DETECTION OF BONE CANCER USING CT SCAN IMAGES

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Abstract: - **From couple of years image processing techniques are extensively utilized for different therapeutic image modalities in which to distinguish infection as in brief period time factor assumes an extremely critical job. The most ideal approach to depict bone malignancy in all stages utilizing image processing. Identifying cancer in the bone is a testing issue because of its complex structure. Here, past analysts have given far reaching survey of bone malignant growth recognition using image processing strategies. A decent research work has been made to the CAD framework behind distinguishing proof of bone malignant growth by images. In this paper we proposed a bone malignant growth identification utilizing k-means segmentation and KNN classifier to recognize the bone disease utilizing image processing strategy for ultra sound images of bones.**

Keywords--- Bone Disease, Ultra Sound Image, Bone Cancer, K-Means, KNN Classifier.

I INTRODUCTION

Restorative image processing is a critical field of research as its results are utilized for the advancement of medical problems. A tumor is an unusual development of tissues. As the tumor develops, the strange tissue uproots sound tissue. Bone tumors create when cells inside a bone gap wildly, framing a protuberance or mass of unusual tissue. There is a substantial class of bone tumor types which have distinctive attributes. There are two sorts of bone tumors, Noncancerous (Benign) and Cancerous (Malignant). Exact bone tumor detection technique is essential in numerous therapeutic imaging applications. It helps in anticipating early treatment, assessment of treatment, and so forth.

Since here and there specialists can't distinguish the ailments rapidly, which can make issues that make the human life unsafe and patients experience the illeffects of numerous challenges. Subsequently, specialist needs incredible exactness in the analysis of bone tumor from imaging examinations. Exact investigation may tackle the issues.

1.1 What is Bone Cancer?

Bone ailment starts in the bone. Threat starts when cells in the body begin to wind up wild. Cells in practically any bit of the body can advance toward getting to be tumor, and can spread to various zones of the body.

1.2 Types of bone tumors:

Essential and optional bone tumor

Basic bone threat starts in the cells of the bones. The tumor cells are bone cells that have ended up being unsafe. Every one of the information in this portion is about basic bone development. Most by far who has tumor cells in their bones don't generally have fundamental bone development. They have infection cells that have spread into the bone from a development elsewhere in the body. This is called assistant or metastatic bone sickness. So for example, if you have chest tumor that spreads to the bones, the harm cells during the bones will truly be chest malady cells.

Osteosarcoma

You can get osteosarcoma at any age. In any case, it's the most outstanding sort of fundamental bone ailment found in teenagers and young adults. Osteosarcomas can grow wherever in the skeleton.

Ewing's sarcoma

Ewing's sarcoma is most essential in adolescents. One can get a Ewing's tumor in the fragile tissues of the body. Sensitive connective tissue tumors are called fragile tissue sarcomas. These are managed an unclear way from Ewing's bone tumors.

Chondrosarcoma

Chondrosarcoma is normally found in adults developed in the region of 30 and 60 years old. It is a danger of tendon cells inside the bone. Tendon is the sparkling, smooth substance that regularly covers the terminations of bones in the joints. In any case, it can similarly be found inside the bone. Chondrosarcoma can wind up inside a bone or on the bone surface.

Undifferentiated sarcoma of bone

This infers the cells are not specific. They are exceptionally undeveloped (energetic) and it isn't possible to tell which kind of common bone cells they started from.

Hurtful stringy histiocytoma (MFH)

Most of the tumors that used to be called MFH are right now more absolutely broke down as various sorts of sarcoma. The humble number that would at present be called MFH is as of now known as undifferentiated high audit pleomorphic sarcoma. Right when this tumor starts in the bone, your pros may imply it as shaft cell sarcoma of the bone.

Fibro sarcoma

This is outstandingly exceptional and routinely found in modestly matured adults. The most outstanding site for fibro sarcoma is the thigh bone (femur).

Leiomyosarcoma of bone

This is to an extraordinary degree unprecedented and little is considered this sort of shaft cell sarcoma. Your lord will talk you through what they think about having leiomyosarcoma of the bone.

Chordoma

Chordomas are an incredibly unprecedented, moderate creating kind of bone sickness. Chordomas make from the notochord, which shapes the early spinal tissue in a kid making in the belly. After around a half year, this tissue is replaced by bone. In any case, once in a while little zones of notochord may remain. Bone cancer occurred in three stages:

Stage 1	Only tumor detected and not spread out of the bone.
Stage 2	In aggressive stage.
Stage 3	Tumor started growing in another multiple places.

II LITERATURE REVIEW

Sinthia P and K. Sujatha [1] proposed a novel way to deal with recognize the bone disease utilizing K-implies calculation and edge location technique. This procedure utilized Sobel edge identification to recognize the edge. Sobel edge locator distinguishes just the outskirt pixels. K-Means clustering calculation is utilized to identify the tumor region. Characterizing the quantity of clusteres is the troublesome advance in K-Means clustering calculation.

Kishor Kumar Reddy [2] proposed a novel methodology for identifying the tumor size and bone malignant growth organize utilizing locale developing calculation. This procedure portioned the area of enthusiasm by utilizing locale developing calculation. Tumor measure is determined by the quantity of pixel in the extricated tumor part. Contingent on the absolute pixel esteem disease arrange is recognized. Determination of seed point relies upon the image and it is hard to choose precisely.

Maduri Avula [3] proposed a strategy to identify the bone disease from MR images utilizing Mean pixel power. The info MR image is denoised and K-Means clustering calculation is connected to separate the tumor part. From the separated tumor part the all out number of pixel is figured and the aggregate of pixel intensity is determined for the extricated tumor part to ascertain the mean pixel power. Mean pixel intensity is determined to distinguish malignant growth. In the event that the mean pixel intensity esteem is over the edge esteem it is considered as malignancy.

Abdulmuhssin Binhssan [4] proposed a strategy to recognize the enchondroma tumor. The info image is denoised utilizing the two-sided filter and normal filter. The two-sided filter has certain hindrance It requires greater investment to denoise the image. The normal filter gives better outcome contrast with reciprocal filter. Thresholding segmentation is done to section the image and morphological activities are connected to upgrade the tumor region.

Ezhil E.Nithila and S.S Kumar [5] proposed Automatic detection of single pneumonic knobs utilizing swarm insight upgraded neural systems on CT images. This philosophy utilized the Gaussian filter to remove the noise and shape model to fragment the image. Spillage issue emerges because of the feeble limit. The knob is identified from the fragmented image. Outskirts of the knob are adjusted to recoup the lung knob. Different features are separated to discover the tumor precisely. The separated component is connected to back proliferation neural system to prepare the information and to order the tumor.

Mokhled S. Al-Tarawneh [6] proposed a strategy for Lung Cancer Detection Using Image Processing Techniques. This system utilized Gabor filter to denoise the image. Gabor filter has the best outcomes. To portion the image two segmentation strategies are utilized. Thresholding approach and marker-controlled watershed segmentation are the two calculations. Marker-controlled segmentation strategy gives better outcome contrast with thresholding approach. The image features are extricated utilizing binarization and concealing way to deal with recognize disease.

Fatma Taher and Naoufel Werghi [7] proposed a strategy to identify lung malignancy by utilizing a counterfeit neural system and fluffy clustering strategies. This procedure utilized two segmentation strategies Hopfield neural system and a fluffy c-implies clustering to portion the image. PC Aided Diagnosis framework is created to distinguish malignant growth at its beginning periods. In this paper, 1000 example images are tried utilizing both the segmentation procedures. HNN has appeared better order contrast with fluffy clustering procedure.

Anita chaudhary [8] has built up a strategy for lung disease detection on CT images by utilizing image preparing. In this system, Gabor filter is utilized for noise decrease. Segmentation is finished by utilizing two segmentation strategies thresholding and marker-controlled watershed segmentation. Features are removed to recognize the tumor. Zone, border and roundness are the three features separated in this paper.

Md. Badrul Alam Miah and Mohammad Abu Yousuf [9] proposed a system to distinguish the lung malignancy from CT image utilizing image processing and neural system. In this procedure, a few preprocessing methods are utilized to improve the image. Segmentation system is completed subsequent to preprocessing to fragment the image. Features are separated and connected to the neural system to prepare and order malignancy.

Nooshin Hadavi and Md.Jan Nordin[10] proposed a strategy for Lung Cancer Diagnosis Using CT-Scan Images Based on Cellular Learning Automata. This approach utilized Gabor filter to remove the noise present in the information image. Area developing calculation is utilized to portion the image. Different features are removed from the divided image and connected to the new calculation cell automata to distinguish malignant growth.

III. PROPOSED METHODOLOGY

The Figure 3.1 show block diagram of bone cancer detection using KNN

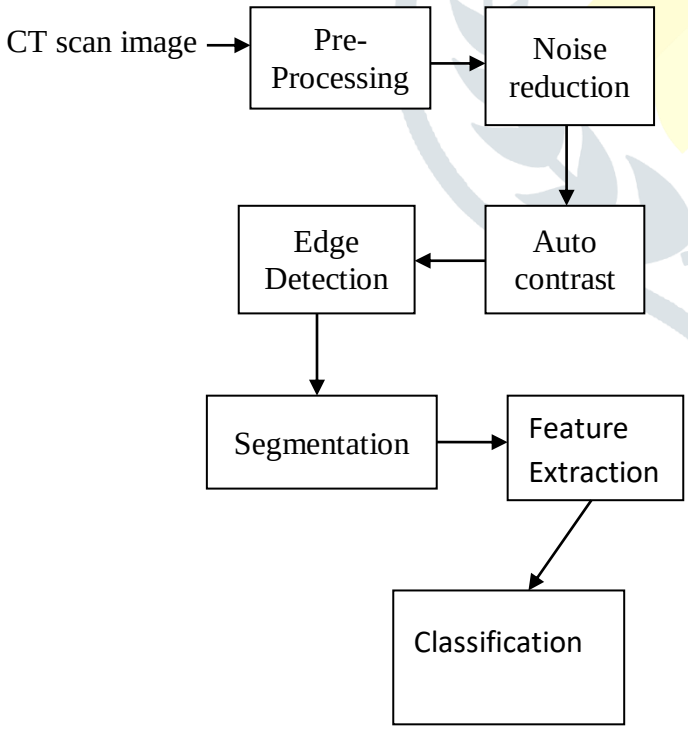

Figure 3.1 Block diagram

Acquisition of Image

The image obtaining is the main stage in any of the vision system. There are distinctive image modalities, for example, CT scans, MRI, US and X-rays. The US images are viewed as the best on account of its higher goals. It is broadly utilized in restorative applications as a result of its capacity to create non intrusively brilliant images of the human body. Figure 3.2 shows input image.

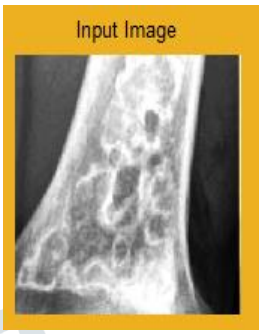

Figure 3.2 Input CT scan image

Preprocessing

Unwavering quality of an optical investigation. Preprocessing is a Essential advance to upgrade the nature of a image. The Image preparing stage is begun with the sifting procedure. Image sifting is helpful for some, applications including smoothing, honing and expelling clamor. Sifting stifles the noise or other little variances in the image. So these noises must be denoised. In this system, middle filter is utilized to remove the noise and to smoothen the damaged images. The principle preferred standpoint of this filter is, it produces amazing noise decrease with less obscuring when contrasted and different filters. The following stage in the wake of sifting is the dim change. This is the way toward changing over the pixels having RGB level into the dim dimension. Shading image has more procedure intricacy. So the change of the grayscale image is essential. This change is mostly to take out the tint and immersion data by holding the luminance. Figure 3.3 shows noise and denoised image. Figure 3.4 shows contrast enhanced image.

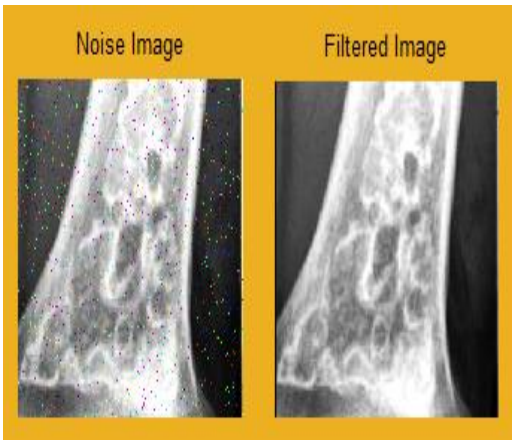

Figure 3.3 Noise and Denoised image

Figure 3.4 Contrast Enhanced image

Edge Detection

An edge indicator used to get a limit between two districts with moderately particular dim dimension properties. Edge detection used to remove valuable features which help to distinguish malignant growth. In this proposed technique, shrewd edge indicator is utilized to distinguish an edge of a image. The focuses at which image brilliance changes are recognized and set apart as the edge. Vigilant edge indicator has points of interest like great recognition, great restriction and negligible reaction. Figure 3.5 shows edge identified image.

Figure 3.5 Edge detected image

Segmentation

The results of image segmentation are a set of segments that collectively corner the entire image or a set of contours extracted from the image.

K-means algorithm:

Clustering is a methodology of clustering objects into unintelligible clusters so the information in a comparative group are similar; anyway information having a spot with different clusters shift. A group is an amassing of information question that resemble each other are in same cluster and not in the slightest degree like the items are in different clusters. The enthusiasm for dealing with the sharp growing information what's increasingly, taking in noteworthy information from information, which makes clustering methodologies are commonly associated in various application domains, for instance, artificial mental ability, science, customer relationship organization, information weight, information mining, information recuperation, image getting ready, AI, advancing, prescription, structure affirmation, cerebrum look into, bits of knowledge and whatnot.

Gathering examination is an instrument that is used to watch the characteristics of gathering and to focus on a particular group for advance examination. Clustering is unsupervised learning and don't rely upon predefined classes. In clustering we measure the uniqueness between articles by estimating the separation between each pair of items. Figure 3.6 shows segmented image.

Figure 3.6 segmented Image

Feature Extraction

The image feature extraction is an essential system in image processing. It assumes a noteworthy job in the disease discovery utilizing image processing. Features are separated from the portioned image to recognize malignancy. Feature extraction speaks to the last outcomes to foresee malignancy and non-disease of a image. Feature extraction diminishes the quantity of assets required to depict an extensive arrangement of information. It is the procedure by which certain features of enthusiasm inside a image are identified and extricated for further preparing. The element is depicted as a most delegate data of the image. Each component indicates some quantifiable property of an item and is registered with the end goal that it evaluates some critical qualities of the object. We classified various features such as Auto-correlation, Cluster Prominence, Cluster Shade, Sum Average, Sum Entropy, Sum of Square, Variance, Sum Variance.

Auto-Correlation:

$$COR = \sum_{i=0}^{G-1}\sum_{j=0}^{G-1} \frac{(i-\mu_i)(j-\mu_j)P(i,j)}{\sigma_i\sigma_j}$$

Cluster Prominence:

$$PRM = \sum_{i=0}^{G-1}\sum_{j=0}^{G-1}\{i+j-\mu_x-\mu_y\}^4 \times P(i,j)$$

Cluster Shade:

$$SHD = \sum_{i=0}^{G-1}\sum_{j=0}^{G-1}\{i+j-\mu_x-\mu_y\}^3 \times P(i,j)$$

Sum Average:

$$AVE = \sum_{i=0}^{2G-2} iP_{x+y}(i)$$

Sum Entropy:

$$SEN = -\sum_{i=0}^{2G-2} P_{x+y}(i)\log\left(P_{x+y}(i)\right)$$

Sum of Square, Variance:

$$VAR = \sum_{i=0}^{G-1} \sum_{j=0}^{G-1} (i-\mu)^2 P(i,j)$$

Sum Variance:

$$\frac{1}{n}\left(\sum_{i=1}^{n}(x_i - \overline{x})^2\right)$$

Classification

Classification is the important and last stage of our proposed system. The classifier differentiates normal tumor from the abnormal tumor. Various texture characteristics such as such as Auto-correlation, Cluster Prominence, Cluster Shade, Sum Average, Sum Entropy, Sum of Square, Variance, Sum Variance, are extracted and applied to KNN classifier as the training data.

IV. EXPERIMENTAL RESULTS

The proposed method is implemented and simulated using MATLAB 2013 tool figure 4.1 below shows the snapshot of graphical user interface of the proposed system.

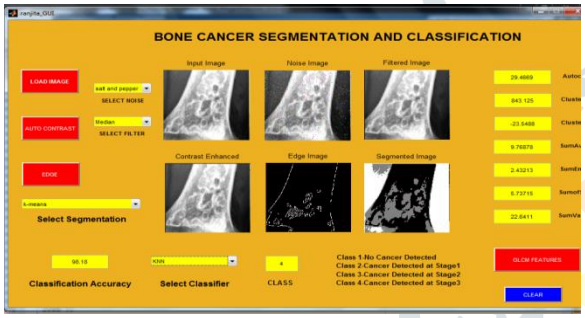

Figure 4.1 GUI of proposed system

The performance analysis of extracted features is represented as the bar graph in Figure 4.2. The classification of malignant and benign cancer was done based on extracted feature values.

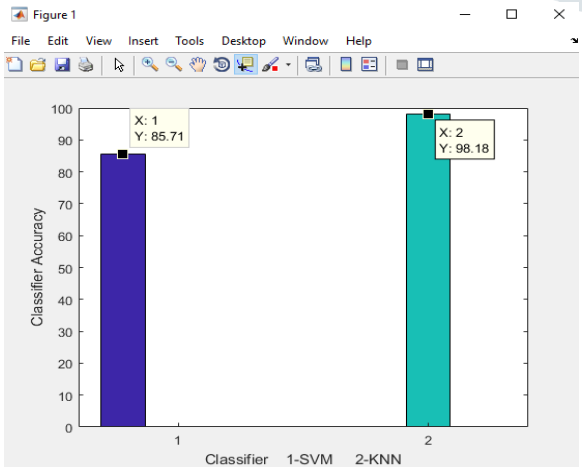

Figure 4.2 Accuracy SVM vs. KNN

V CONCLUSION

Bone malignancy is one sort of risky ailments, so it is important to recognize disease in its beginning times. In any case, the recognition of bone disease is the most troublesome errand. From the writing survey, numerous systems are utilized for the detection of bone disease however they have a few restrictions. In our proposed strategy seek after methodologies in which the initial step is preprocessing, edge detection, segmentation and feature extraction, and afterward these features are utilized to train up the KNN classifier and test the system. The proposed system effectively recognizes the bone malignant growth from ultra sound scan images. The proposed method accomplishes its ideal desire toward the finish of the framework with a detection accuracy of 98.14%.

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