# DETECTION OF LIVER CANCER DISEASE USING MICROSCOPIC IMAGES



**Gururaj L Kulkarni[1], Sanjeev S Sannakki[2], Vijay S Rajpurohit[3]**
**[1,2,3]Dept. of CSE, KLS Gogte Institute of Technology, Belagavi.**

***Abstract*—**
The detection of liver cancer in its early stages is very difficult and more time consuming. The proposed system collects microscopic images as input from the patients and preprocesses them to extract features. Once the feature extraction stage is completed the classification of the image need to be done on them. The proposed system uses the classifier support vector machine (SVM) technique to classify the images into their respective classes. The classifier in the proposed system uses the normal approach of classification i.e., a classifier has normally two stages one is training and then testing. Each of these classifiers goes through both these stages. Firstly, the training stage involves the system learning on the images and their respective category which is already known from the expert advice. In this way a series of images are given in the form of an input with their actual category. The classifier learns from this and then in the testing phase a new image is given for classification to the system. The system uses the prior knowledge which it has learnt during the training phase to predict the category for the image.

***Keywords*—*Microscopic Images, Support Vector Machine (SVM), Feature Extraction, Training, Testing.***

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## I. INTRODUCTION

Liver cancer has become one of the deadliest types of disease among both men and women. Early detection can only save the life of a patient when it comes for survival. The doctor analyses the microscopic images which is being collected from the patients and predicts the presence of tumor, microscopic images are more helpful in diagnosing the presence of liver cancer. Nowadays, as the chance of detecting the cancer takes more time in case of manual detection as we have very a smaller number of professionals [1-3]. Hence, we require a computerized technique for this purpose to help the doctor to predict in a shorter time to save the life of patient by reducing severity. Several image processing techniques can be used for Liver cancer detection system. It's determined from Scanned images of liver. Usually, a doctor analyses the microscopic images of the liver and detect the presence of cancer cell in the image. But however, in this manual method of detection there are chances of false detection which may be due to the presence of ribs, presence of air in bronchi, and blood vessels and others. Hence, it is necessary to develop a computerized method for detection of cancer. Image processing is a most identical concept for developing such a method [4-6]. So, when microscopic image is processed by several image processing tools and techniques, the machine predicts whether a cancer nodule is present or not.

## II. MOTIVATIONOF PROPOSED WORK

The below points were the motivation of work.

- Failure to identify disease in an early stage.
- No knowledge of disease types.
- Limited number of Professionals available.
- Identifying disease in a shorter time reduces theseverity which in turn saves the life of a patient.

## III. LITERATURE REVIEW

Ramkumar et. al diagnosed using Bayes' theory with the WEKA tool for predicting the liver



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cancer and they got 70 percent of the accuracy which was very less efficient for the cancer disease detection as some parts of the tumor are not being analyzed [7-9].

Acer et. al, analyzed differentially expressed genes and protein interaction network for 20 Hepatic Cellular Carcinoma (HCC) patients using the microarray data. They selected 10 HCC patients and 15 cirrhosis patients. 12 genes were detected changes at the expression level among the patients [10-12].

Ibragimova et. al, applied SBRT outcomes for a novel based neural network system for accurate prediction of the disease. The patients' demographics along with three-dimensional delivery (3-D) of the patients were used for the analysis. It detected 75 percent of the accuracy when compared with the manual detection [13-15].

Nguyen et. al, used principal component analysis (PCA) for detection of hepatic steatosis in vivo for fatty liver. They used rabbit model for the attenuation which uses three rabbits per diet group [16-21].

## IV. PROPOSED METHODOLOGY

The proposed technique classifies the image into diseased or not. The Labeled dataset is being collected from the JSS Hospital Davangere for prediction of cancer. The dataset contains the set of images of different patients.



The image is being preprocessed by performing gray scale on the image, then the resizing of the image is being done and Median filtering technique is applied on it. Once the preprocessing is done on the imageHistogram is applied on it and Principal component Analysis (PCA) is done to extract different components for analysis. The image is binarised by taking Threshold Binary value of the image. The dilation and eroding are performed on the image and masking is applied on it. Then cancer is detected weather it is a benign or malignant form of a cancer. If it found cancerous then how much it has spread to check the severity. The Figure 1 sequence diagram clearly shows each step in a process from Image collection to disease detection.

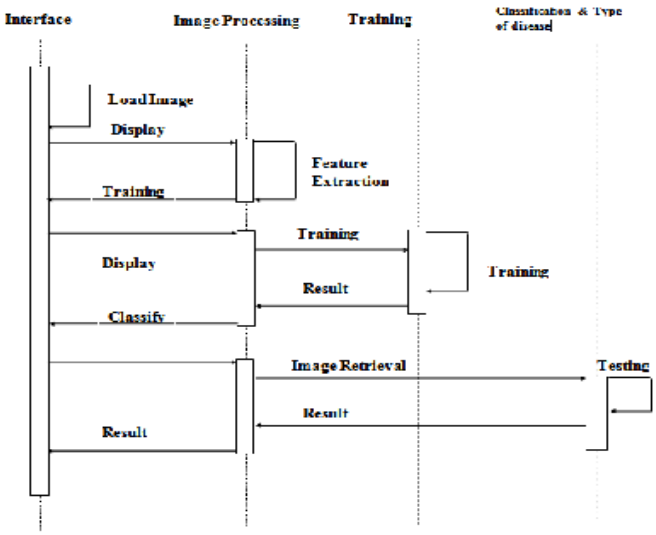


**Figure 1: Sequence diagram**

## V. IMPLEMENTATION

The algorithm shows the flow of implementation process.

**Algorithm**

Step1: START

Step 2: collect the microscopic images of the patient.

Step 3: input an image of format .png, .jpeg, jpg.

Step 4: load the image, pre-process it.



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Step 5: convert the RGB or colored image to the gray scale

I = rgb2gray (RGB)

Step 6: Resize the selected image to the dimension of 500*500

J = imresize(I,[numrowsnumcols])



Step 7: Remove the noise using Median filter technique.

Step 8: plot Histogram.

h = histogram(x)

It creates a histogram plot of X

Step 9: PCA features are fetched.

coeff = pca(X,Name,Value)

Step 10: Binarize image.

Step 11: Dilation and Erosion are performed on Binarized image.

J = imerode(I,SE)

Step 11: Masking is performed.

Title('Masked Image')

Step 12: Cancerous nodule is detected.

Step 13: The cancer is classified as Malignant and Benign.

Step 14: Features are displayed.

Step 15: Exit the interface.

Sample module is included for fetching PCAComponents. The input image's threshold value is being calculated by using Mean, Variance and Standard deviation values and PCA features are fetched.

```
function btn_fetch_pca_Callback (object, event data, handles)
global input image B A threshold Value
C=A.*B
D=A.*A
E=B.*D
n=sum(B)
Mean=sum(C)/sum(B)
var=sum(E)/sum(B)-Mean*Mean
std= (var)^0.5
threshold Value = Mean+0.5*std
msgbox('PCA Features Have Been Fetched')
```

Regionmeasurements are calculated using the labeled images which are being collected from the JSS Hospital, Davangere.

```
labeled Image = label (bwImage, 8)
Region Measurements = region props (labeled Image, initImage, 'all')
Ecc = [RegionMeasurements.Eccentricity]
RegionbNo = size (Region Measurements, 1)
AllowableEccIndexes = (Ecc< 0.98)
KeeperIndexes = find (allowableEccIndexes)
RegionImage = is member (labeledImage, keeper Indexes)
BwImage=Region Image.
axes (handles. axes7)
imshow(Region Image)
```



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## VI. RESULTS

Figure 2 shows the sample output which contains the image of a patient being fed as an input for fetching the different parameters and detecting the tumor.

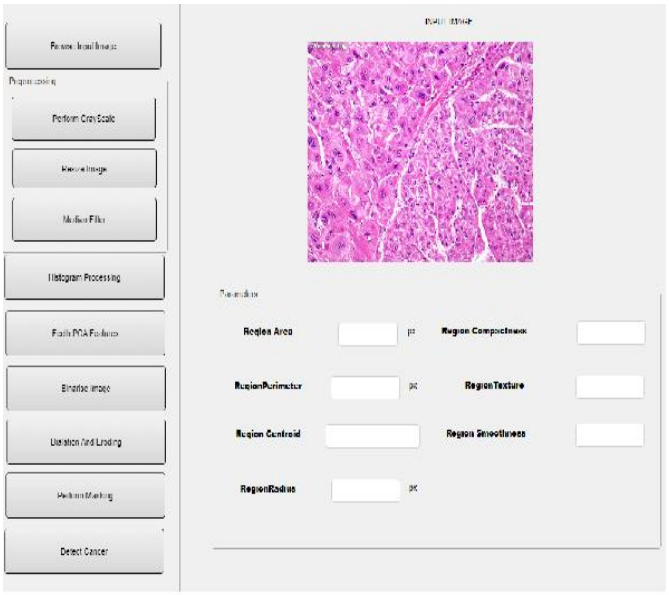


**Figure 2 Sample output**

Figure 3 shows the Region Compactness and Region Centroid calculated for each component.

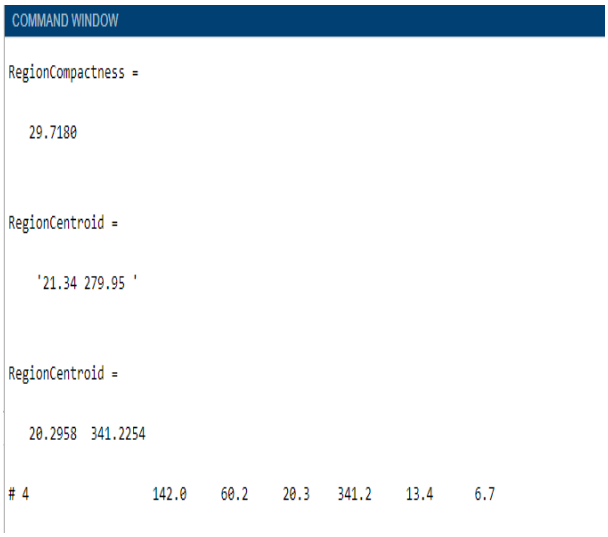


**Figure 3 : Region Compactness and Centroid**



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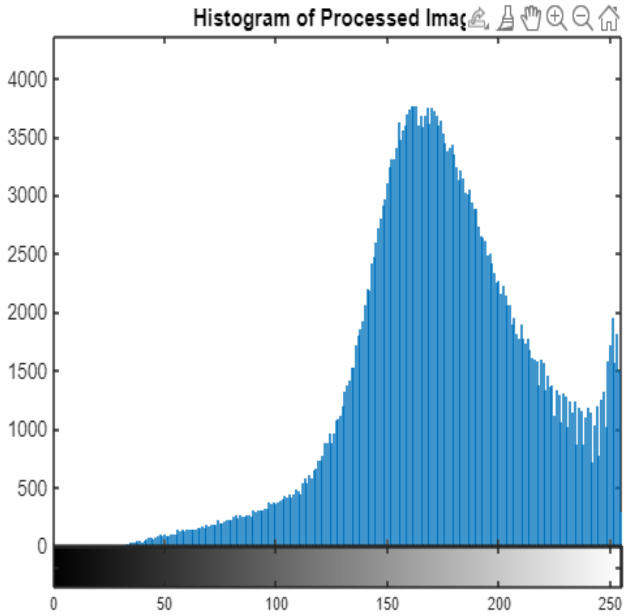


**Figure 4 shows Histogram of the processed image.**

Figure 5 shows the output image where it clearly shows the detected cancer status along with the affected region.

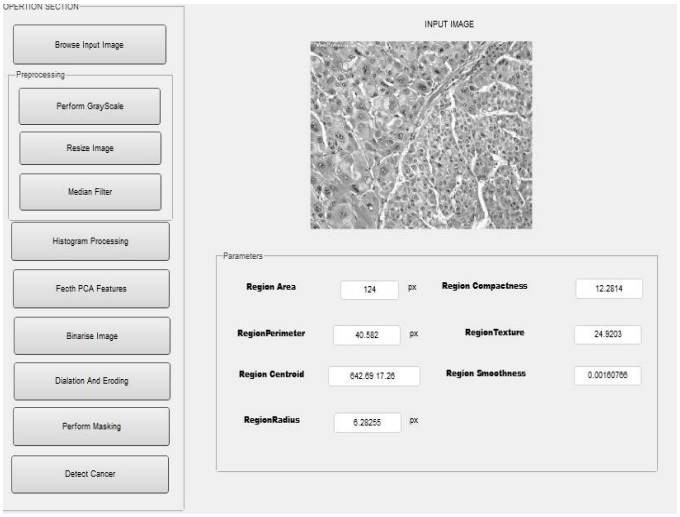


**Figure 5 Output Image**



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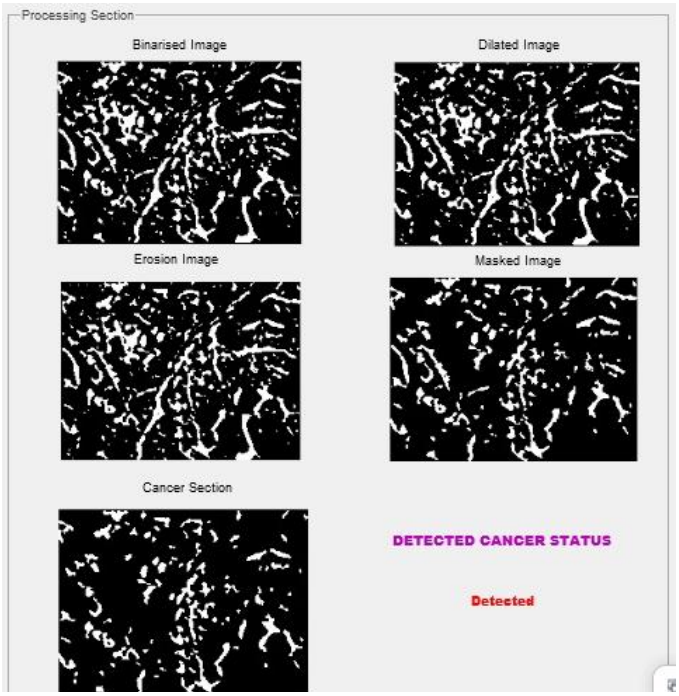


**Figure 6 Output Image**

## VII. Conclusion

The work focuses on classifying the liver into benign or malignant form of cancer. If it found cancerous then it shows the part of the liver that is being affected. The Image collected from the patient is preprocessed by performing gray scale on the Images, Resizing the Image and applying the Median filtering technique to remove the noise present in the image. The Principal Component Analysis (PCA) is done by fetching Region area, Region Perimeter, Region Centroid, Region radius, region compactness, Region texture and Region smoothness. The Histogram processing is done on the Image to classify it. The Principal Component analysis and Histogram Processing along with other parameters will classify the liver into cancerous or non-cancerous. If it found cancerous then affected part of the tumor is highlighted for detecting severity of the disease.

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