Automated Cervical Cancer Screening Using Pap Smear Slides

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Abstract- *Among the various types of cancer,cervical cancer is one of the most common cancers among women worldwide. Cervical screening using Pap smear images is one of the most effective ways of detecting and diagnosing the disease even at an early pre-cancerous stage. During mass screening program there will be huge number of samples to be analyzed and diagnosed and the current manual screening methods are time consuming and restricts the capabilities of the cyto-technicians in diagnosing more samples in shorter time. Therefore there is a need for a support system for faster analysis of samples. This work addresses this need and aims to develop detection system using efficient classifiers for cervical cancer screening.*

Keywords- Classification, Feature Extraction, Pap smear, Segmentation

I. INTRODUCTION

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps:

- Importing the image via image acquisition tools;
- Analysing and manipulating the image;
- Output in which result can be altered image or report that is based on image analysis.

There are two types of methods used for image processing namely, analog and digital image processing. Analog image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

Medical imaging seeks to reveal internal structures hidden by the skin and bones, as well as to diagnose and treat disease. Medical imaging also establishes a database of normal anatomy and physiology to make it possible to identify abnormalities.

II. EXISTING SYSTEM

The existing system includes typical procedures that involve pre-processing of original image. Segmentation of images is performed as the next step.

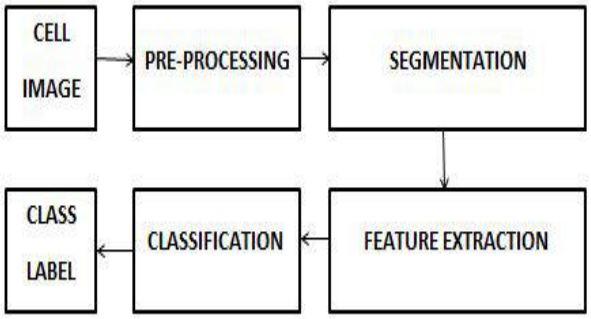

Figure 1. Conventional screening

III. PROPOSED SYSTEM

Cervical cancer can be prevented if it is detected and treated early. Pap smear test is a manual screening procedure used to detect cervical cancer or precancerous changes in an cervix by grading cervical cells based on color, shape and texture properties of their nuclei and cytoplasms. A computer-assisted screening system for Pap smear tests will be very beneficial to prevent cervical cancer if it increases the reliability of the diagnosis.The key step of a computer-assisted screening system that aims early diagnosis of cervical cancer is the accurate segmentation of cells by including .

The first and the most crucial step of such a system is the accurate segmentation of cells along with their nuclei and cytoplasms.In this paper, we propose an approach to cell

segmentation in Pap smear test images with the challenges of inconsistent staining, poor contrast, and overlapping cells. Experiments using two data sets show that our method performs well for images containing both a single cell and many overlapping cells.

The automated screening system uses advanced image acquisition, processing and classification techniques to differentiate normal cells from abnormal cells. The proposed cervical cancer detection framework is designed to work with single cervical cell images. The work flow of the proposed system is shown below.

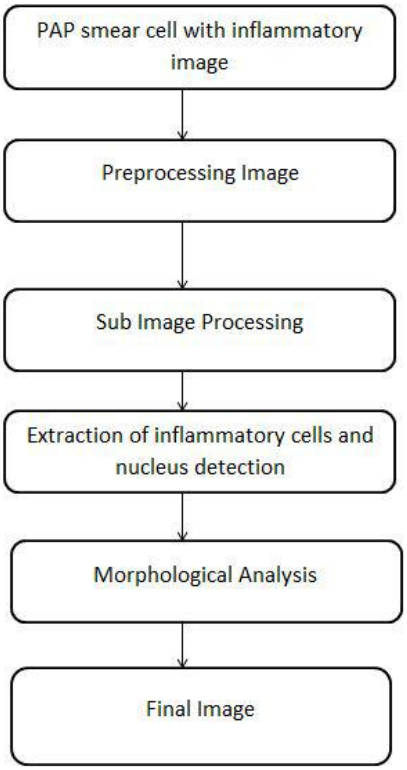

Figure 2. Proposed System Methodology

A. Segmentation

In this phase, the image is processed in order to effectively detect the regions of interest (in our case the cells) from the background. The background in the image is expected to exhibit homogeneous characteristics, as the noise is removed in a high degree in the preprocessing step. Furthermore, the background presents significant difference from the areas of the cells,because in most cases the intensity of the cells is lower than the intensity of the background.For these reasons, image thresholding provides an easy and effective way to define the regions of interest in the specific images.The results of the thresholding process are highly depended on the choice of the threshold value.

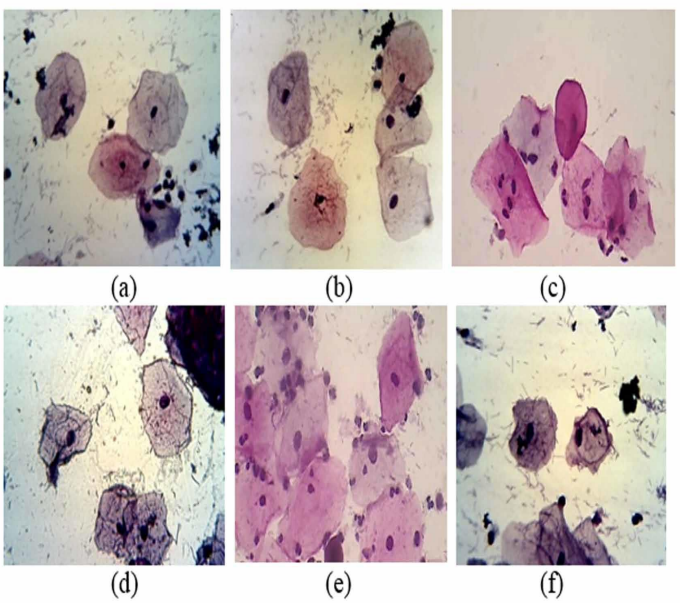

Figure 3. Original Image

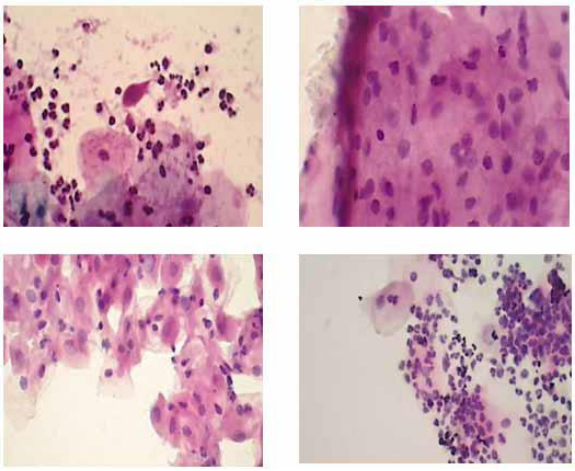

Figure 4. Conventional Pap smear cell images with inflammatory cells

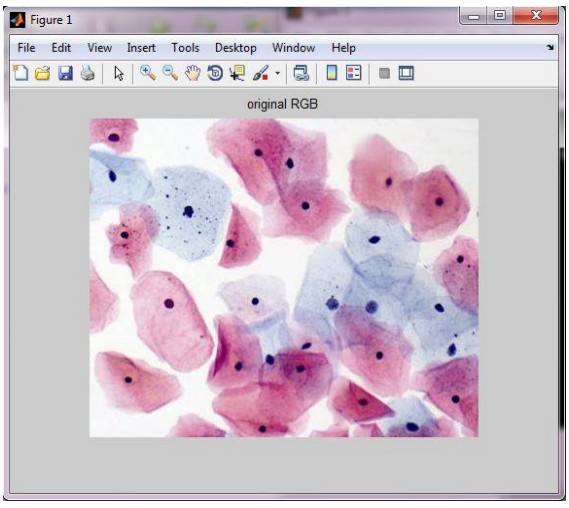

Figure 5. Original image

Result showing the number of segmented nuclei

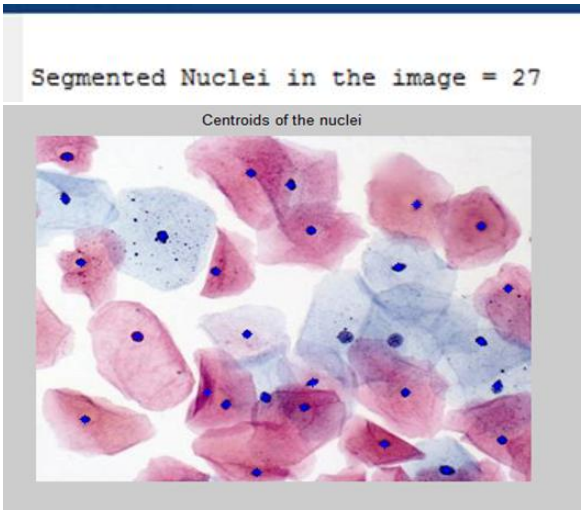

Figure 6. Centroids overlayed on the original image

Field	Value	Min	Max
Area	36	36	36
Centroid	[381.9167,141.9722]	141.97...	381.91...
MajorAxisLength	7.0238	7.0238	7.0238
MinorAxisLength	6.6907	6.6907	6.6907
Eccentricity	0.3043	0.3043	0.3043
Perimeter	19.3137	19.3137	19.3137

Figure 7. Features extracted tabulated

B. Classification

The data set used for evaluation of the classification was partitioned into equally sized training and test sets.Support Vector Machine(SVM) is used for classification of segmented images.The SVM is trained and tested by feeding the data sets in the machine.

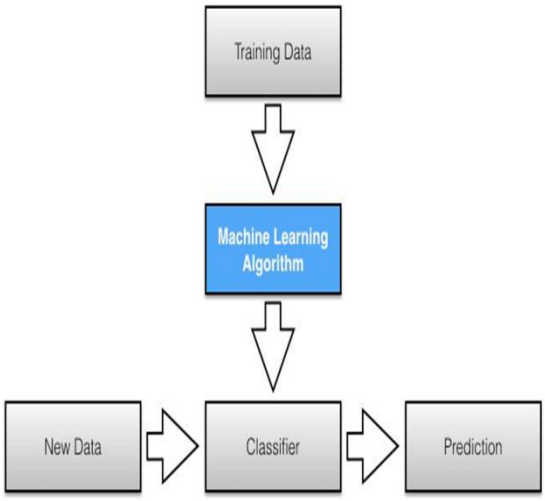

Figure 8. Classification strategy

IV. CONCLUSION

In this paper,the extraction of malignant cells in Pap smear images is proposed by automated procedure. This task is particularly useful for the correct interpretation of microscopic images and to draw accurate diagnostic conclusions. More reliable practical alternative methods are required to segment Pap smear images effectively.

V. FUTURE ASPECT

Future enhancements are made so that the accuracy in detecting the defected cells from the normal cells is enhanced and to be able to accurately recognize overlapping cells and improve its performance.

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