# Debris and Poisson Noise Removal from Pap Smear Image

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**Abstract -** *Pap smear is a test conducted to identify the cancerous cells in women's cervix. Cancer is the second leading cause of death, globally 1 of 6 deaths is due to cancer. If this disease is identified in the early stages, then it is curable. Many methods exist which provide ease and produce accurate results of this analysis. One such approach is using image processing techniques. The watershed algorithm is used to remove the debris and Poisson noise from an image. The image is then processed using other image processing tools to detect the cancerous cells. This paper briefs, how watershed algorithm is used to clean the debris from the medical image.*

*Key Words*: **Pap smear, Debris, Poisson noise, Image Processing, Watershed Algorithm, Cervix.**

## 1. INTRODUCTION

Diseases like cancer can be analyzed early in patients using effective technology. As pathologists manually analyze the cells by placing samples under a microscope. It is tiring, time-consuming, and even costly. Hence there is a need for a method that overcomes all these problems. Advanced image processing is the utilization of PC calculations to perform image handling on computerized images. Image segmentation is a significant and testing procedure for image handling. Image segmentation procedure is utilized to segment an image into important parts having comparative highlights and properties. Hence this paper attempts a method using image processing techniques which can overcome fewer of above- mentioned problem to some extent. The conclusion drawn from this work helps to find the useful cells by removing the debris and Poisson noise from a sample, which can further be analyzed to find whether the cell is normal or abnormal. There are different approaches to carry out image segmentation for example as the Region-Edge approach, Data clustering, etc. Suitable image processing techniques are used in this paper to detect the cells in the given microscopic image. This decision further helps pathologists to automate the work.

Images utilized in this work are procured utilizing light microscopy. In which patient should be prepared for collecting samples which are done in the laboratory at hospitals. Pap smear is a test that is conducted manually by the pathologists to detect cancer in women's cervix. Samples are collected using a spatula. The cells are then placed on the glass slides and then placed under the microscope. Then the sample is viewed manually by pathologists. But in the manual method the result accuracy may vary, it consumes more time and costly. This paper approaches to build such software.

## 2. Literature Survey

Research on the mechanized screening of Pap spreads has moved from cytology to histology over late years. In practically all imaging framework examination, picture division is a significant and requesting task. It is difficult for people to accurately break down the division of all pieces of cervical cells (cores and cytoplasm) in Pap spreads. Poor cell division can prompt poor examination results. Precise and programmed PC helped division overall cervical cell is important for cervical disease screening and analysis. [2]

From that point forward an enormous number of tasks have endeavored to create screening frameworks. The issue ended up being significantly tougher than foreseen. It took more than 40 years before the main fruitful business frameworks appeared. What's more, despite everything, mechanized screening isn't adequately financially savvy to supplant the visual screening deciding from the generally restricted entrance of computerized screening frameworks in the screening activities around the world.

Three SVM-based methodologies (standard SVM, SVM joined with a calculation, and SVM joined with the PCA calculation) are utilized to order the cervical malignant growth dataset from the archive of the University of California at Irvine. Core and cytoplasm division and classification utilizing multi-class SVM classifiers, for example, around 95% precision is provided by polynomial, quadratic, Gaussian RBF, and straight SVMs. [2]

Pradipta Maji et al (2015), proposed a computerized strategy for including red platelets present in the blood test. This strategy tends to the issue of gaps present in the middle of platelets and furthermore covering qualities of RBC's. In this strategy, thresholding is finished utilizing Otsu's technique, the gap-filling process is applied. Each platelet is removed and its shape is broken down to discover its circularity, covering, and so on. Halfway cells are disposed of. The number of cells in the covered zone is found. This strategy can be utilized to check different sorts of platelets. [1]

Marina E. Plissiti and Christophoros Nikou (2011) introduced an effective system for preparing a functioning shape model that speaks to smooth shapes. The limits of the

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district of intrigue (ROI) are identified with the union of a material science-based deformable model. The characteristics of states of ROI are communicated regarding the modular examination. The proposed technique is assessed by utilizing pap pictures. [1]

## 3. METHODOLOGY

The methodology of Segmentation of image using the Watershed Algorithm. Watershed segmentation to isolate contacting objects in an image. The watershed change is regularly applied to this issue. The watershed change discovers "catchment bowls" and "watershed edge lines" in an image by regarding it as a surface where dark pixels are low and light pixels are high. [9]

Segmentation utilizing the watershed change works better on the off chance that you can recognize, or "mark," forefront articles and background areas. Marker-controlled watershed segmentation follows this essential procedure:

### I. Reading Input Image:

A two-dimensional function, F(x,y) are used to define an image, where x and y are spatial coordinates, and the amplitude of F at any pair of coordinates (x,y) at that point is called the intensity of that image. When amplitude estimations and x, y, of F are finite, we consider it a digital image. A digital image is given as input, and rest all the operations are performed on the input image.

### II. Converting image to grayscale image:

The image given as input is colored image i.e. it contains colors, the operations which are to be performed further need to be operated on Grayscale image so the input colored image needs to be converted to a grayscale image.

### III. Use Gradient Magnitude as Segmentation Function:

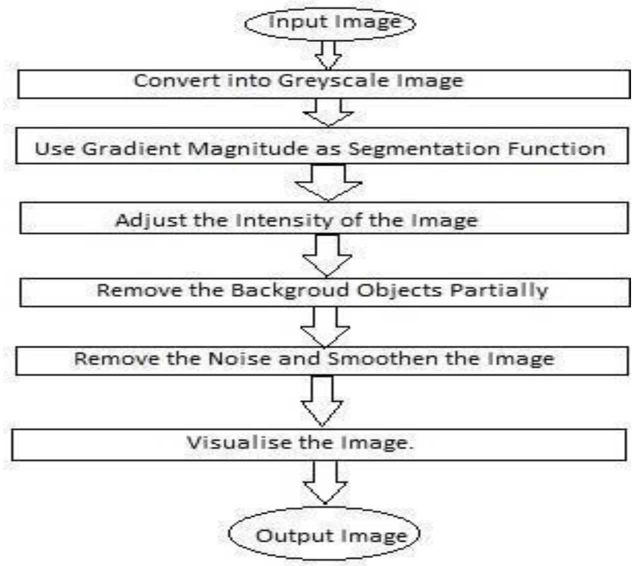
The gradient magnitude is utilized to preprocess a dark gray-scale image before utilizing the watershed change for segmentation. The image has a high pixel esteem along object edges and low pixel esteem elsewhere. The edges would result in watershed ridgelines along with object edges. There is an issue of over-segmentation in this strategy. The gradient gives an investigation of image then the practically unwanted contours due to the noise added to a given image can be fundamentally reduced by this methodology.

### IV. Remove the Noise and Smoothen the image:

The main motive of this approach is to remove the biological debris which is not important in the cell. Biological debris is organic waste. Precise detection and identification of biological cells are significant for the diagnosis and prognosis of many diseases, and hence for human health, and this biological debris can be a major problem in the diagnosis and prognosis of numerous diseases. Biological debris is the natural waste products which are removed from the cell by the immune system of human or animal.

The function imimposemin can be utilized to modify an image with the objective that it has territorial minima just in some ideal areas. Here you can utilize imimposemin to adjust the angle greatness picture so its lone provincial minima happen at the forefront and foundation marker pixels.

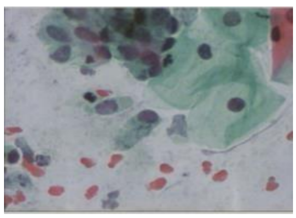
## 4. RESULT




Visualization strategy is to superimpose the foreground markers, background markers, and sectioned item limits on the actual image. You can use dilation as needed to make certain aspects, such as the object boundaries, more visible. Object boundaries are located where L == 0. The binary foreground and background markers are scaled to different integer values so that they are assigned different labels. In a few areas, somewhat occluded darker objects were converged with their brighter neighbor objects in light of the fact that the blocked items didn't have closer view markers. To superimpose this pseudo-shading mark grid use transparency on the first intensity image.

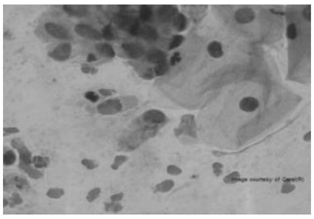
Results of the procedure carried out are shown below where a cell image is taken as an input and watershed segmentation is performed on it.

### I. Original Image:



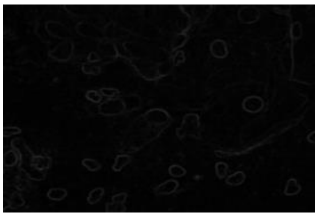
A colored image is given as an input to the system to carry out the assigned task.

**II. Greyscale Image:**



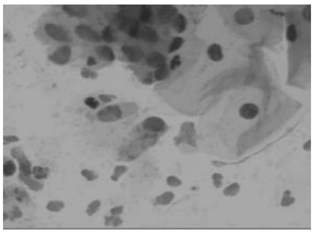
This image represents a greyscale image containing only shades and no color. A greyscale image has the luminance of each pixel.

**III. Marked Foreground Objects:**



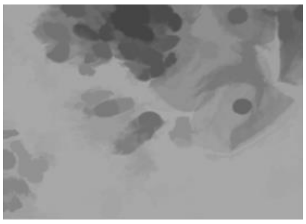
In this image, the objects in the foreground region of the image are marked so that they can be separated from the cells. Removing the foreground objects gives a clear image.

**IV. Background Objects Removed Partially:**



This image gives a partial view of the cells as the background objects are half removed.

**V. De-noised Image:**



In this image, cells can be seen clearly as all the debris and noise are removed. The image is segmented and is ready for its future use.

## 5. CONCLUSIONS

In the image, cells are seen clearly as all the debris and noise is removed. The image is segmented and is ready for its further use. The acquired output image is on greyscale. Each cell is visible and can be analyzed further. Compared to manual testing, this method gives a 90% correct output.

The purpose of an automated inspection system is to diminish the expense and/or false-negative pace of a screening program. To accomplish the primary goal, the expense of working the framework including capital and maintenance costs in addition to the direct operational costs must be not as much as what it expenses to do the similar work as the framework does with conventional manual strategies. It is doubtful if the current age commercial systems meet these objectives. They have been more focused on the second goal.

By running machine screening in parallel to visual screening the machine likely misses different anomalies than the human screener, thus decreasing the overall false-negative rate. The general operational cost will be that as it may, be higher. The presently available business framework may hardly marginally increase the quality of the screening however they won't essentially decrease the expense.

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