A REVIEW ON: IMAGE PROCESSING BASED LIVER CANCER DETECTION METHOD

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***Abstract*:** The liver is the second organ most generic involved by metastatic disease being liver cancer one of the prominent causes of death worldwide. Without healthy liver a person cannot survive. It is life threatening disease which is very challenging distinct for both medical and engineering technologists. Medical Science is growing field with the parallel working of information technology and improvement of automated system instruments. Disease prediction can be done using evaluation performance over medical data with many different approaches which can process the data. Liver cancer is one of the disease which cause by many regular or irregular activity. Liver cancer prediction from the reports may needed proper human skillset and on time skillset to find analysed data. The machine learning mining algorithm can work towards to analyse the disease from the medical report feature and help in prediction. Medical image processing is used as a non-invasive method to reveal tumours. The chances of survival having liver Tumor highly depends on early detection of Tumor and then classification as cancerous and non-cancerous tumours. With the help of Image processing techniques containing pre-processing and enhancement, image segmentation, classification have been developed for the detection of liver Tumor and different liver tumor detection algorithms and methodologies utilized for Tumor diagnosis.

***IndexTerms* —CT Image, Computed Tomography, Segmentation, Image Processing and Enhancement, Cancerous, Non-cancerous, Classification.**

I. INTRODUCTION

Liver cancer is one of the major death factor in the world and also known as hepatic cancer; it is a cancer which starts in the liver, and not from another organ which ultimately travels to the liver. In other words, those cancer that start from another organ and end-up in the liver, are not (primary) liver cancers. Cancers that derives in the liver are known as primary liver cancers. Liver cancer comprises of malignant hepatic tumors (growths) in or on the liver. The most common type of liver cancer is hepatocellular carcinoma (or hepatoma or HCC), and it likely to affect males more than females. Early detection and accurate presentation of liver cancer is a significant issue in practical radiology. Liver lesions refer to those abnormal tissue cell that are found in the liver. Liver lesions are a wound or injury in the tissue areas of the body due to harm caused by a wound or disease. These lesions can be identified in a CT scan by a difference in pixel intensity from other areas of the liver. For proper clinical treatment, manual segmentation of this CT scan is difficult and excessively time consuming task. Alternatively, automatic segmentation is very challenging task, due to numerous issues, including liver stretch over 150 slices in a CT image, poor intensity difference between lesions and other nearby similar tissues and ambiguous form of the lesions.

Melanoma is considered to be the most aggressive tumors in human being, it could be lethal too if there is no pre-diagnosis for it taken place. The frequency of melanoma among every single dermatologic malignancy is 4%, while melanoma-actuated mortality represents about 80% of passings from disease; just 14% of patients with metastatic melanoma make due for a long time [2]. In addition, dangerous melanoma has a fix rate of over 95% whenever distinguished at a beginning time [3]. The above measurements show that there is a critical need to create imaginative techniques ready to build the indicative precision and to help dermatologists making early analysis. For sure, given the present absence of viable remedial methodologies, the early determination is the fundamental method to accomplish a genuine effect on mortality from melanoma. Novel methodologies are being created to help early conclusion as indicated by bio-material science investigations [4], sub-atomic targets distinguishing pieces of proof [5], and novel picture examination criteria [6,7].
Some factors which describes the effectiveness of the images in terms of-
1. Image acquisition;
2. Noise and artifact filtering;
3. Lesion segmentation;
4. Feature extraction;
5. Classification.

The lesion segmentation step is fundamental in order to increase the effectiveness of the subsequent steps, since it strongly affects the results of the whole system[9]. Indeed, an accurate segmentation allows for deriving border structure information, such as the asymmetry and the irregularity of the lesion area, which are fundamental for a right possible finding. Moreover, important clinical highlights like blue-white zones, atypical shade systemscan be naturally separated just when the exactness of the recognized body's part is high [10].

II. LITERATURE REVIEW

In this section the overview of some previous techniques which were proposed by several authors on different segmentation techniques.

M V Sudhamani, G T Raju suggested that Segmentation of CT liver pictures examines the event of hepatic tumor and group the tumor from pictures. Here, to look at the neighboring pixels of beginning seed focuses and decide if the pixel neighbors ought to be added to the region or not they utilized area developing method. The technique is iterative and seed point is chosen intuitively in the presumed region. The watershed division strategy is utilized to section the form, which is produced by the region developing. The texture highlights for segmented region are removed through Gray Level Co-event Matrix (GLCM). These features are utilized to characterize the tumor as benign or malignant using Support Vector Machine (SVM) approach. This paper explained, a semi-Automated system, which is pragmatic, allows radiologist and surgeons to have easy and convenient access to organ measurements and visualization. Experiments result in liver segmentation errors are reduced significantly and all tumors are segmented from the liver and are classified as benign or malignant. [2]

Yu Masuda, Amir Hossein Foruzan, Tomoko Tateyama and Yen Wei Chen proposes a new method to detect liver tumors in CT images automatically. The proposed method is composed of two steps. The first step contains a process where tumor candidates are extracted by EM/MPM algorithm; which is used to cluster liver tissue. To cluster a dataset, EM/MPM algorithm exploits both intensity of voxels and labels of the neighbouring voxels. In the second step, by using shape information false positive candidates are filtered. The tumor shape information is used to reduce the false positive regions. In proposed method they also reject those candidate tumors that their centroids are near the liver boundary. Quantitative evaluation of our method shows that it can decrease false positive rate successfully without decreasing true positive rate, compared with other conventional methods. [4]

Pedro Rodrigues, Jaime Fonseca and João L. Vilaça proposed an interactive algorithm for liver tumour segmentation was developed, allowing the user to quickly paint the object of interest in the image using an intelligent paintbrush. This technique was based on an image partitioning into homogeneous primitives regions by applying a pseudo-watershed algorithm on an image gradient magnitude. Outcome of this initial segmentation was the input of an efficient region merging process to find the best image partitioning, based on the minimum description length principle. The algorithm was evaluated on Computed Tomography (CT) and Magnetic Resonance (MR) data using the dice similarity coefficient (DSC) as a statistical validation metric. This led to a DCS mean scores of 87% and 84% on the CT and MR studies, respectively. [5]

A semi-automatic algorithm was presented providing a powerful technique allowing liver tumour segmentations in CT and MR images. The segmentation was reduced by selecting all primitives regions belonging to the anatomical target, instead of having to considerer all pixels. It decreased the total number of decisions, time- consumption and user dependence and increases the segmentations efficiency and robustness. It also has a high sensitivity detecting tumor boundaries located near other anatomical structures, identifying weak edges, robustness against image noise, and being able to segment hyper dense and hypo dense metastasis with different size and shape.

L. Ali, A. Hussain, J. Li, U. Zakir, X. Yan, A. Shah, U. Sudhakar research objective is to grow a robust and intelligent clinical decision support framework for disease management of cancer based on legacy Ultrasound (US) image data collected through numerous stages of liver cancer. The proposed intelligent CDS framework will automate real-time image enhancement, segmentation, disease classification and progression in order to enable efficient diagnosis of cancer patients at early stages. The CDS framework is motivated by the human interpretation of US images from the image acquisition stage to cancer progression prediction [3].

Table 1 Comparison of various methodology

Sr. no.	Name of author	Year	Technique used	Features	Limitations
1.	M V Sudhamani, G T Raju	2014	Region growing technique, watershed segmentation, SVM Classifier	Robust, convenient access to organ measurements	Human expert intervention is needed, complex
2.	L. Ali, A. Hussain, J. Li, U. Zakir, X. Yan, A. Shah, U. Sudhakar	2014	Intelligent CDS framework, Classifiers	Accuracy of 95.29% could be achieved	Very complex, Different classifiers Used
3.	Yu Masuda, Amir Hossein Foruzan, Tomoko Tateyama	2014	EM/MPM algorithm	it can decrease false positive rate	Complex, Only considers sphere like structure
4.	El-Masry W.H	2014	Invasive Weed Optimization	Multi-objective optimization in CAD Applications	Computational time is high
5.	Abdalla Zidan, N. Ghalli, H. Hefny	2012	Watershed Segmentation and Artificial Neural Network	Accuracy of 92.1% could be achieved	The use of Ant Colony is Ignored
6.	Pedro Rodrigues, Jaime Fonseca and João L. Vilaça	2011	Pseudo-watershed algorithm	It decreased the no. of decisions, time-consumption and user dependence	A semi-automatic algorithm, Has low accuracy

The above table explains about several techniques that areproposed by the authors along with their improvements from the previous work done.

III. IMAGE PROCESSINGTECHNIQUES

Pre-processing:

Image pre-processing is performed which help in smoothing and binarizing the image data. It help in getting sharpness among the image.

Feature Extraction:

Feature extraction is the further performed process using which the number of feature from the selected area is extracted. It help in analyzing the image data using the features available in the multimedia.

Classification:

This is the final process of prediction where the algorithm of processing the features and finally predicting the classification results such as accuracy and confusion matrix. Finally a result on computation is also get performed.

Thus the given execution application steps help in completing the execution. This is the main advantage of processing data in multiple steps.

In this area the extraction of the skin injury district will done in the accompanying stages, for example, Image Acquisition, Pre-Processing, skin Lesion Detection and Feature Extraction. The schematic graph.

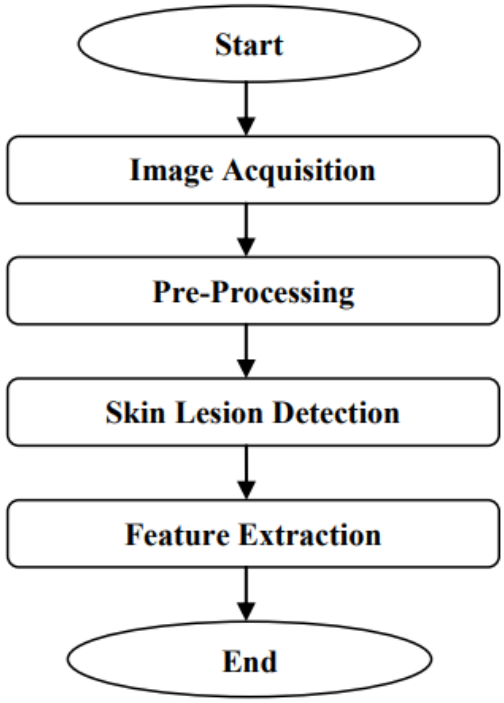

Figure 1 Schematic Diagram of the Proposed Method.

A. Image Acquisition

In this step the initial task is to take the clear-cut picture from the digital camera containing resolution of 5MP as well as the resized 257×196 for the fast computations. The image will then read in the MATLAB by using imread().

B. Pre-Processing

In this segment the input image will convert into the gray scale image by the help of gbrtogray(), this function will retain and staurate the color components of the images and will retain the luminance value. In the first step which is the image acquisition, in this step the unwanted noise particles will get removed because of some illuminations factors as well as it can be removed with the help of the median filter.

C. Segmentation Techniques

After applying pre-processing there are three segmentation techniques which will also applied such as-Segmentation, Morphology-based segmentation and k-means Clustering, these techniques are used for the extraction of the abnormal skin-lesions. The obtained output from these segmentation techniques will now looked at by computing the highlights of the fragmented skin injury area.

Edge-based Segmentation

It is the identification strategy for edges which is as often as possible utilized in the computerized picture preparing where an arranged limited change in the force of an image generally known as edges. There are several techniques present for the detection of edges which are-Sobel, perwit, kirsch as well. In this paper, the angle administrator is utilized for the extraction of the influenced zones (1) where Gx and GY speak to the flat and vertical subsidiaries at a specific point. The limit of the portioned picture (veil) is recognized and embedded in the first picture to feature the influenced skin region. The technique for Edge Based Segmentation is given underneath:

Stage 1: Input the preprocessed skin injury picture.
Stage 2: Apply Gradient Operator
Stage 3: Detect the Boundary
Stage 4: Finally embed the separated limit as a veil in the first picture.

IV.CONCLUSION

Liver cancer prediction contains datasets and real-time usage. It needs a human skillset which is time-consuming and costly while analyzing large data input. A short text data value analysis is required to process the dataset and find a prediction for liver cancer disease. In this paper, a hybrid ANN-based approach with Synaptic analysis approach is presented which compared with the traditional classification approach. A further work to deal with real-time datasets and continuous value parameters can be done. The work also can lead to hardware integration of current values and real-time values to monitoring its usability.

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