maximum connected component and the remaining area will be discarded.

3. CONCLUSION

In this paper the main point of concern is automatic counting of WBCs to detect leukemia automatically from the image which is taken from the microscope. The manual counting process to detect WBC is very much time taking and gives inaccurate result also. So to save lives this automated proposed method is very important. Actually in two ways we can detect WBC. For the first one after segmentation counting algorithm is used to count automatically. And for the second one some features are extracted to form a feature matrix to compare with the standard values. We have achieved an accuracy of almost 94.11% using this proposed method of counting.

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