Cancer Clumps Detection using Image Processing Based on Cell Counting and Artificial Neural Network Techniques

Suneetha Davuluri, D. Rathna Kishore

Abstract: Cancer is one of the main reasons for death among humans. So much research has been done for detecting and diagnosing cancer using image processing and classification and techniques. But the disease remains as one of the deadeist disease. Thus early detection of the disease is only one of the reasons to cure the cancer. In this proposed technique identifying cancer cell by using Image Processing, Artificial Neural Network techniques using cell counting, area measurement and detection of clumps. With the help of proposed technique we detect the cancer traits of any CT image, mammography image of biopsy samples automatically. So many algorithms was proposed but there was a lack of flexibility and the level of accuracy is not consists. Before applying proposed algorithm, the system preprocesses the input images with various techniques like gray scaling, binarization, inversion and flood fill operation. The proposed method can be work on various images and fine tuned with a feedback system and if can effectively used for automatically detection of cancer cells in a unique way and lead to open up new dimension in detecting cancer cell in the field of medical sciences.

Keywords: Image Segmentation, Artificial Neural Network, Mammography Image, Image acquisition, Clusters

I. INTRODUCTION

Cancer is one of the frequent diseases among humans. It can be detected by using various clinical examinations. The rate of detection of cancer is very low [11]. Now a day this one is challenging area for researchers to help the doctors to discover the existence of tumor in the early stage of the disease. Detecting cancer is a challenging issue now a days and this is not a single disease it is a combination of multiple disease. So many types are present and that one is vary from person to person. That means one algorithm is not suitable for all types and that one is vary from person to person. For example in breast cancer the breast appears differently from person to person. So one particular algorithm is not suitable for all the humans. So it is a typical task to propose an algorithm which is mostly suitable for all the humans to detecting cancer cells [13].

Cancer has been big topic from past three decades.

It has the funded medical research across world. So many people are cured and saved the lives because of early detection of cancer.

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So many researchers have been conducting for identifying cancer using clustering method with the help of general image preprocessing techniques for CT scan image[10][14]. In this proposed approach we introduced a new algorithm for detecting cancer at the early stage by using image processing and Artificial Neural Network Concepts.

II. RELATED WORK

Kumar [2] proposed a new cancer detection technique using clinical interpreferable features. This algorithm works on K mean cluster and segmentation concept. This consists of so many stages like segmentation of cells, feature extraction and classification technique for the enhancement approach. The original image was divided into segments by using image segmentation concept of image processing. In feature extraction phase the features are extracted from the segmented images. Finally apply classification techniques like KNN and SVM [15] based classifiers and the results are observed for various images and the selected features list of images. Jain [3] proposed a new preprocessing technique for identifying lung cancer. In this paper we had a new noise removal technique for input image to reduce the noise difference for input and output image.

Ramin [4] proposed image analysis technique for identifying cancer cells and to count the number of cells leads o cancer in original images. This algorithm consists of four major steps like preprocessing, classification, bound areas and cell counting. In preprocessing removal of noise detection was done for original image. Secondly the original image was classified using KNN [1] algorithm after that it will group into the same cluster value. Thirdly we count the common cells which are based on the output from the second stage [5]. The local thresholding algorithm is used for separating bound nucleus. The results are good with respect to error ratio and Standard Deviations [12].

Thilagavathi [6] presented a new method for counting red blood cells using transform technique. This algorithm is used for estimating red blood cells. This algorithm is presented in 5 stages.

Preprocessing, segmentation, image acquisition, feature extraction and counting. In segmentation find out the lower and upper threshold values and the saturation image is used for preprocessing and apply basic XOR [1] operation for two binary images. In general digital mammography is one of the first techniques to diagnosis cancer. So many algorithms were proposed based on the various classification problems for the digital mammography image.

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In this various features are extracted using the basic notation and are using various standard procedures. In this area of the tumor is calculated by using an algorithm called MLE [7][17]. Screwing mammography is one of the easiest ways to diagnosis the breast cancer. In this we find the edges, smoothen the edges of the image. Finally calculate the size of distribution, tissues in a image without segmentation [12].

Nano Technology is also gives fast and delicate location for cancer cells. The nano devices can be used to identify cells and kill the infected cells in a human body. Mello proposed two methods for identifying cancer cells in a human body [8]. These two methods are based on the different color. In this the input image is in RGB color format and it is transformed into HSL [16] color model. HSL color model is applied to the binarization. Filtering is done for the binarization image to smoothen the edges of the image [9].

III. PROPOSED ALGORITHM

The proposed algorithm consist of six different stages to identify cancer cells, counting cancer cell automatically .The proposed model structure is shown in Figure 1.Those are
- Image acquisition
- Pre Processing
- Cell counting
- Train the cells using Artificial Neural Networks
- Identify the area in between cells
- Detection of clumps

Stage 1: Image acquisition

Read the original biopsy RGB image from any microscope or any macro camera as an input image.

Stage 2: Pre Processing

The input image needs to undergo several filtering process to produce more accurate results. Take any biopsy image collected from any microscope or any macro camera as an input image.
Step 1:
Convert the original RGB image into gray scale image.
In this the original image is converted into gray scale image to reduce the noisy levels of the image. The image is converted into gray scale image by using rgbtogray() function or with saturated values of RGB
$(0.189*R)+ (0.6870*G) + (0.1140*B)$ (1)
Step 2: Binarization of gray scale using otsu threshold algorithm. Mainly this algorithm assumes the original image into two parts foreground part and background part. This step is mainly used to calculate the threshold value.
Step 3:
After obtains the binary values from the image those parts values are inverted using inversion function and finally obtain the inverted image.
Step 4:
Apply filtering process to reduce the noise or unwanted noise levels of the image

Stage 3: Cell Counting

To trace the boundaries of the original image or cells we apply canny edge detection algorithm which will find all the edge Pixels of original image. After identifying edge pixels of the original image we applied neighbor facing algorithm which will identify the black pixels of the current edge. The Process of cell counting is show in Figure 2
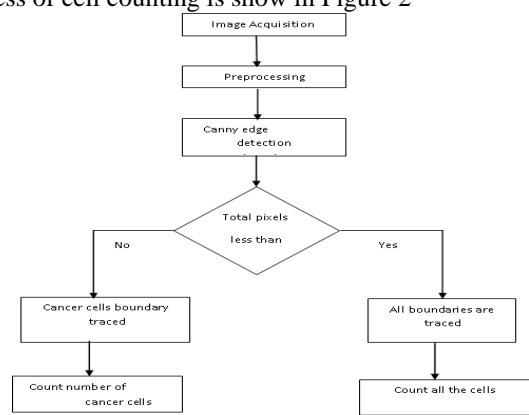

Fig 3.Biopsy image collected from the microscope

Stage 4: Train the cells using Artificial Neural Networks

After counting the number of cancer cells in a human body those cells are trained with the help of cascading feed forward network to train the cells.

Stage 5. Area measurement between cancer cells and normal cells

In this the area of the cells is the total number of non-zero pixels in between the two cells or in the bounded areas. Before calculating the area the image will be smoothened by gaussian algorithm to reduce the noise level of the image. In this the area is calculated based on the Douglas peculate algorithm which will store all points of horizontal, vertical and diagonal segments.
Consider $L(x,y)$ is an original image and the area is calculated using the formula
$A = \Sigma^w = 0 \ \Sigma^h = 0 \ x^0 y^0 f(x,y)$ (2)
The image areas are lower than 1000 those are treated as normal cells and remaining are treated as cancer cells.

Stage 6: Detection of clumps

In this calculate the center of the cells and identify the lowest distance from one to another based on the distance between the cells.
The center of the cell is calculated by using the following formula
$Center = [X_{10}/X_{00}, X_{01}/X_{00}]$ (3) (1)   (3)
Where X_{00} is the zero [th] moment of the pixel
$X_{10} = Suma/X_{00}$ and $X_{01} = Sumb/X_{00}$
And the distance between two points is calculated by using the general formula

$$D = \sqrt{(x2-x1)^2 + (y2-y1)^2}$$

If the distance between two cells is under certain specified mean value then it will be taken as clump and identified as a cancer.

IV. RESULTS

The proposed algorithm count cancer cells and identify cancer clumps and the various stages results are showed from Figures 3 to Figures 8.

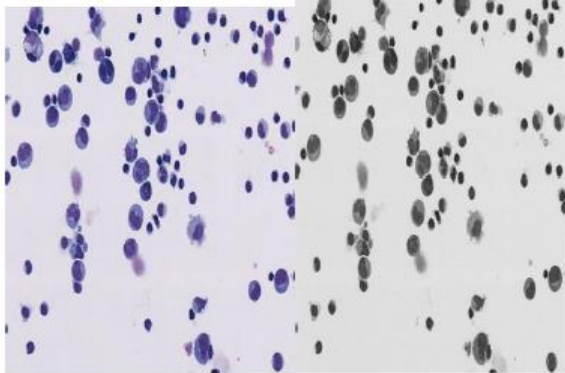The cell count for the different areas are shown in Table
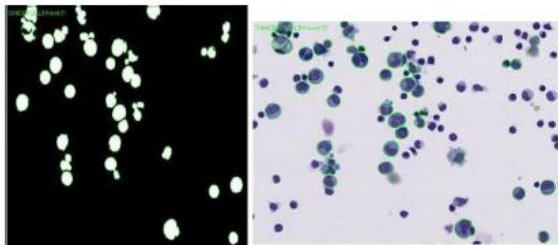

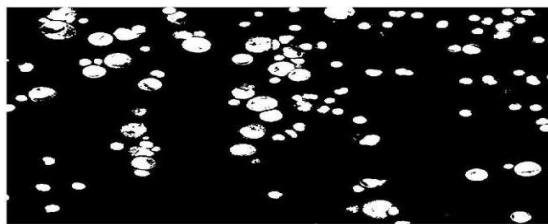**Fig.4.Gray Scale Image**

Fig. 5.Binary Image

Fig.6. Inverted Image

Fig. 7.Counted Cancer Cells in binary

Table1: Counted Number of Cells for Different Areas

Area in Pixels	Counted Number of Cells
900	38
950	35
1000	33
1050	28
1100	27
1150	27
1200	26
1250	26
1300	24
1350	23

V. CONCLUSION& FUTURE SCOPE:

Million of peoples are affected by cancer disease by all over the world, significant amount of humans die due to last stage of identification and there is exact cure for cancer. The proposed approach effectively detect the cancer clumps automatically at the early stage of cancer by using different stages like preprocessing, training, area measurement and cancer clumps identification based on the distance. This proposed approach is effectively produced good results for various mammographic and CT scan images in various areas.

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