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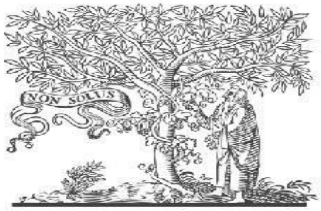

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DETECTING LIVER TUMOR FOR A PRAGMATIC APPROACH USING NOVEL DIGITAL IMAGE PROCESSING

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ABSTRACT: Cancer diagnosis and treatment has a great significance due to the prevalent episodes of the diseases, high death rate and cancer stands in the fifth position which causes death. Among the various cancers, liver cancer stands in the third position. Liver cancer is generally diagnosed by three different test like blood test, image test and biopsy. To make the task of detecting the liver cancer simpler, less time consuming, an effective and efficient approach is adopted for the same. In this analysis, a computer aided diagnostic system for detecting liver cancer is put forward. The proposed detection methodology makes use of MRI, CT and USG scan imagery. *K* means clustering technique is adopted so as to segment the images in order to capture the region of interest. Later, Haar wavelet transform is considered to compute the threshold values for the of interest. Hence, this analysis, gave an better accuracy, reducing the time complexity and computational complexity of the test.

KEYWORDS: Haar wavelet transform, Image processing, K-means clustering, Liver cancer

I. INTRODUCTION

Cancer which is clinically referred as a malevolent neoplasm is a extensive group of diseases, involving unregulated cell growth. In cancer, cells subdivide and grow hysterically, forming malignant tumours, and invade nearby parts within the body. These tumours can grow and hinder the digestive, nervous, and circulatory systems and releases hormones that may alter the body functionality. There are about 200 different known cancers that are shown in human. Each of these are characterised by the type of the cell that is first affected.

Liver is considered to be one of the major internal organs in the human body, which plays a major role in the body's metabolism, serving several vital functions that supports every other organ in the body. Research is carried out across the globe, looking at ways to prevent the occurrence of liver cancer. As there are very few effective ways to prevent this disease, at this juncture, there is always a great deal of research going on in the area. Scientists are experimenting for causes and ways to thwart liver cancer, on the other hand doctors are striving hard to improve the nursing procedure. The most effectual approach to reduce the worldwide burden of liver cancer is to avert it from happening in the first place. Some scientists believe that vaccinations and improved treatments for hepatitis could prevent about half of liver cancer cases worldwide. Researchers are studying ways to prevent or treat hepatitis infections before they cause this disease. The prime facie of this disease is due to the regular or excessive consumption of alcohol, intake of contaminated food and drugs, injecting drugs with shared needles. Apart from these, having low immunity, inherited liver diseases, L-carntine deficiency, smoking etc. The physical appearance of liver, the cause of infection, the toxic damages, and

the immunological damages resulting this fatigue infection.

Endurance of a cancer patient depends heavily on early detection, and thus, developing technologies applicable for sensitive and specific methods is an inevitable task for cancer depicts the percentages of various causes that give birth, develop this disease. The bar graph shows that over consumption of Alcohol and Hepatitis C virus stands as the major cause for this growth and development of this cancer cell. Existing cancer screening methods include: the Papanicolau test for women to detect cervical cancer and mammography to detect breast cancer, occult blood detection for colon cancer endoscopy, Prostate-Specific Antigen (PSA) level detection in blood sample for men to detect prostate cancer, and CT scans, X-ray, ultrasound imaging and MRI for various cancer detection. These traditional diagnostic methods however are not very powerful methods when it comes to cancer detection at very early stages. Apart from this, some of the screening methods are quite expensive making it unaffordable and unavailable to the common man.

Therefore, with the growth in technology it has become an utter importance to having a mechanism that is specific and reliable for detecting cancers at early stages and is easily accessible so that it can function as the first-line guidance. With an increase in cancer effect and the death toll due to this disease and a lack of early detection it gave a motivation to present an idea that would not only be a novel approach, less time complex, less computational complex but also could be made available for all section of the people.

The liver cancer can be diagnosed in 3 ways namely Blood test, Imaging test and Biopsy. To get a computer assisted technique, the focus is mostly given to the Imaging tests. The Imaging tests used in the diagnosis of liver cancer are Ultrasound, Computed Tomography (CT), Magnetic resonance Imaging (MRI) and Angiography. Computer assisted liver tumour detection and classification which is based on image analysis techniques provides more useful information. The conventional methods for liver cancer tissue classification consist of three steps: Firstly, segmentation [10] of liver and tumour from CT abdominal images, secondly features are extracted and finally classification is done using classifiers. Over the years the characterisation of liver images based on texture study techniques is been developed over the years. Researchers have shown that, although the wavelet transforms are very effective while they are representing objects with isolated point singularities, but when line singularities are considered they are not so efficient. Many have worked on the ridgelet transform, curvelet transform and other transformation techniques [9].

The Haar technique has two advantages over other techniques. Firstly Haar automatically converts a grey scale image to RGB image and secondly it considers any discontinuous image and compresses it accordingly. The liver part is extracted from the image and clusters are formed using the k-means clustering [7] technique. The most appropriate cluster is selected from these clusters and the number of pixels for the cancer part is calculated.

Various hepatocellular carcinoma illnesses have been identified and grouped into distinct groups based on their clinical presentation. The progressive development of hepatocellular carcinoma is dependent on changes in tissue architecture and variations in vascular supply. Changes in the architecture of the tissue have been shown to accelerate the formation of additional tissue in the liver, which has been discovered via the use of medical imaging [11]. This procedure is dependent on the tumor cells' architectures and shapes, as well as their sizes. In clinical

diagnosis, CT and MRI scans are utilised to examine liver cancer, with physical or semi-manual segmentation methods being employed in the process. These approaches are manual, highly operational, subjective, and time-consuming, and they need greater effort. Through the automated function, it is possible to decrease the amount of time spent on invention and radiologist improvement in computer-aided techniques, and to build unique segmentation methods.

Automatic segmentation was performed on the combined liver and lesion area picture [4] to determine the extent of the lesion. The uneven segmentation in low contrast pictures between the liver and the lesion site has proven to be a significant hurdle for the researchers to overcome. When comparing hyper and hypo tumors, the contrast levels may be different, and the aberrant tissue development in the lesion may be different in different sizes and numbers of the lesion [2]. It is not possible to segment the liver area using the intensity-based technique because of the intricacy of the contrast variations seen across several testing instances. Cancer cells may have a variety of shapes, which reduces the efficacy of computational approaches that segment cancer cells. The suggested technique differentiates between cancer stages based on the structure of the tumor and the form of the lesion.

II. LITERATURE SURVEY

Rizzo S., Botta F., Raimondi S., et al. [1] two benchmarks were conducted on liver and liver lesions segmentation at the MICCAI 2007 and 2008 Sessions. The statistical model forms were the focus of the concerns discussed throughout the workshop. In addition, the workshop focused on grey levels and lesions texture analysis, which were also discussed. Otsu segmentation is a method that has lately become popular for graph cutting and level setting in pictures of liver cancer. However, because of the rise in velocity and intensity level, as well as the poor contrast in CT data, these approaches are not routinely employed in clinical settings. Interactive approaches are continuously being developed to address these flaws and strengthen their defences against future attacks.

Abdulrahman W, et.al., [5] The term "Segmentation of Liver Tumors Using Image Processing" refers to the process of distinguishing specific parts of the liver in abdominal CT scans. When it comes to retrieving the tumor's location from CT scans, a new method has been developed.

Verma A., Khanna G, et.al [3] "Techniques for Detecting Tumors Using Digital Imagery The background analysis in the segmentation of tumour cells is provided by the survey." If you compare the performance of this method to other existing methodologies, it is the most effective at finding and categorising cancers.

Tang J., Sun Q., Liu J., Cao Y.,et al. [12] described an Adjustable Anisotropic Noise Reduction filter in MR images was developed, and it was recommended that an adaptive threshold range be used in the stepped-forward anisotropic diffusion filter. A transparent diffusion with an anisotropic probability-pushed memory system is proposed to tackle the over filtering problem by selecting a tissue and an overall metaphysical impact from a large number of possible options. The proposed technique has been tested in real MR pictures, and the results have been outstanding.

Chandel R., Gupta G, et al. [6] defined the segmentation algorithms and technique used for illustration of filter in embodiments and smoothing, as well as the smoothing algorithms and technique "Image Filtering Algorithms and Techniques Image smoothing, also known as image smoothing algorithms and techniques, is one of the most significant

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image dispensation techniques that is widely used.

W. H. K. Lee, J. M. Espinosa-Aranda et al [8] gave a system which is used to segment the tumor with so as to generate the required basis for the detection. Bi-orthogonal wavelet based texture features can be extracted which can be used to train the PNN to classify the liver tumor as hepatocellular carcinoma, cholangio carcinoma, hepatocellular abdomen and hemagioma with better performance that supports the radiologists and the medical specialists during their medical decision.

III. DETECTING LIVER TUMOR FOR A PRAGMATIC APPROACH USING NOVEL DIGITAL IMAGE PROCESSING

In this section, a pragmatic approach using novel digital image processing for detection of liver cancer is discussed.

Analyze the images that are framed from the CT scan, MRI scan and generate results whether the said image contains cancer cells or not. These images are collected from various multispecialty hospitals and diagnostic centers. The experimentation procedure makes use of MATLAB R2011a software in order to process the images. The overall methodology is elucidated by the segmentation process. As the images that are framed via the MRI/CT scan exist as a grayscale image, it creates a discrepancy in identifying the cancer cell which may mislead the experimentation process, therefore the image is again converted to RGB image, which makes it easier to identify the cancer cell based on the color. Now, as the cancer cell is considered to be the region of interest segmenting the liver alone from the abdominal CT image is difficult due to the fact that the image includes other organs like kidney, spleen, pancreas etc very close to the liver.

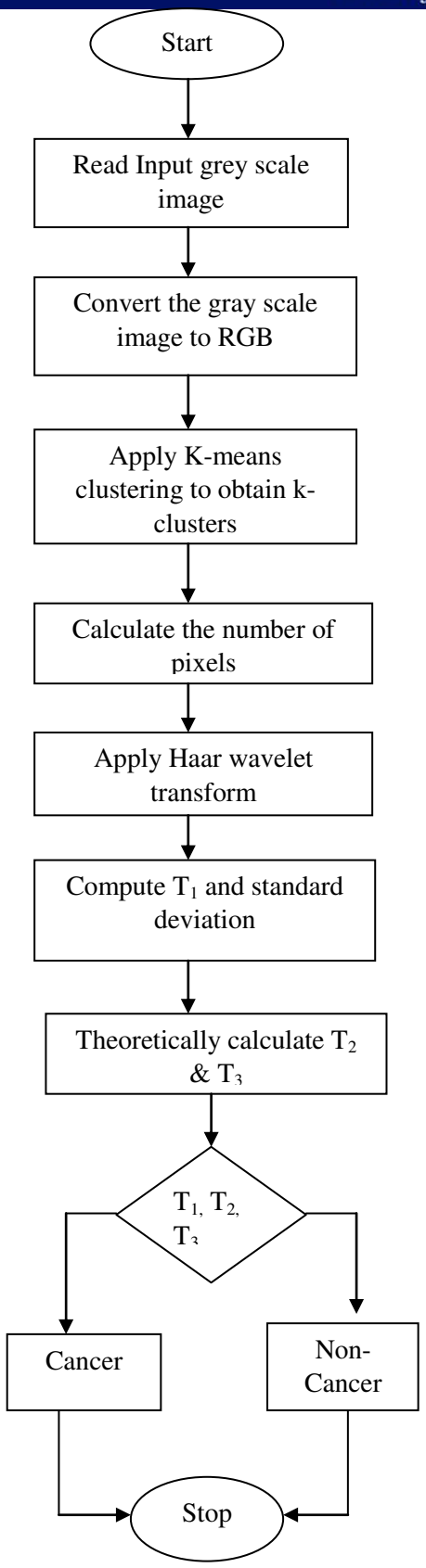

Fig.1: Block Diagram

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In order to amass only the liver part and analyze the cancer cell the experimentation makes use of image segmentation using *K*means clustering. Now the clustered image that depicts the extracts of cancer cell which is further used for detection process. So as to analyze and judge if the given image is a cancer cell or not the feature is extracted by cropping the region the interest, and for these images the threshold range is to be fixed.

IV. PERFORMANCE ANALYSIS

The result analysis of the described a pragmatic approach using novel digital image processing for detection of liver cancer is discussed. But this analysis focuses on features using image processing, which gives the better performance and this performance metrics are calculated in terms of accuracy, complexity and detection time.

Table.1: Performance Analysis

Parameters	Image processing	CNN
Accuracy	98	91
Complexity	76	95
Time (sec)	7156	8932

In fig.2 accuracy comparision graph is observed between Image processing and CNN. The accuracy of Image processing shows higher.

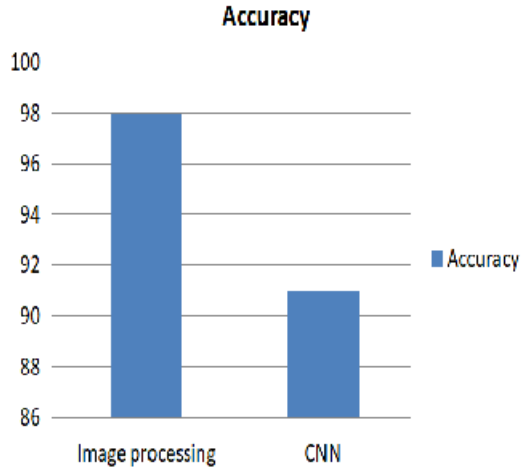

Fig.2: Accuracy Comparision Graph

The Complexity of Image processing is reduced when compared with CNN in fig.3.

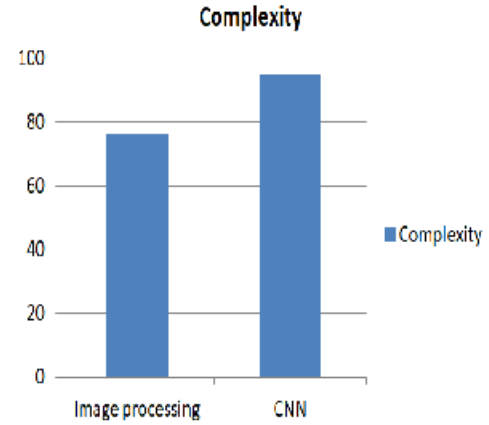

Fig.3: Complexity Comparision Graph

In fig.4 time is compared with Image processing and CNN. The detection time of Image processing is reduced.

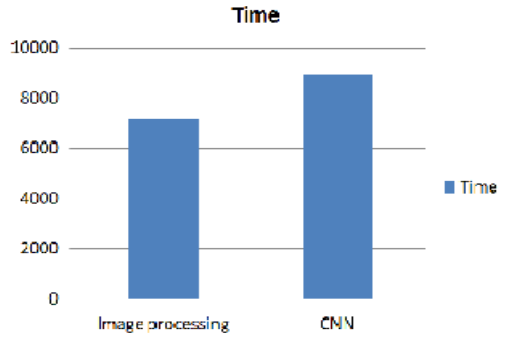

Fig.4: Time Comparision Graph

V. CONCLUSION

This analysis is a continuous, unavoidable, necessary, experimenting, an innovative and result based process, In brief to the fact, this paper this contributes by providing a computer aided diagnostic system for the diagnosis of the liver cancer using the images framed through the MRI, CT scan of certain patients. The whole analysis is done based on the threshold values and the images are justifying by checking if the threshold falls within the same range estimated for each image. The result obtained found to be a pragmatic approach for the early and accurate detection of cancer cells. This analysis achieved an higher accuracy besides being less time complex, reducing the computational complexity for the purpose of detection.

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