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Digital Hepatitis Lesion Extraction for TMS-India under Rural Telemedicine

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Abstract
Providing healthcare services to the rural part of India is a big challenge. Deadly diseases like cancer need systematic way to detect and diagnose. In this paper, a liver cancer extraction and detection technique is proposed under MATLAB for telemedicine terminology. Each sample considered in this paper is retrieved from clinical standards and hence the results are archived. Dedicated infrastructural environment is also prepared and projected.

Keywords*: Liver cancer, Mammographic image processing, Tele-mammography services, Telemedicine.*

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1. Introduction

Liver is considered to the biggest human organ. As it is a large organ, its complexities of diagnosing any lump or lesions formation are not easier. Hence this domain has a wide range of opening for research and development. Many latest techniques have been proposed based on many Para-critical features of liver which includes size, dimensions and geometry in general. In recent era of advanced medical surgeries, it's important for a surgical planning system to detect the lumps and lesions. Detection of these lesions is achieved through various image segmentation techniques and algorithms. Performing this task of image segmentation shall be time consuming if it is done manually, hence we discuss about semi or full automation of the surgical planning system known as machine learning. Machine learning is an approach of combing complex image processing algorithms which is intended to perform a complex operation in a dynamic machine state input. In order to mask images of liver under segmentation is considered to be a difficult task as the edges of liver are smoother and bulged with low contrast. Fetching an abnormal image of liver is made still more complicated as the pixel intensities of overall liver area remains same due to its neighboring organ overlapping in case of abnormalities. Hence fetching such image for processing shall lead to an ambiguous results and diagnosis.

2. Literature Review

Accurate and realistic liver image segmentation is difficult and complex in computation for automatic surgical planning system with various causes. These studies have been conducted on various liver image segmentations which are discussed below [2]:

Based on Neural Network: In this approach, the proposed techniques used to calculate the region of liver and its surrounding organs based on intensity values and later this approach was enhanced by introducing textural detection and future these images we sampled with clustering for ROI classification and extraction of abnormalities in liver.

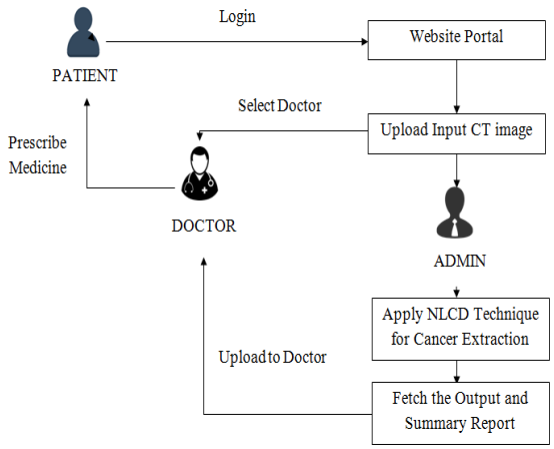

Fig. 1: System Architecture

Support vector machine based technique: Through this approach, liver images can be extracted with maximum accuracy in segmentation. This technique adds value to textural detection with wavelets for enhancement with respect to liver morphological characteristics. These textural descriptors are used to support vector machine for liver are classification and ignoring surrounding organs using pixel ranging technique [4].

Clustering Techniques: With this approach, liver images can be extracted and preprocessed which includes operations like removal of surrounding organ. Hence this paper can draw a summarized conclusion on literature of overlapping, fat layer removal and edge extraction of the liver overlapped within another organ. In this approach, removal of fat cells and mass is comparatively easier as it is globalized and extracted and masked based on lower intensity range values. Image classification is second step in this approach, which concludes images abnormality using patterns of clusters. Various segmentation techniques as manual liver segmentation is possible and remains safer in expertise consultation but it consumes more time for break down. Various image processing techniques improves the speed and performance of segregating liver images and they lesions. Machine learning is said to be one of the most important mile stone in automation of surgical planning system. Though segmentation with these approaches is faster but overall accuracy remains still a challenge.

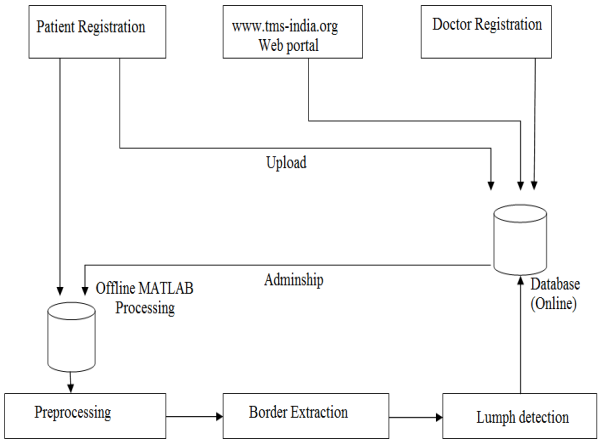

Fig. 2: High Level System Design

3. System Modeling & Design

The proposed system designs a novel liver cancer detection technique for a TMS-India portal for remote diagnosis and consultation under telemedicine. NLCD technique incorporates dedicated system architecture as shown in figure 1. The proposed NLCD technique comes with a series of offline and online processing of datasets in accordance to achieve a liver cancer detection unit.

This also includes web technologies for detailed remote server implementation. A high level of system architecture is shown in figure 2.

The high level system architecture in figure 2 depicts unique and isolated module behavior. It consist of a patient registration and uploading cum dashboard web portal unit, WEB server for remote sample collection, Doctor Registration and consultation unit, a database for server activation and services and an offline processing unit. This unit consists of MATLAB computation under Novel Liver Cancer Detection (NLCD) technique for Data preprocessing, border extraction and filtering, Image segmentation and finally liver lesion extraction. The technique focus on liver lesion extraction but not detection and conclusion on the status of cancer existence.

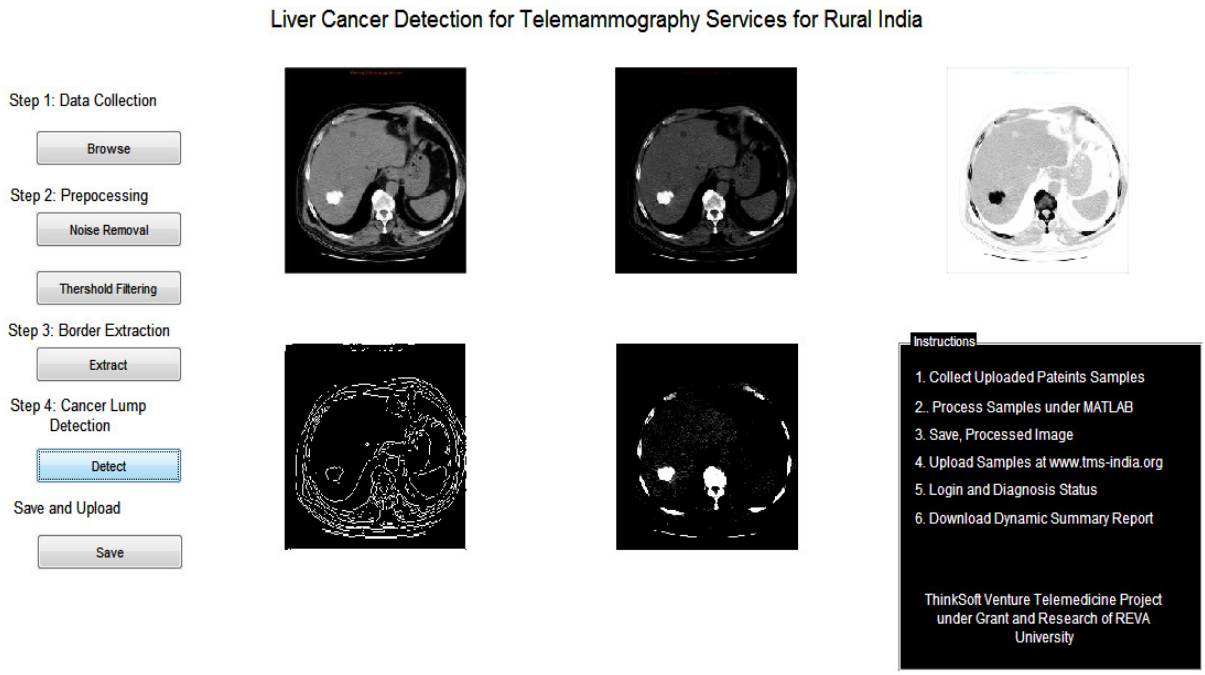

Fig. 3: Results and GUI for Liver Cancer Detection

4. Result and Observation

The system is simulated under MATLAB 2012a Version, 64 Bit processor and on clinically satisfied images. The output is shown in figure 3 via a GUI creation for fast and authentic understanding. The output shown in figure 3 consists of a series of steps as discussed in system architecture. Each image represents a processing step for liver lesion extraction. The images acquired and processed are efficient and has gained a higher efficiency compared to the previous algorithms.

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