A DYNAMIC LIVER LESION DETECTION TECHNIQUE AND EVALUATION OF LESION COMPLEXITY

Dr. Mohammed Abdul Waheed[1] ,Mohammadi Begum[2]

[1]Associate Professor, [2]Student,

[1,2]Department of Computer Science & Engineering, [1,2]Visvesvaraya Technological University Centre for PG Studies, Kalaburagi, INDIA.

Abstract— The primary goal of this paper is to recognize Focal Liver Lesions(FLL) in contrast-enhanced ultrasound videos. This work also extended to find the features of FLL such as the diameter of the tumour and the growing intensity of the tumour. This work provides a computational platform to help radiologist in recognizing FLLs. The CEUS videos exhibit dissimilar patterns at various stages of temporal phase. We present a novel structured method to overcome this challenge, which identify various number of discriminative Region Of Interest and based on this ROI FLLs are recognized. This method uses k-mean classifier to discover various ROI enhancement patterns. This method is simple and effective for FLL recognition.

Key words : FLL (Focal Liver Lesions), ROI, CEUS (Contrast enhanced Ultrasound).

I. INTRODUCTION

Liver cancer or hepatic cancer is considered as 5th most common cancer. The survey of WHO(World Health Organization) show that hepatic cancer is the second major reason of cancer related deaths. Liver cancer that begins in the liver is known as primary hepatic cancer and the cancer that spreads from other organs of body is known metastasis. Numerous types of cancers can be found in the liver but the most widespread type of liver cancer is hepatocellular carcinoma.The foremost cause of liver cancer is cirrhosis owing to hepatitis B,C or Alcohol. Other causes of liver cancer comprise Aflatoxin, non alcoholic fatty liver diseases and liver flukes etc. Diagnosis can be done through blood test and medical scanning.

Early diagnosis of FLLs has a key role in affluent cancer treatment. Ultrasound imaging is frequently utilized for cancer diagnosis due to its inexpensiveness, efficiency and non-intrusiveness .On the other hand , typical sonograhy can generate obscure metaphors along with fall short in recognizing tiny ample owing towards stumpy perception moreover signal-to-noise ratio .Therefore additional imaging is essential utilizing the Tomogarphy or MRI (magnetic resonance imaging) procedure, although their crucial drawbacks incorporate charge of interception , clumsy equipments moreover the ionizing radiation applied in Tomography. In past few years CEUS has been anticipated to revise improved dynamic of Focal Liver Lesions at practical world , through analyzing FLLs enrichment patterns , that is concentration rate at which FFL region respective that of their contiguous healthy liver tissues . CEUS possess acutely improvised the detailed prognosis of FLL.

II. RELATED WORK

X,Liang, Q.Cao [2] propose an automatic computational configuration for describing various sort of Focal Liver Lesions(FLL) in Contrast enhanced ultrasound(CEUS), which effectively joins the different data of spatial and fleeting upgrade designs. Moreover, a feebly managed learning estimate is used, which shifts from side to side between construing the inactive factors (like the areas of Region Of Interests) and streamlining the model parameters. They also work on parametric imaging like dynamic vascular patterns. The outcome appear promising arrangement correctness's and the capability of being created for constant clinical application.

G-J. Liu et [3] present a new quick two advance method to computerized the Liver Lesions division, initialized with a single seed point. Firstly, they had applied a rectangular force function to improve the accurateness of vigorous Ellipse method to approximate Focal Liver Lesions structure. After that they had used boundary Renitent scheme to repeatedly classifying the border line pixel. The results are more effective and easy for the estimation of Focal Liver Lesions(FLLs) and requires minimum interface.

A . Anaya in this [2] work estimate whether parametric imaging by means of contrast enhanced ultrasound is supercilious to vision analysis for the distinct Focal Liver Lesions(FLL) scanning .This results in intuitive ocular elucidation about cine circles for 3 peruses is better which improved significantly. They also work on Parametric imaging like Dynamic Vascular Patterns ameliorate analytical execution of US scan inside disparity among malevolent and benign FLLs ; in addition it furnishes exceptional conserver agreement .

III. METHODOLOGY

On the input data Contrast enhancement is done to improvise the internal appearance of the FLL from which we can extract the key features .We apply standard GLCM(Gray Level Co-occurrence Matrix) features to depict appearance of each ROI. Exclusively, we take out four statistics that is contrast, correlation, energy, homogeneity. We suppose that Focal liver lesions can be rendered through ROI in three phases: arterial phase, portal venous phase, late phase. Here the ROI (region of interest) is a small area of Focal Liver Lesion, that is defined by the consequent drafts in video. Therefore, the main goal is to trace the most discriminative Region of interest(ROIs), {R1,R2,R3,……..Rm}in the input data. To arrest diverse variations patterns of Focal liver lesions we use local classifier to discover ROIs per FLL. Every local classifier is used to spot one candidate ROI, and the appropriate classifier is selected to perform the classification process. In the meantime, the location information and the scale of all ROIs will be determined.

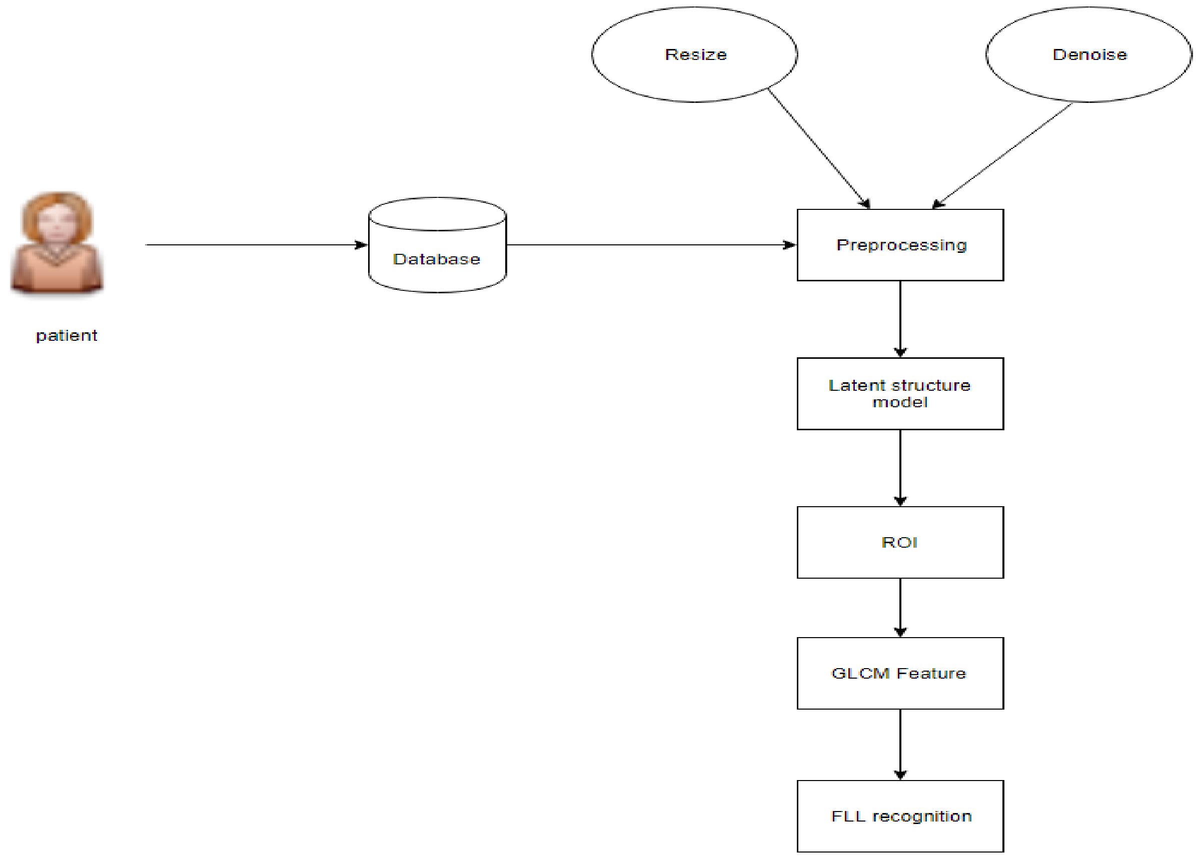

Figure 1: System Architecture

- **Pre-processing Phase:**

First we have to resize the input image means bring all input images into standard size in our work we rescaled the input images into 300*300 resolution. During this phase we apply Wiener filter to denoise the image that will eliminates the blurriness from the image. After that we divide the image into 3 clusters to form an ROI.

- **Latent Structure Model:**

The detection results of discriminative ROIs are expressed with a set of hidden variables h={h1,h2,.....hm}(associated with the ROIs {R1,R2,.....Rm}), where h_i takes value from a finite set H_i of all possible hypotheses about R_i. More precisely,h_i=(z_i , v_i) includes two terms: the layout (i.e. the location and scale)of R_i and the local classifier selection v_i . The layout z_i = (p_i^x, p_i^y, t_i, s_i) specifies the spatial coordinates (p_i^x, p_i^y), the temporal location t_i (i.e. the frame number in the video sequence), and the scale s_i of R_i. For each ROI R_i, we define a set of local classifiers to capture diverse enhancement patterns. The exact number of local classifiers of each phase for each FLL type is automatically learned, and limited to be smaller than the pre-defined maximum number L_i. We denote N_v = $\sum_{i=1}^{m} L_i$ as the maximum number of local classifiers. The classifier selection variable v_i € $[1, L_i$] for R_i is used to indicate the most appropriate local classifier after performing inference algorithm. By adoptively combining different local classifiers in three phases, the diverse enhancement patterns can be captured and our learn model for FLL is reconfigurable.

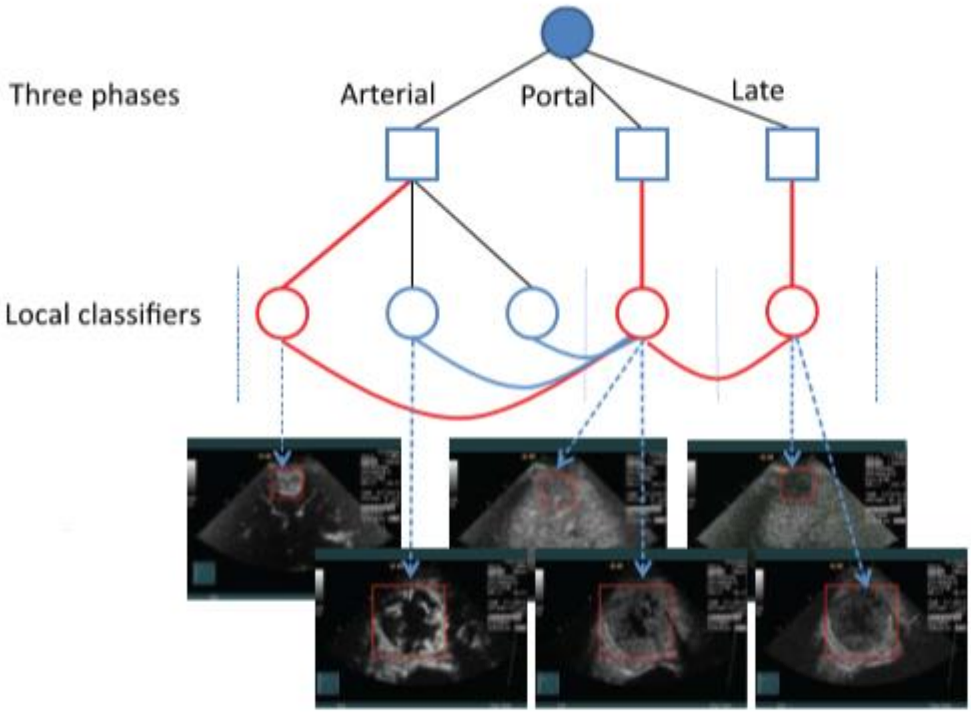

Fig.2. An example of latent structured model

Fig 2. Shows that the local classifiers are denoted by circles for localizing the candidate ROIs in each phase. We utilize multiple local classifier to capture the diverse enhancement patterns in the arterial phase, the curve between the local classifiers are used to incorporate temporal transitions between pair wise ROIs. The bold red circle and curves represent the selection of local classifiers during the inference.

- **GLCM Features**

Gray level co-occurrence matrix is the statistical method of examining the texture that consider the spatial relationship of the pixels, the GLCM functions characterize the texture of an image by calculating how often pairs of pixel with specific values and in a specified spatial relationship occur in a image, creating a GLCM, and then extracting statistical measures from this matrix. The gray co-matrix function in MATLAB creates a GLCM bt calculating how often a pixel with the intensity value i occures in a specific spatial realtionship to a pixel with the value j. We take out four statistics that is contrast, correlation, energy, homogeneity .

a. **Contrast** : measures the local variations in the gray level co-ocurrence matrix.
b. **Corelation** : measures the joint probability ocurance of the specified pairs.
c. **Energy** : Provides the some of squared elements in GLCM, also knows as uniformity or the angular second moment.
d. **Homogeneity** ; measure the closeness of the distribution of the elements in GLCM to the GLCM diagonal.

IV. RESULTS

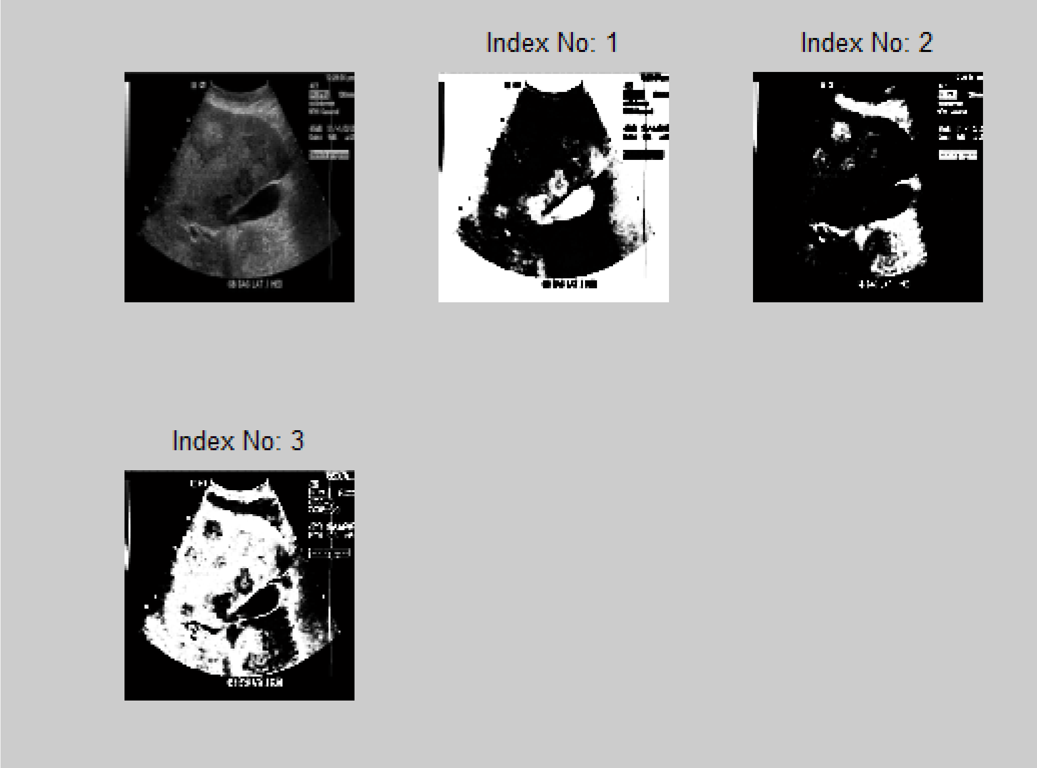

Fig 3:Scaled sample of data processing in proposed system

Fig 4: Extraction of region towards processing

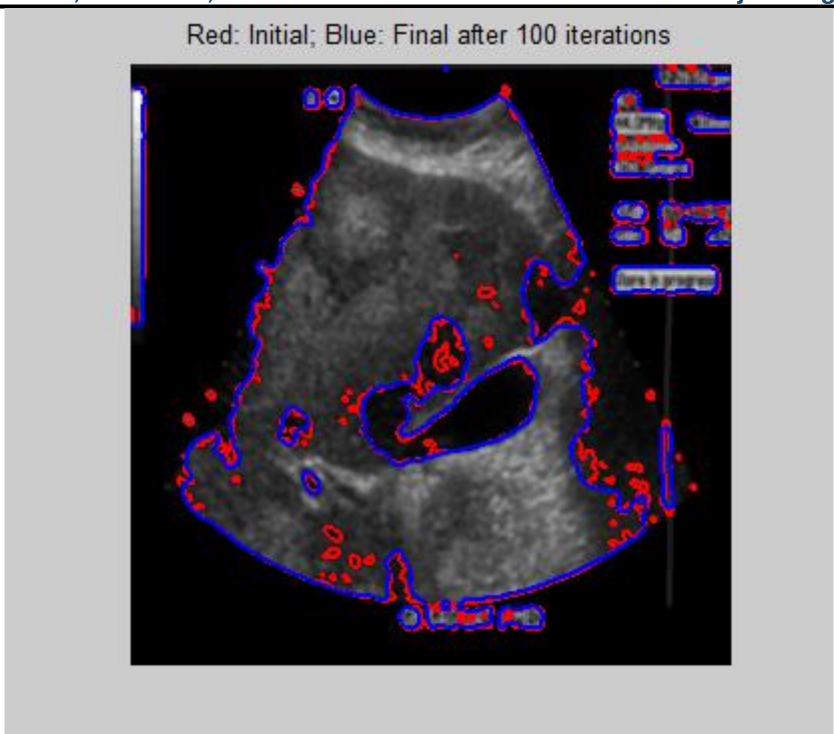

Fig 5: Defined iterative extraction of data sample with elimination of void region under processing scale

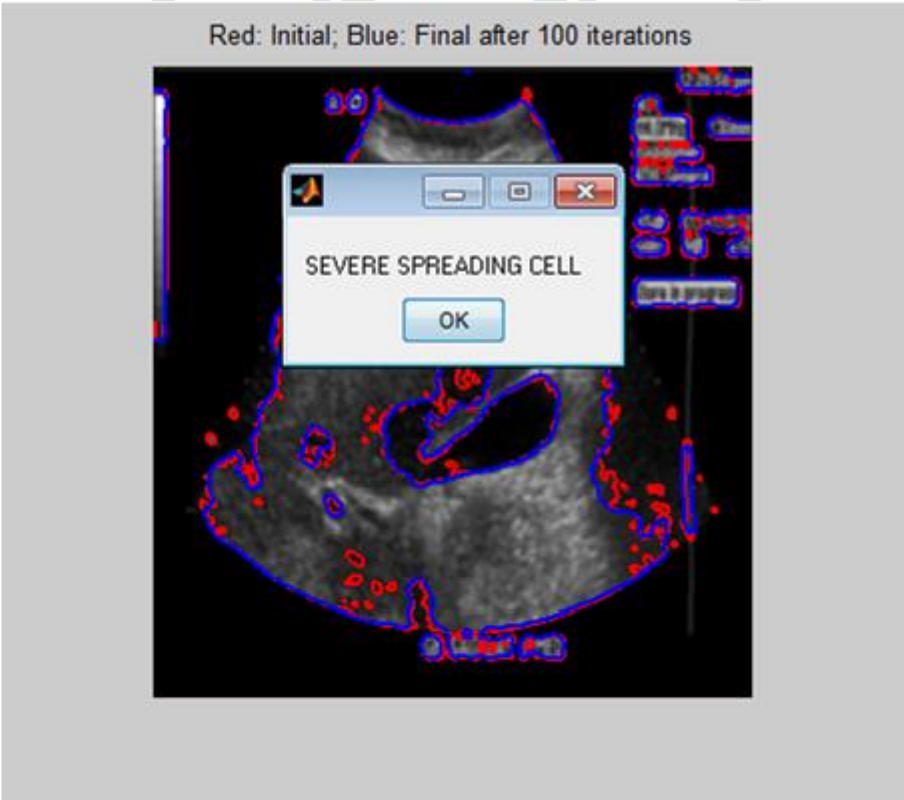

Fig 6: Demonstration of scaling range towards the region

V. CONCLUSION

This paper explore a task to recognize Focal Liver Lesions(FLLs), in CEUS images. To accomplish this task we employ a novel structured method. This method divide the image into numerous clusters from which we choose the Region Of Interests(ROI). Based on the Euclidean's distance formula we calculate the centroid for each ROI. At last this paper shows the growing intensity of the tumour cells. This may helps the radiologist to take a correct decision for the FLL diagnosis.

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