

K-Fuzz Model : A review technique for Bone Tumor Detection Using Machine Learning

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ABSTRACT

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Image processing has a tremendous area under research, where Medical Imaging is the most significant region to work in. As in biological cases, for example, fractures, tumors, ulcers, and so on, image processing made it all the more simple to discover the specific reason and the best fitted arrangement. Explicitly in tumor identification clinical imaging accomplished a benchmark by settling different complexities. Fundamentally Medical Imaging can be clarified as the way toward making human self-perceptions for clinical and research work. Doctors usually give an advice to get MRI ,CT SCAN and XRAY to recognize and detect tumor locations. MRI provides the best possible options with higher goals. In this paper the tumor identification of bone has been proposed utilizing Machine Learning.

Keywords : Image Processing, Tumors, Clinical Imaging, MRI, CT Check, Machine Learning.

I. INTRODUCTION

Malignant growth is the most relinquished ailment everywhere throughout the globe which is clinically alluded to as a pernicious neoplasm, it is a diverse hereditary infection that is caused basically by the natural elements. As the best possible treatment isn't accessible a large portion of the patient dies however the quantity of death rate can be decreased by methods for early discovery of disease in order to continue controlling techniques. Unfettered cell development is the side effect of cancer growth leading to the formation of vindictive (malevolent) tumors, which attacks the close by body tissues.

These tumors further develop and hinder the circulatory system, digestive system and nervous system and also can liberate hormones that amends to proper body function. The unrestrained cell development isn't really hurtful except if and until it influences the DNA. In the event that the influenced DNA cannot be fixed inside the early time it might lead DNA for creation of unnecessary new cells. Cancer often becomes serious in one's case because of the property of 'Metastasis'. The procedure of metastasis can be characterized as the procedure of development of malignant growth cells starting from one part of the body then onto the next part leading to producing tumors that return to regular tissue. There are almost 200 types of cancer causing tumors.

The primary side effects of cancer are new lump , abnormal bleeding, prolonged cough, unexplained weight reduction, change in bowel movement and so on. Fundamentally tumors are of two kinds cancerous and non-cancerous, clinically can be termed as malignant and Benign. Benign tumor can be removed by medical procedure and at most it doesn't grow once again. In general a malignant tumor can be identified as a tumor with a larger core(nucleus) compared with normal cell nuclei.

Clinically the bone malignancy is named as the Sarcomas, which starts in the muscle, bone, fibrous tissue, blood vessels, some tissues. Probably the most widely recognized kinds of bone disease are osteosarcoma, chondrosarcoma, ewing's sarcoma, pleomorphic sarcoma, fibrosarcoma. In bone cancer the tumor gets formed into the bone and affects the bone development. Explicitly in the bone tumor consideration, Enchondroma is a kind of benign tumor found inside the bone which starts at the ligament. In most of the cases of Enchondroma found in the small bones of the hand, possible susceptible bone areas for Enchondroma are the femur (thigh bone), tibia (shin bone), humerus (upper arm bone). Bone cancer occurred in four stages:

- Stage 1: Only Tumor detected and not spread out of bone.
- Stage 2: In an aggressive stage.
- Stage 3: Tumor Starts growing in other multiple areas.
- Stage 4: Cancer has reached other parts of the body.

II. METHODOLOGY

In this paper a model called "K-Fuzz Model" is introduced to detect bone cancer by using a machine learning algorithm. This model will make use of k means clustering and Fuzzy c means together to detect bone cancer. The objective is to detect the tumor present in the bone, but majorly it happens that during the tumor detection method ,images obtained possess greater noise factor which limits the region to operate since it fails to give the exact

location of tumor and the affected tissues. Hence in this paper a novel approach has been proposed which consists of the number of stages which will ultimately lead to the proper detection of enchondroma tumor i.e. bone tumor. A simple flow chart for the proposed system as follows:

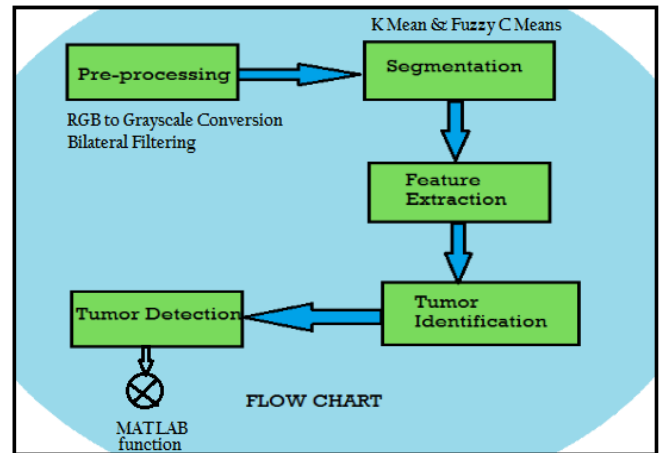


Fig.1.Process of Flowchart

2.1 Pre-processing

Majority times images that are captured are lowered with the noise that leads to poor quality ,hence image pre-processing is much needed and important to bring out exact and important information.

Pre-processing is done by denoising the image. Main steps in pre-processing are:

- RGB to Grayscale Conversion
- Bilateral Filtering

Mathematically filtering operation can be formulated as follows:

$$I_b(x,y) = \frac{\sum_{n=-N}^N \sum_{m=-N}^N W(x,y,n,m) I_g(x-n,y-m)}{\sum_{n=-N}^N \sum_{m=-N}^N W(x,y,n,m)}$$

Where,

$I_g(x,y)$ = grayscale image with values in the range [0,1].

$I_b(x,y)$ = bilateral filtered version of $I_g(x,y)$.

2.2 Segmentation

It is the process of bifurcating the image into the subdivisions with a base of areas with similarities. In this paper the use of the K-Means clustering

algorithm and the Fuzzy C-Means algorithm have been proposed.

K-means Clustering algorithm:

It was developed by J. Mac Queen (1967) and then by J.A. Hartigan and M.A. Wong around 1975. It organizes, classifies, generate groups for data in to K number of groups depending on attributes/features where K is a positive integer number. This grouping is carried out by keeping down the sum of squares of distances between data and the corresponding cluster centroid.

Basic Steps Of algorithm involves following:-

1. Initialize k and place centroids randomly.
2. Generate distance matrix
3. Form the cluster using centroid and data point distance closeness
4. Measure SSE and calculate Mean and re-position all k centroids
5. Repeat steps 2 to 4 till convergence is obtained.

Fuzzy C-Means Segmentation algorithm:-

It is a method of forming clustering allowing one part of data to relate or be into two or more clusters developed by Dunn in 1973 and improved by Bezdek in 1981. It is frequently used in pattern recognition. It works by allocating membership function to every data point that corresponds to cluster center based on distance between cluster and data point. Simple logic goes here "Maximum the data nearer to cluster center, the membership is more nearly towards the particular cluster center.

Putting forward in clear order "summation of membership =one(should be) for every data point" .

Fuzzy stands for probabilistic logic or a multi-values logic. In fuzzy C-means the main prime features are: Support, Boundary and the core.

They differs in the cluster membership because of following points:-

- a. The support value is non-membership value of the set
- b. The boundary is the intermediate membership with range value [0,1]
- c. The core is complete member of the fuzzy set.

2.3 Feature Extraction

Captured images feature extraction can be carried out by utilizing the available number of techniques. In this paper I am going to use the machine learning algorithm so as to make the system more robust. In machine learning algorithms there are several algorithms which are classified based on their performance. Specifically in supervised learning the Random forest and the nearest neighbour algorithm are useful, as these algorithms generate a function that maps inputs to desired outputs.

2.4 Tumor Identification

The bone tumor is identified by the calculation of mean pixel intensity of segmented images which can be calculated using following formula:

$$\text{Mean pixel intensity} = \frac{\sum \text{Intensities for extracted tumor part (S)}}{\text{No. of pixels for extracted tumor part(N)}}$$

2.5 Tumor Detection

The last step is to detect the tumor to be carried out by the use of MATLAB function for connected components, which in further will select area with maximal connected component and the remaining area will be deleted.

III. CONCLUSION

In this paper I have studied the basic mechanism for tumor detection/demodulation. In this review article I have specifically focused on bone tumor detection. An algorithm comprising the various stages have been compiled to study the result.

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