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AN EFFICIENT WATERSHED TRANSFORMATION TECHNIQUE TO DETECT CANCER CELLS IN HUMAN ORGANS

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ABSTRACT
Cancer is a significant health problem throughout the world. It is very important to detect such types of cancer at an earlier stage than the later stage where the treatment becomes unsuccessful. Early detection helps surgeons to provide necessary therapeutic measures which also benefit the patients. In this paper, a technique is proposed to detect cancer cells present in organs like Brain,Breast,Lung,Liver by MRI, 3D, Image Segmentation, Watershed and Morphological Operators. A novel mathematical morphological watershed algorithm is proposed to preserve these edge details as well as prominent ones to identify tumors in dental radiographs. Applying watershed on images leads to segmentation hence it is preprocessed.

Keywords: Image processing, Watershed Segmentation, Brain cancer, Breast Cancer, Lung cancer, Liver cancer, Mammogram Detection.

INTRODUCTION
Image processing techniques is widely use in the medical image currently. Ultrasound and X-ray medical images play an important role in the detection of lung, liver, brain, breast tumors. Different methods were employed to detect the cancerous cell in image pre processing such as Gabor filter, image segmentation using watershed segmentation and feature extraction by using MATLAB. This paper is an attempt for comparison of cancer detection in various organs which mentioned above. This paper deals with tumors that start within the brain, breast, lung, liver using morphological watershed algorithm on Magnetic Reasoning Images (MRI) to identify, locate and segment the tumor. The basic idea in this paper is to design software and use the proposed system to help the physician reading and classifying these types of tumors into benign or malignant. Segmentation method based on morphological watershed transforms to extract watershed lines from a topographic representation of the input image. The diagnosis of cancer is achieved by algorithms based on morphological operation and segmentation using watershed transformation. The basic idea in this paper is to design software and use the proposed system to help the physician reading and classifying the type of tumors into benign or malignant.

MEDICAL ASPECTS
Cancer disease begins in the cells of the human body, which is generated by abnormal division of those cells. There are two types of cancer, benign tumors are not cancerous and malignant tumors are cancerous [7].Image segmentation by mathematical morphology is a methodology based upon the notions of watershed transformation. Watershed transform is a powerful tool for image segmentation [2].

IMAGE SEGMENTATION
The goal of image segmentation is to cluster pixels into salient image regions, i.e., regions corresponding to individual surfaces, objects, or natural parts of objects. Using this process most of the image analyzing task can be done subsequently. In specific, many methods depend highly on the segmentation result for image description and recognition. But in this paper a study on Watershed segmentation and thresholding method used is analyzed. Obtained image after segmentation from thresholding had much significance like fast processing speed less storage space and simply by manipulation of 256 levels of grey level image. Thresholding is the most dominant tool for image segmentation by replacing original pixel values by black pixel values (converts grey image into binary image).Thresholding selects a threshold value T and it assigns two levels to the image that is above value and below value for original threshold value.

THE WATERSHED TRANSFORMS
The watershed transform proposed by Vicent and Soille [9] is a well-known segmentation technique, which is based on immersion simulation, and allows the generation of an initial image partition into regions. It is based on visualizing a gray level image as topographic surface with three dimensions: two special coordinates versus intensity. In such a topographic surface view, the gray level of a pixel is interpreted as its altitude. Suppose a water source is placed in each regional minimum (also called `catchment basins') and the entire topography structure is flooded from below. When water from two sources (regional minima) are about to meet, a dam is constructed to prevent the merging as in Fig.1. The flooding and dam construction process continues until only the dams are visible from above. These dams (watershed lines or 'watersheds') effectively segment the image

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into regions. Image segmentation is an essential process for most subsequent image analysis process. In particular, many of the existing techniques for image description and recognition, image visualization, and object based image compression highly depend on the segmentation results [8].The steps shown in figure Fig.2.

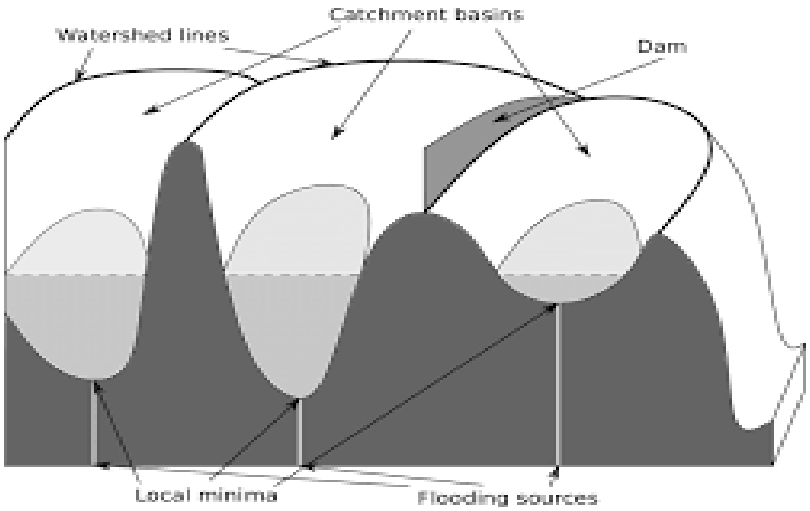

Fig-1

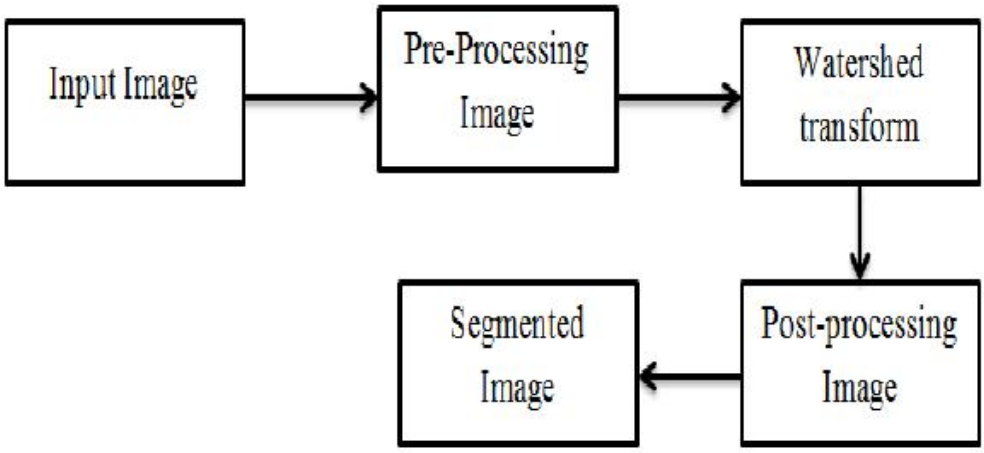

Fig-2: Block Diagram for Applying Watershed Method

BRAIN CANCER

One of the main causes for increasing mortality among children and adults is brain tumor. It has been concluded from the research of most of the developed countries that number of peoples suffering and dying from brain tumors has been increased to 300 per year during past few decades. The National Brain Tumor Foundation (NBTF) for research in United States estimates the death of 13000 patients while 29,000 undergo primary brain tumor diagnosis. This high mortality rate of brain tumor greatly increases the importance of Brain Tumor detection. Hence the MRI, 3D, Image Segmentation, Watershed & Morphological Operators are the fundamental problem of Tumor Detection [6]. Input image and its Segmentation image is as shown in Fig.3 and Fig 3.1

Fig-3

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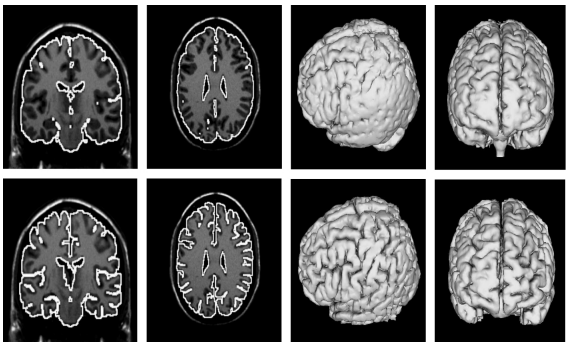

Fig-3.1

BREAST CANCER

Breast cancer is a malignant tumor. The malignant tissue begins to grow in the breast. The symptoms of breast cancer include breast mass, change in shape and dimension of breast, differences in the color of breast skin, breast aches and gene changes. The early detection and diagnosis of breast cancer is the key to decrease rate and to provide prompt. In recent year, a variety of imaging techniques used to study breast tumor such as: magnetic resonance imaging (MRI), Computed Tomography (CT), Ultrasound, X-ray Ultrasound and X-ray mammogram are the most widely used techniques, because their ability to produce resolution images of normal pathological tissues. Mammogram is a low dose x-ray procedure for the visualization of internal structure of breast. Mammography has been proven to be the most reliable method and it is the key screening tool for the early detection of breast cancer. Ultrasound imaging is non- invasive, real time, low cost, and convenient for patients [4]. Segmentation is an important way to extract information from medical image. In Segmentation the inputs are images and, outputs are the attributes extracted from those images. Segmentation divides image into its constituent regions or objects as shown in Fig.4. Segmentation based on morphological operation, and watershed transform applied to grey level images is a fast, robust and widely used in image processing and analysis, but it suffers from over-segmentation [5].

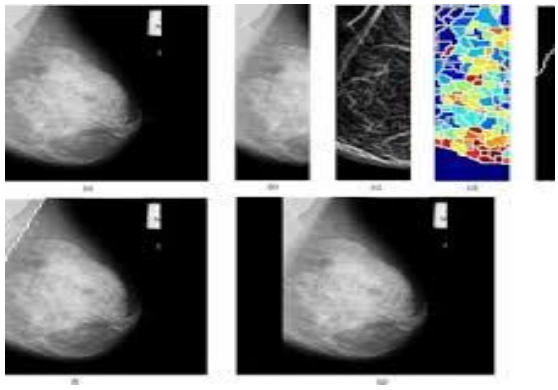

Fig-4

LUNG CANCER

Lung cancer cell can be identified using image pre processing, feature extraction of cancer image and finally the classification process. Lung cancer images are collected from a private hospital Chennai. Various stages are involved in the cell identification of lung cancer. Lung cancer cell identification processes involves convolution filter for smoothening the cancer cell images. To enhance the image contrast and color, then the nucleases were segmented by using thresholding process in the images. It's a simple image processing techniques on lung cancer detection system which can extract the feature from the MRI lung image [1]. Fig.5 shows the lung image and Fig 5.1 shows segmentation image.

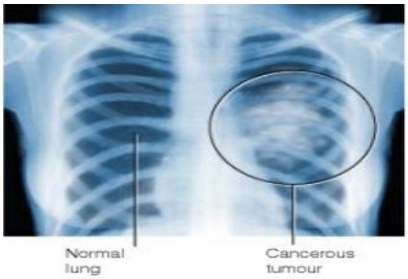

Fig-5

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Fig-5.1

LIVER CANCER

Segmentation method of liver cancer CT image based on the watershed algorithm by the methods of edge detection, the watershed algorithm and region merging, and has obtained good results.MRI scanned liver image Fig.6 and segmentation applied image as shown in Fig.6.1. This method can better solve the over-segmentation of the traditional algorithm, and get closed, continuous, more accurate lesion area contour curve. However, in this method, the thresholds in region merging is the experience values gained through many tests, because the selection of the threshold directly affects the segmentation results, how to select the threshold adaptively will become a study emphasis in research environment[3].

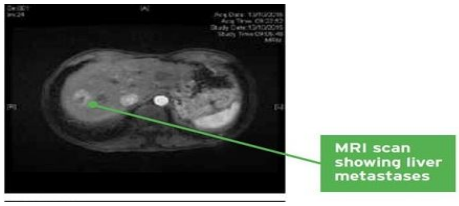

Fig-6

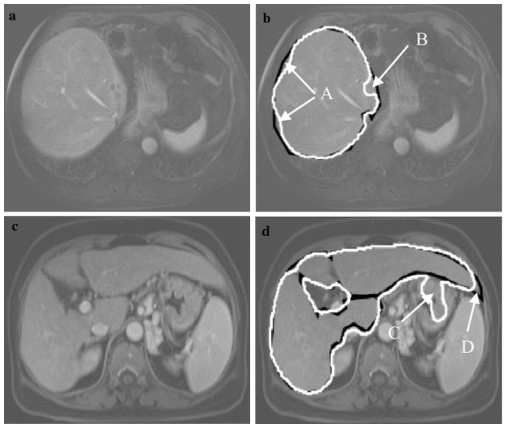

Fig-6.1

CONCLUSION

In this paper, use image processing techniques in the medical image. The proposed approach algorithm helps in detection of cancer in brain, breast, lung and liver cancer using medical image processing such as MRI, Ultrasound and x-ray. Since medical image are complex, requirement preprocessing aids in gray scale image use some operation. Then applied the watershed transform. The areas in the image are highlighted and that could be under analyzed to detect cancerous and non-cancerous. The proposed algorithm has been tested on standard digital image techniques. Through the work the value of neighbor adopted has been reached a good results ratio. In future, this work can be detection the tumors using any of techniques such as combined the watershed transform algorithm and clustering algorithm, Neural network system, Fuzzy logic and also control problem of over-segmentation using watershed transform.

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