Detection of Cervical Cancer By Using Digital Image Processing Technique

Mr.V.J. Vijay Arvindh[1], Mr.J.Beschi Raja Asst Prof[2]
Department of Computer Science
[1,2] Sri Krishna College Of Technology, Coimbatore, Tamil Nadu, India

Abstract- *Cervical cancer is one of the deadliest cancers and various techniques are applied to detect this cancer and a key research area is image processing. The main problem is that this type of cancer cannot be identified in the early stage because it does not show any symptoms until the final stages. This is attributed to the cancer itself and also to the lack of pathologists available to screen the cancer. A novel approach to classify the various malignancies in cervical images was proposed. For classification, a classifier was used that would help us to classify the stages of the cancer and help the pathologist detect the cancer better. Firstly, the image of the cells is segmented and identified automatically. Then, the median filter is used to suppress the noise to get the best approximation of the original image. Then, the characteristic parameters of cervical cancer cells are extracted according to the gray level distribution of the image. Finally, the cancer cells were distinguished from the normal cells. In the proposed system, the image that is obtained has been tested with a set of other related images and hence proved efficient.*

Keywords- Image processing, Median filter, Gray level distribution

I. INTRODUCTION

The field of Image processing has gone through tremendous useful changes in the recent few years. Medical imaging plays a vital component these days in various applications used in the field of medical and is providing a great relief to the people associated to this field in terms of time and the efforts used. Various diseases have been identified using image processing techniques and thus have provided early phase detection and helped the doctors to cure the disease.

Basically, the main objective was to develop a detection system that is able to detect and characterize cervical cells into normal and cancerous cells based on color intensity distribution. There are few scopes that limit the functions of this system. Firstly, this system is able only to classify cervical cells into cancerous and noncancerous cells. Then in the next stage, the images used in this research were captured from cytological Pap smear slide using Olypmus microscope. In the end, this system has applied digital image processing techniques such as image enhancement, image conversion, image segmentation, and filtering in the development of the system using Matlab programming.

Many researchers developed various Automatic classification system of cervical cells images. Then in those process it takes long time and are less accurate. Hence to reduced the processing time while maintaining the accuracy the various methods have been proposed in classification of cervical cancer. Initially in the traditional methods the visual procedures are time consuming and produce lot of errors.It is impossible to check each one of them separately to identify this problem. To solve this problem the introduction of some automated process are made that could accelerate the process and also produce accurate results. When the process are done the classification are done,so before doing that the image is optimized and labeled. When this methods are followed it accelerate the segmentation and classification process. The result shows the significant reduction of computation time when compare to other results,while maintaining the accuracy, specificity, sensitivity and positive predictive value.In the automated system it would consist of three phases such as pre-processing phase to remove noise , segmentation phase to identify the cells and to separate nucleus and cytoplasm and feature extraction phase to identify and locate the cancerous cells.

The main problem is that the Neural Network classifies the cervical caner cells as normal and abnormal. Neural Network is normally a binary classification where it can classify one of the two classes and not more than two. Neural Network can be applied not only to classification problems but also to the case of regression.

In the Neural Network they specific class of algorithms which are characterized by usage of kernels, absence of local minima, sparseness of the solution and capacity control obtained by acting on the margin and depends on number of support vectors. Still it contains all the main features that characterize maximum margin algorithm: a non-linear function is leaned by linear learning machine mapping into high dimensional kernel induced feature space. With the help of the parameters which do not depend on the dimensionality of feature space control the capacity of the

system. In the similar manner with classification approach there is motivation to seek and optimize the generalization bounds given for regression. They depend on defining the loss function that will ignores the various errors, which are situated within the certain distance of the true value. This type of function is often called – epsilon intensive – loss function.

II. RELATED WORKS

H.Wijkstra[3] Classification of medical images using textural classification have been successfully performed on various medical images which reveals a lot about the image.We utilize Neural Network to classify the features extracted. Neural Network are a set of related supervised learning methods which analyze data and recognize patterns, used for statistical classification and regression analysis. Since an Neural Network is a classifier, then given a set of training examples, each marked as belonging to one of two categories, an Neural Network training algorithm build a model which predicts whether a new example falls into one category or the other. Intuitively, a Neural Network model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible.

Eko supiyanto [1] A new approach is proposed for the early detection of cervical cancer using Papsmear images. Regular Papsmear screening is the most successful attempt of medical science and practice for the early detection of cervical cancer.. The very popular method is the Pap smear test where the physician scrapes a small amount of cells from the uterus of the cervix region to find changes in the cervical cells before they change into cancer cells. The Pap smear test is very costly and only few experienced cytologists are available to conduct this test which leads to high false positive rates due to human error.

P. Boyle [2] The automated detection system of cervical cancer cells is based on the morphology of the cells and level set operations. The test result shows that by using color intensity classification the system is to differentiate between normal and cancerous cells. This system will hopefully help the pathologist to reduce the work-load and minimize human error while maintaining and improving the accuracy of the system.The conventional Pap smear has been undeniably responsible in reducing the number of incidence and mortality of cervical cancer but there is a shortage of skilled and experienced pathologists and the increasing workload which would lead to human errors.

Guyon, I [5] In this system the method is based on level set active contour model to sever the nucleus and cytoplast from the cervical smear image. Initially the region of interest (ROI) which contained a main connected cell region has been separated from the smear image after the coarse segmentation by auto dual threshold segmentation. When the segmentation process are done thenn two independent level set functions are formed based on the Chan-Vese model with intra-region similarity and inter-region diversity have been constructed to approximate the cytoplast and nucleus contours. In this system there may be more than one connected cell regions in the ROI, a method of main cell body and main cell nucleus contour curve extraction has been proposed.

Jan Pontén[4] Grouping images into semantically meaningful categories using the low-level visual features is a challenging and important problem in content based image retrieval and other applications. A specific high-level classification problem which is scene images classification is done using the low level features such as representative colors and Gabor textures. Based on the low-level features, we introduce the Neural Network to merge these features with the final goal to classify the different scene images. Experimental results show this method of approach is promising

III. PROPOSED SYSTEM

The proposed approach for cervical cancer detection using Papsmear images. The input images used in this method are conventional Papsmear images which are microscopic optical images in .bmp format. In this work we have considered single cell Papsmear image for evaluating the cell as normal or abnormal. The first stage is the preprocessing block which constitutes color conversion and enhancement to prepare the image for further processing. The next stage is the processing block where the main objective is to segment the nucleus from a single cell. Following this stage is the feature extraction where the area of the nucleus is extracted for classification of the cervical cells as normal or abnormal.

The main objective was to develop a detection system that is able to detect and characterize cervical cells into normal and cancerous cells based on color intensity distribution. In this proposed system has applied digital image processing techniques which includes image enhancement, image conversion, image segmentation, and filtering in the development of the system using Matlab programming.

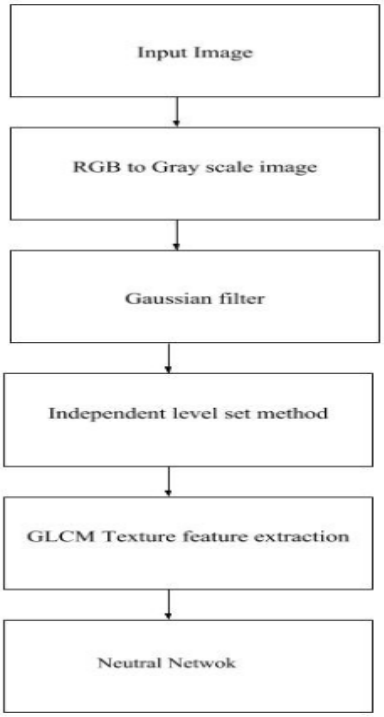

Figure 1.Block Diagram

A. IMAGE ANALYSIS

The images taken as input are cervical cytological cells in RGB color scheme. The images are first converted into gray scale image. An input image is digitized to convert it to a form which can be stored in a computer's memory or on some form of storage media such as a hard disk or CD-ROM. Here the digitization procedure method can be done by a scanner, or by a video camera connected to a frame grabber board in a computer. When digitization method is followed then it can be operated upon by various image processing operations.

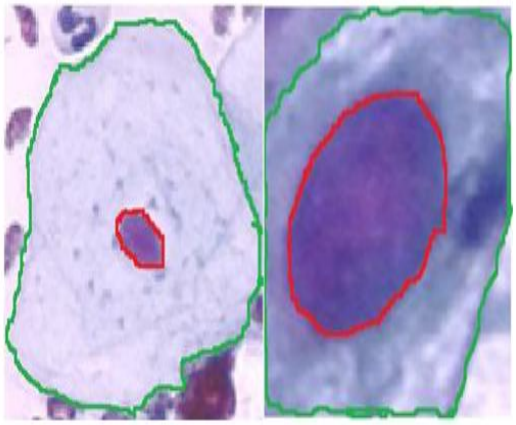

Figure 2. Normal Cell

Figure 3. Abnormal Cell

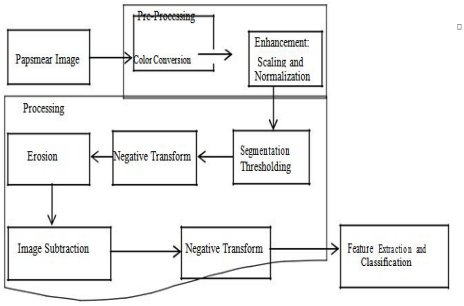

Figure 4. Image Processing Technique

CONVERSION INTO GRAY SCALE IMAGE

We know that the image is a visual representation of any object or we can say that the image or picture is created, copied and stored in a electronics form.The two dimensional signal defined by f(x,y) of mathematically image where f is the intensity property like brightness and contrast.Color information is made by RGB color format.Human can easily identify the type of colour and describe it cannHuman has an ability to describe any type of colors and also identify colors but machine has no capacity to do those things like humans. Same problem will also arise in the gray scale images So we need that type of system who can identify the gray scale information.

Grayscale images in which the computer images contains only the two colors, black, and white .Grayscale images have many shades of gray in between and Matlab supports large amount of image formats. Image which is formed is made of number of pixels and different major parameters like color and monochrome which are processed and executed by an image processing techniques. In the signal processing the image processing techniques takes the important part.Gray scale conversion is also a vital part of image processing. To remove the drawbacks of gray scale conversion in which RGB or color information has a 3 dimensional property which makes signal processing so much bulky and heavy.

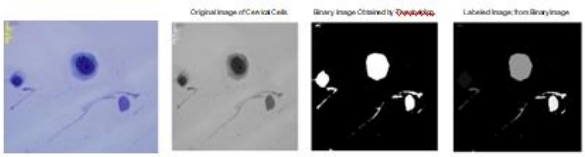

Figure 5.Image conversion from. RGB image to gray scale image

NOISE SUPPRESSION BY GAUSSIAN FILTER

With the help of Gaussian filter for noise suppression, the noise is smoothed out, at the same time the signal is also distorted.The use of Gaussian filter as

preprocessing for edge detection will also give rise to edge position displacement, edges vanishing, and phantom edges. In this paper, we first review various techniques for these problems. We then propose an adaptive Gaussian filtering algorithm in which the filter variance is adapted to both the noise characteristics and the local variance of the signal. Gaussian filter is a linear smoothing filter that chooses the weights according to the shape of Gaussian function. Whether in spatial domain, or in frequency domain, Gaussian smoothing filter is a kind of effective low-pass filter, especially to remove the noises that are subject to the normal distribution. Therefore it has a broad prospect of application in image processing. For one-dimensional Gaussian function of zero mean.

INDEPENDENT LEVEL SET METHOD

In the level set method, the construction of the speed function by which the final results are obtained.The speed function is designed to control movement of the curve and in each different application problems, the appropriate stopping criteria for the evolution is set. In this system, two improvements for enhancing the speed function of level set methods are carried out , to tackle the segmentation of the left ventricle from tagged MR images. In this system its is efficient in segmenting the tagged MRI images with blurry boundaries and strong tag lines. Two ways to enhance the speed function for segmentation of images with blurry boundaries and strong tag lines are presented here.The first process is to introduce the relaxation factor which provides a way to stop the evolving curve at the ventricle boundary even when the boundary is blurry. The relaxation factor detects the bounding condition of the difference between the maximum and minimum gradient values of the image.

This initial idea solves the leak problem at the blurry boundary by relaxing the bounding condition of the speed function. Then image content-based items are incorporated in the speed function. The properties of image is give more importance in order to control the front propagation instead of using the image gradient alone. We derive a simple through combining the image content items, to endow the speed function with more variability and better performance. By exploiting more image features than the image gradient, the constructed speed function can force the evolving boundary to stop at the object boundary, even if strong tag lines are close to the true boundary.

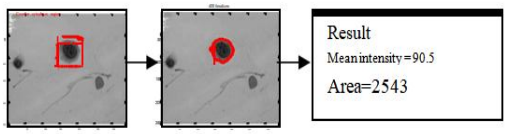

Figure 6. The implementation of Level Set Algorithm

GLCM TEXTURE FEATURE EXTRACTION

The texture features are calculated with help of observed combination of intensities.Depending on the number of intensity points (pixels) in each combination, statistics are classified into first-order, second order and higher-order statistics. The second order statistical texture features are extracted by the Gray Level Coocurrence Matrix (GLCM) method. Third and higher order textures consider the relationships among three or more pixels.These cannot be implemented because of the calculation time and interpretation difficulty.

NEURAL NETWORK

To classify the normal and the abnormal cells in the cervix region of the uterus the Artificial neural network technique can be used. By the method of an artificial neural network the classification of normal ,abnormal and cancerous cells can be done which produces accurate results when compared with the manual screening methods such as Pap smear and Liquid cytology based test. The ANN uses several architectures for accurate detection of cervical cells.

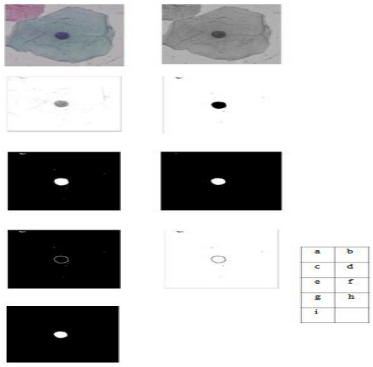

Figure 7. Segmented Results of Normal Nucleus

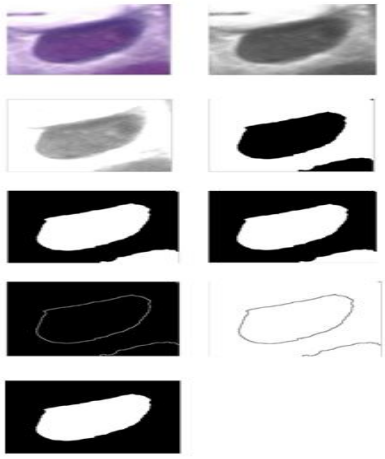

Figure 8. Segmented Result of Abnormal Nucleus

IV. RESULTS

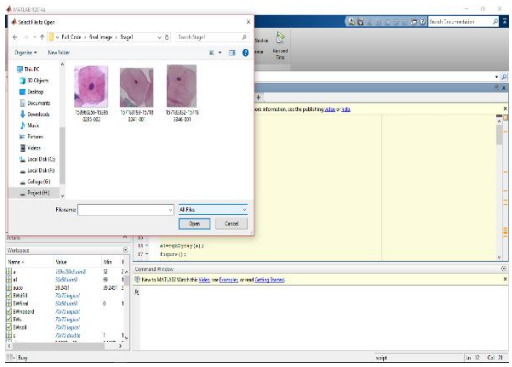

Figure 9. OPENING A FILE

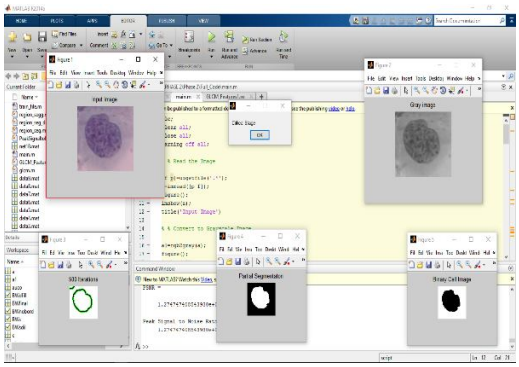

Figure 10. CRITICAL STAGE

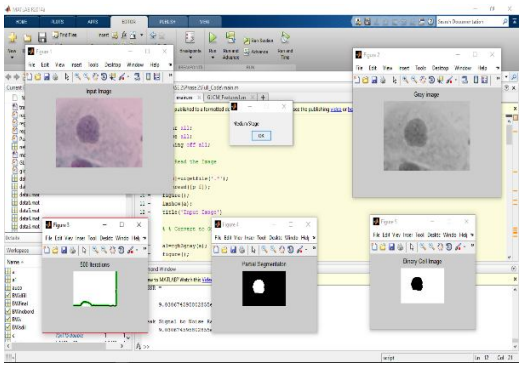

Figure 11. MEDIUM STAGE

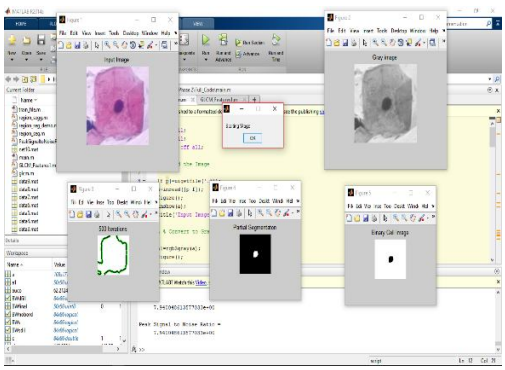

Figure 12.STARTING STAGE

V. CONCLUSION

An improved method for cervical cell detection is proposed. This work involves extracting both geometric and texture features for the purpose of classification by using Neural Network. This reveals that the method not only helps in classification of images but by the use of PCA, it also helps in selecting the features suitable for all types of classes. This method has been tested on cervical cell images from patients and compared with manual classification done by experienced pathologist. Test result shows the method able to classify the cervical cells with accuracy up to 77% in few milliseconds processing time, while manual pathologists require few minutes and other methods consume few seconds. The developed method improve the existing color intensity classification method and can become a potential candidate for cervical cancer rapid screening. Thus, we have classified the cancerous pap smear images into different stages by using Neural Network algorithm and also enhance the images. May also be enhanced by improving the contrast enhancement technique for Cervical Cell of Pap Smear Images by Reducing the Effect of unwanted background information.

REFERENCES

[1] Eko supiyanto, “Automatic Detection System of Cervical Cancer Cells Using Color Intensity Classification,”in Recent Researches in Computer Science.

[2] J. Ferlay, P. Autier, M. Boniol, M. Heanue, M. Colombet, and P. Boyle,“Estimates of the cancer incidence and mortality in Europe in 2006,”Ann.Oncol., vol. 28, no. 3, pp. 58 1 – 592, 2007

[3] H. Wink, J. J. M. C. H. de la Rosette, C. A. Grimbergen, and H.Wijkstra, “Transrectal contrast enhanced ultrasound for diagnosis of prostatecancer,” World J. Urol. , vol. 25, pp. 367 – 373, 2007.

[4] Jan Pontén,Strategies for global control of cervical cancer 3 January 1995

[5] Guyon, I., Weston, J., Barnhill, S., Vapnik, V.: Gene selection for cancer classification using support vector machines. Machine Learning 46 (2002) 389–422

[6] BustanurRosidi, NorainiJalil, Nur. M. Pista, Lukman H. Ismail, EkoSupriyantoTati L. Mengko “Classification of Cervical Cells Based on Labeled Colour Intensity Distribution” International Journal of Biology and Biomedical Engineering, Issue 4, Volume 5, 2011

[7] Marina E. Plissiti, Christophoros Nikou1 and Antonia Charchanti,” Combining shape, texture and intensity features for cell nuclei extraction in pap smear images”, Pattern Recognition Letters, Vol.32, No.6, pp.838-853, 2011