A STUDY ON TUMER IDENTIFICATION THROUGH ADVANCED MRI IMAGING

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Abstract: In medical field image process technology plays a significant role. Magnetic resonance imaging is one amongst the rising technologies during this field. growth in brain of patient is known through magnetic resonance imaging pictures. During this field noise filtering is one amongst the most criteria that square measure moderate in existing technique. So, SPHIT technique is applied on region of interest (ROI) this methodology incorporates with some noise removal functions, segmentation and morphological operations that square measure the essential ideas of image process, filters square measure main blocks for pictures sweetening. MATLAB computer code is employed for magnetic resonance imaging pictures process.

Keywords: Digital Image, MRI, Detection, Segmentation, Extraction, Scan

Introduction: in this paper discuss the great deal of image information is made within the field of medical imaging within the style of CT (CT), resonance Imaging (MRI), and Ultrasound pictures, which might be keep in image archiving and communication system or hospital data system. A medium scale hospital with higher than facilities produces on a median five GB to fifteen GB of knowledge. So, it's extremely troublesome for hospitals to manage the storing facilities for identical. Moreover, such high information demands for prime finish network particularly for sending the pictures over the network like in telemedicine. This is often important for telemedicine state of affairs thanks to limitations of the transmission medium in info and Communication Technology (ICT) particularly for the geographic area. Compression is beneficial in, reducing the storage and transmission information measure needs of medical pictures. For e.g., associate 8-bit gray scale image with 512 × 512 pixels needs have zero.2 MB of storage. If the image is compressed by 8:1 compression with none sensory activity distortion, the capability of storage will increase eight times. Compression strategies square measure classified into lossless and loss strategies. Within the medical imaging state of affairs, loss compression schemes aren't usually used. This is often thanks to asdoable loss of helpful clinical info which can influence designation. Additionally to those reasons, there will be legal problems. pictures , mostly problematic owing to the need to preserve the most effective doable image quality that is typically taken as a requirement for lossless compression.3D magnetic resonance imaging contains multiple slices representing all info needed a few, a number of the foremost fascinating properties of any compression methodology for 3D medical pictures include: (i) high lossless compression ratios, (ii) resolution quantifiability, that refers to the flexibility to rewrite the compressed image information at numerous resolutions, and (iii) quality quantifiability, that refers to the flexibility to rewrite the compressed image at numerous qualities or signal/noise ratio ratios (SNR) up to lossless reconstruction. DICOM is that the most comprehensive associated accepted version of an imaging communications commonplace. DICOM format

features a header that contains info regarding the image, imaging modality and knowledge regarding the patient.
The header additionally contains info regarding the sort of media (CT, MRI, recording, etc.) and therefore the image dimensions. A body of DICOM commonplace contains info objects like medical reports, audio recordings, and pictures. The focuses algorithmic program should watch out of different info within the DICOM file. Also, the algorithms ought to settle for the input image in DICOM format at encoder finish and turn out DICOM file at decoder finish. The scale of a graphics file will be reduced in bytes while not degrading the standard of the image to associate unacceptable level exploitation compression. So additional pictures will be keep within the given memory house. This additionally minimizes the image and receiving time of the pictures, say for associate example: through web. Many strategies square measure there to press the pictures. This will be as a result of the applied math properties of the pictures can be exploited well solely by the encoders specially designed for them. Sometimes, a number of the inner details within the image will be full-motion for the sake of very little additional information measure or cupboard space. In different words, lossy compression will be employed in such areas. Generally, a computer file will be compressed while not the introduction of errors up to an exact extent. This is often known as lossless compression. However at that time extent errors square measure inevitable. In text and program files it's thus necessary that we have a tendency to use lossless compression as a result of one error in text or program file an amendment that means of the text or cause the program to not run. The tiny low loss in compression is often not noticeable. There's no concern until the crisis. On the far side that it isn't possible! The compression issue will be high if there's loss tolerance as an alternative it should be less. So, graphic pictures will be with high compression quantitative relation than that of the text files or program files. Economical compression is one of the main aspects of image storage. for instance, a picture of 1024 x 1024 x twenty four would need the storage memory of 3MB and desires seven minutes for sending and utilizing during a high speed ISDN (64 Kbit/s). however if the image is compressed at the quantitative relation of 10:1 the memory needed for storage would be simply three hundred kilobyte and therefore the TRM drops underneath half dozen seconds. Within the time needed for causing associate uncompressed file through application program alk network, we are able to transfer compressed seven one MB files to a floppy. In any quite atmosphere, the big files square measure perpetually a biggest natural event in systems. This shows however urgently we'd like compression for managing transmissible dimensions. Aside from compression strategies, we are able to additionally increase the information measure however this can not offer economical outputs. The qualitative transition from straightforward text to full-motion video information and therefore the disc space, transmission information measure, and TRM required to store and transmit such uncompressed information.

Motivation and Perspective: Digital image process deals with manipulation of digital pictures through an information processing system. It's a subfield of signals and systems however focus notably on a DIP focuses on developing a computer system that's ready to perform processing on a picture. The input of that system may be a digital image and therefore the system method that image exploitation economical algorithms, and offers a picture as associate output. The foremost common example is Adobe Photoshop. It's one amongst the wide used applications for process digital pictures.

Literature Survey: A paper that shows comparison of K-means, Fuzzy C-means and hierarchic agglomeration algorithms for detection of brain tumour, These 3 agglomeration algorithms K-means, fuzzy c-means and hierarchic agglomeration were tested with magnetic resonance imaging brain image in non medical format (.jpg, .png, .bmp etc) yet as DICOM image. It's proving that DICOM pictures turn out additional economical result compare to non medical pictures. Time needed for hierarchic agglomeration is least and fuzzy c-means is most to sight the brain tumour wherever as K-means algorithmic program turn out additional correct result compared to Fuzzy c-means and hierarchic agglomeration. Detection of brain tumour involves numerous stages like image preprocessing, feature extraction, segmentation and classification. Pulse couple neural network (PCNN) uses for image smoothing, feature extraction and image segmentation and Back Propagation Neural Network (BPNN) is employed for classification that classifies the image whether or not it's traditional or abnormal. The bilaterally symmetrical analysis to sight the brain growth by creating the calculations on the realm of tumor. It s application with many information sets with completely different growth size, intensity and location shows that it will mechanically sight and section the brain growth. adult male pictures provides higher result compare to different technique employed in the sector of bioscience like CT pictures and X-rays Segmentation is one amongst the essential tasks in medical space however is boring and time overwhelming.

Image pre-processing together with changing RGB image into gray scale then passing that image to the high pass filter so as to get rid of noise is finished and eventually the last we get increased image for post-processing that may embody watershed segmentation and thresholding yet as morphological operation . For the extraction of text region. Morphological operator is employed since text regions square measure composed of vertical edges, horizontal edges and diagonal edge. At completely different orientation these text square measure connected along otherwise. In recent years the ideas of metaphysics has taken a good leap from formal specification to the realm of AI within the domain of specialists system. Metaphysics has been common on World Wide net nice ends up in the pictures having non-uniform distinction distributions. Kharrat et al. planned associate algorithmic program for detection of brain tumour from magnetic resonance imaging pictures [5]. During this paper, the morphological operations ripple decomposition and k-means algorithmic program for segmentation is enforced to extract growth space. The results show that the algorithmic program is possible and performs alright on magnetic resonance imaging pictures. S. Roy et al. explored a method to differentiate growth in brain magnetic resonance imaging [6]. During this paper, image sweetening, morphological operations and watershed segmentation square measure applied. Results demonstrate that Watershed Segmentation will effectively extract a growth if the parameters square measure set properly before segmentation. Malakooti et al. planned a growth segmentation technique which mixes each symbolic logic and neural networks and extracts the boundary taking under consideration level set methodology [7]. The planned technique provides higher results as compared to different existing techniques. M. K. Behera et al. planned a unique quick and sturdy fuzzy c-means agglomeration framework for image segmentation supported native abstraction and grey info [8]. This methodology has low machine time, less complexness and therefore the algorithmic program is effective and economical. A fuzzy agglomeration algorithmic program that utilizes dependable this idea primarily deals with categories, sub-classes and their association from the basic categorization of product along side their options .[4] Aboul Ella Hassanien , [5] bestowed review paper that shows however the rough set approach and close to set approach square measure helpful to resolve numerous issues in medical imaging like medical

image segmentation , object extraction and image classification .This paper additionally shows however the rough set framework hybridized with numerous computing technologies such neural network (NN), support vector machine (SVM) and fuzzy sets . a mixture of assorted machine intelligence technologies in medical image downside has become one amongst the foremost promising avenues in image process analysis.

An intelligent Model for brain tumour designation from magnetic resonance imaging pictures .which consists of 3 completely different stages like preprocessing, Feature extraction and classification. Preprocessing wont to scale back the noise by filtration and to reinforce the magnetic resonance imaging image through adjustment and edge detection. Texture options square measure extracted and principal element analysis (PCA) is applied to scale back the options of the image and eventually back propagation neural network (BPNN) primarily based Person parametric statistic was wont to classify the brain image.N.senthilal kumaran. et al [7] bestowed a hybrid methodology for white matter separation from magnetic resonance imaging brain image that consist of 3 section. 1st section is to preprocess a picture for segmentation, second section is to section a picture exploitation granular rough set and third section is to separate substantia alba from divided image exploitation fuzzy sets This methodology was compared with mean shift algorithmic program and it absolutely was found that hybrid segmentation performs higher result Rajesh patil et al [8] bestowed a technique to sight and extract the growth from patients magnetic resonance imaging image of brain by exploitation MATLAB computer code. This methodology performs noise removal operate, Segmentation and morphological operations that square measure the essential construct of image process. growth is extracted from magnetic resonance imaging image for this it's associate intensity quite that of its background thus it becomes terribly straightforward locates. Mehdi Jafri and Reza Shafaghi [9] planned a hybrid approach for detection of brain tumour tissue in magnetic resonance imaging supported Genetic algorithmic program (GA) and support vector machine (SVM).In the preprocessing stage noise is removed and distinction is increased. For removing high frequency noises low pass filter is employed for enhancing bar chart stretching methodology is employed. In segmentation unsought tissue like nose, eyes and os square measure deleted and options square measure extracted by other ways like FFT, GLCM and DWT. In feature choice GA is employed with PCA by exploitation this calculations complexness is reduced. Finally the chosen options square measure applied to SVM classifier wont to classify the image into traditional or abnormal.A Sivaramkrishnan [10] bestowed a unique primarily based approach during which Fuzzy C-mean (FCM) agglomeration algorithmic program was wont to realize the centroids of cluster teams to obtained brain tumour patterns. It's additionally most well-liked as quicker agglomeration by exploitation this center of mass purpose will be set simply. The bar chart equalisation calculates the intensity of grey level image and PCA was wont to scale back spatiality of ripple constant.

In the literature, there square measure an outsized range of existing techniques and algorithms for the detection and segmentation of brain tumour from magnetic resonance imaging pictures. Asra Aslam et al. bestowed associate improved edge detection algorithmic program for brain tumour segmentation [3]. This algorithmic program combines the Sobel methodology with image dependent thresholding, finds closed regions exploitation closed contour algorithmic program and extracts tumors from the image. The brain tumors extracted by planned algorithmic program square measure higher than the tumors extracted exploitation Sobel edge detector, Roberts's edge detector and Prewitt edge detector. Roy et al. planned a totally automatic algorithmic program to spot tumors by utilizing symmetry analysis [4]. during this paper, the concept that the region of image containing the growth has higher intensity than the region with healthy brain tissues is being employed. The magnetic resonance imaging image is increased, filtered and segmentation is finished and it additionally produces neighbor pixels for image segmentation [9]. The planned algorithmic program uses the native applied math information to separate dependable neighbor pixels thereby up the segmentation performance and therefore the results of segmentation is adaptive to the first image. Gopinath et al. delineated the planned system for recognition and extraction of glandular cancer cells from the magnetic resonance imaging image of the prostate organ [10]. During this paper, noise removal from magnetic resonance imaging image by high pass and median filtering so segmentation of magnetic resonance imaging image is finished by threshold segmentation, watershed segmentation and morphological operations. The extracted regions of cancerous cell from the input magnetic resonance imaging image square measure extracted expeditiously. R. B. Dubey et al. planned a semi-automated region growing segmentation algorithmic program for the brain.

Proposed Method

ROI Based DICOM Image Compression: If we consider any medical image it requires large amount of data for storage and requires large transmission bandwidth, so we have to compress medical image. A medical image for Compression can be a single image or sequence of images. The diagnostic data produced by hospitals has geometrically increased. Some of medical images which indicate that a compression technique is needed that results with greater data reductions and hence transmission speed.

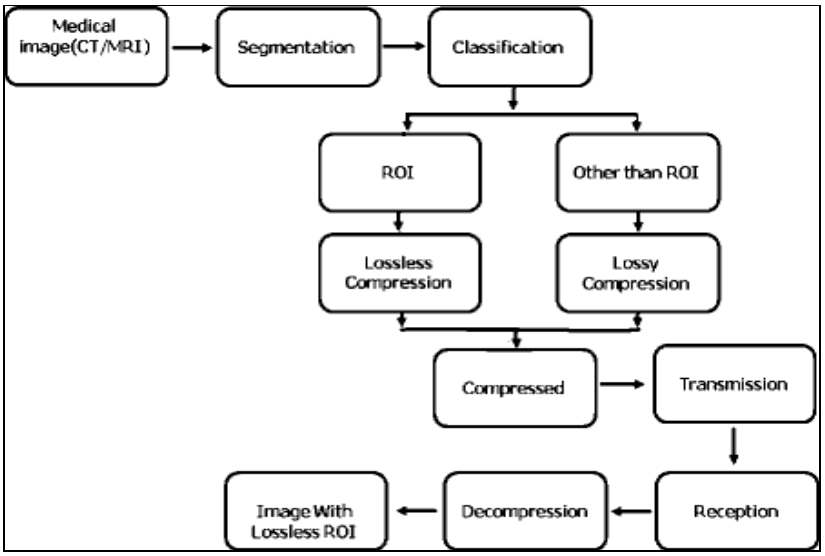

Fig.1 ROI based DICOM image compression

In medical cases, a lossy compression method that preserves the diagnostic information is necessary. Recently ROI based coding has also been proved as a good approach for medical image compression especially in telemedicine applications. Region of interests (ROI) are those regions which can be given more importance in any given image. If loss of quality is affordable, then many compression schemes produce high compression rates for general images. However, medicine cannot afford any deficiency in diagnostically important regions (ROI). Thus it is necessary to have an approach that brings a high compression rate maintaining good quality of the ROI. Since all regions of medical images do not have equal importance. Such as for brain MRI, instead of scanning the whole image the section of image that contains the tumor is examined. Which results in high reconstruction quality over user specified spatial regions in a limited time. Lossless compression, Progressive transmission and region of interest (ROI) are necessary requirements for a medical image compression scheme. In our proposed method, For the ROI based Image compression we have to separate both ROI and non ROI part and apply compression methods accordingly. In Fig 1 let us consider a medical image either CT or MRI and by applying segmentation technique the image will be divided into both ROI and non ROI parts.

Region of Interest: Those regions of an image which are given more consideration as compare to other regions are called region of interest i.e. ROI. It is a general observation that in some real image or medical image all the regions do not show equal importance for examination point of view. Considering this fact, attention is paid only to selected parts of the image. For example in Fig.1, of a brain MRI image, region containing tumor is examined instead of scanning the whole image, because actual information exists here**.** In medical diagnosis, the Region of Interest (ROI) concept is important because of the limitation and hampering of medical images due to lossy and lossless compression techniques. The compression ratio of lossless compression techniques result into 25% of original size, while for the lossy encoder s compression ratio is much greater, but both of these compressions causes loss in the data. This loss in data may cramp the important part of medical image. So to get rid from this problem, a better compression technique is needed which provide a better compression ratio by taking care of the important part (ROI) of the medical images.

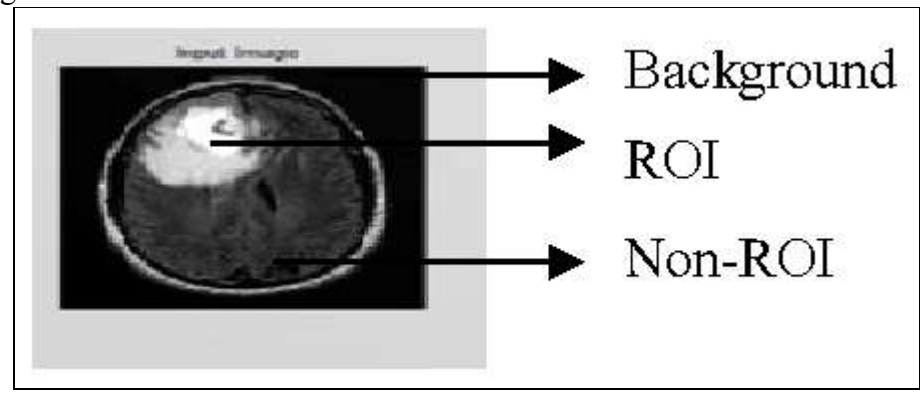

Fig 2: different parts of MRI Image

We will apply the lossless compression for ROI region by using Integer Wavelet Transform and apply lossy compression to non ROI part by using SPIHT algorithm. After that we will combined both the images that will be the compressed image. The compressed image will be transmitted through the transmission channel. At the receiver the image will be received and the original image will be extracted by doing decompression. The output image is the image

with lossless ROI.

Set Partitioning In Hierarchical Trees (SPIHT): In a wavelet-based still image coding algorithm known as set partitioning in hierarchical trees (SPIHT) is developed that generates a continuously scalable bit stream. This means that a single encoded bit stream can be used to produce images at various bit-rates and quality, without any drop in compression. The decoder simply stops decoding when a target rate or reconstruction quality has been reached. In the SPIHT algorithm, the image is first decomposed into a number of sub bands using hierarchical wavelet decomposition. The sub bands obtained for two-level decomposition are shown in Fig 2. The sub band coefficients are then grouped into sets known as spatial-orientation trees, which efficiently exploit the correlation between the frequency bands. The coefficients in each spatial orientation tree are then progressively coded bit-plane by biplane, starting with the coefficients with highest magnitude and at the lowest pyramid levels. Arithmetic coding can also be used to give further compression. In general, increasing the number of levels gives better compression although the improvement becomes negligible beyond 5 levels. In practice the number of possible levels can be limited by the image dimensions since the wavelet decomposition can only be applied to images with even dimensions. The use of arithmetic coding only results in a slight improvement for a 5 level decomposition. The embedded zero tree wavelet (EZW) coding was first introduced by J.M. Shapiro and has since become a much studied topic in image coding. The EZW coding technique is a fairly simple and efficient technique for compressing the information in an image. Our focus in this project is to analyze the Set Partition in Hierarchical Tree algorithm in the EZW technique and to obtain observations by implementing the structure and testing it.

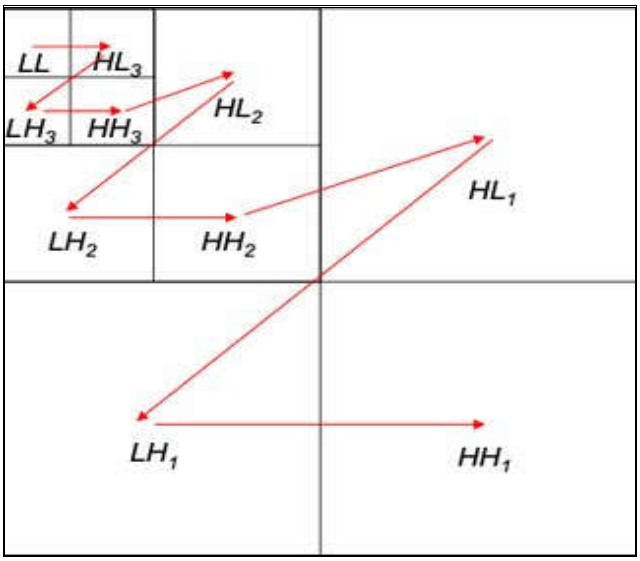

Fig 3: Two-level wavelet decomposition with orientation tree

In order to compress a binary file, some prior information must be known about the properties and structure of the file in order to exploit the abnormalities and assume the consistencies. The information that we know about the image file that is produced from wavelet transformation is that it can be represented in a binary tree format with the root of the tree having a much larger probably of containing a greater pixel magnitude level than that of the branches of the root. The algorithm that takes advantage of this information is the Set Partition in Hierarchical Tree (SPIHT) algorithm.

Approach: Mat lab offers a set of wavelet tools to be able to produce an image with the needed properties. The concept of wavelet transformation was not our focus in this project but in order to understand how the SPHT algorithm works; the properties of wavelet transformation would need to be identified. Matlab was able to create adequate testing pictures for this project. To adequately comprehend the advantages of the SPHT algorithm, a top level understanding will be needed to identify its characteristics and differences from other algorithms.

Set Partitioning Algorithm: The SPIHT algorithm is unique in that it does not directly transmit the contents of the sets, the pixel values, or the pixel coordinates. What it does transmit is the decisions made in each step of the progression of the trees that define the structure of the image. Because only decisions are being transmitted, the pixel value is defined by what points the decisions are made and their outcomes, while the coordinates of the pixels are defined by which tree and what part of that tree the decision is being made on. The advantage to this is that the decoder can have an identical algorithm to be able to identify with each of the decisions and create identical sets along with the encoder. The part of the SPIHT that designates the pixel values is the comparison of each pixel value to $2^n \leq |c_{i,j}| < 2^{n+1}$ with each pass of the algorithm having a decreasing value of "n". In this way, the decoding algorithm will not need to passed the pixel values of the sets but can get that bit value from a single value of n per bit depth level. This is also the way in which the magnitude of the compression can be controlled. By having an adequate number for n, there will be many loops of information being passed but the error will be small, and likewise if n is small, the more variation in pixel value will be tolerated for a given signal pixel value. A pixel value that is $2^n \leq |c_{i,j}|$ is said to be significant for that pass. By sorting through the pixel values, certain coordinates can be tagged at "significant" or "insignificant" and then set into partitions of sets. The trouble with traversing through all pixel values multiple times to decide on the contents of each set is an idea that is inefficient and would take a large amount of time.

Therefore the SPIHT algorithm is able to make judgments by simulating a tree sort and by being able to only traverse into the tree as much as needed on each pass. This works exceptionally well because the wavelet transform produces an image with properties that this algorithm can take advantage of. This "tree" can be defined as having the root at the very upper left most pixel values and extending down into the image with each node having four (2 x 2 pixel group) of spring nodes. The SPIHT method is not an extension from the traditional methods of image compression, and it represents an important advance in the field. The SPIHT (set partitioning in hierarchical trees) is an efficient image coding method using the wavelet transform. Recently, image-coding using the wavelet transform has attracted great attention.

Among the many coding algorithms, the embedded zero. Tree wavelet coding by Shapiro and its improved version, the set partitioning in hierarchical trees (SPIHT) by Said and Pearlman have been very successful. Compared with JPEG which is the current standard for still image compression, the EZW and the SPIHT methods are more efficient and are able to reduce the blocking artifact. The method provides the following which requires special attention:

- Good image quality and high PSNR especially for the color images
- It is optimized for progressive image transmission
- Produces a fully embedded coded file

- Simple quantization algorithm
- Can be used for lossless compression
- Can code to exact bit rate or distortion
- Fast coding/decoding (nearly symmetric)
- Has wide applications, completely adaptive

Generally, different compression methods were developed that has at least one of the following properties but SPIHT really is outstanding since it has all those qualities simultaneously.
To make it simple, the following sets of coordinates are defined.

1) (i, j): set of coordinates of all offspring of node (i,j);

2) D (i, j): set of coordinates of all descendants of the node (i,j);

3) H: set of coordinates of all spatial orientation tree roots (nodes in the highest Pyramid level);

4) L (i, j) =D (i, j)-O (i, j).
Thus, except at the highest and lowest levels, we have
O (i, j) = (2i, 2j), (2i, 2j+1), (2i+1, 2j), (2i+1,2j+1)

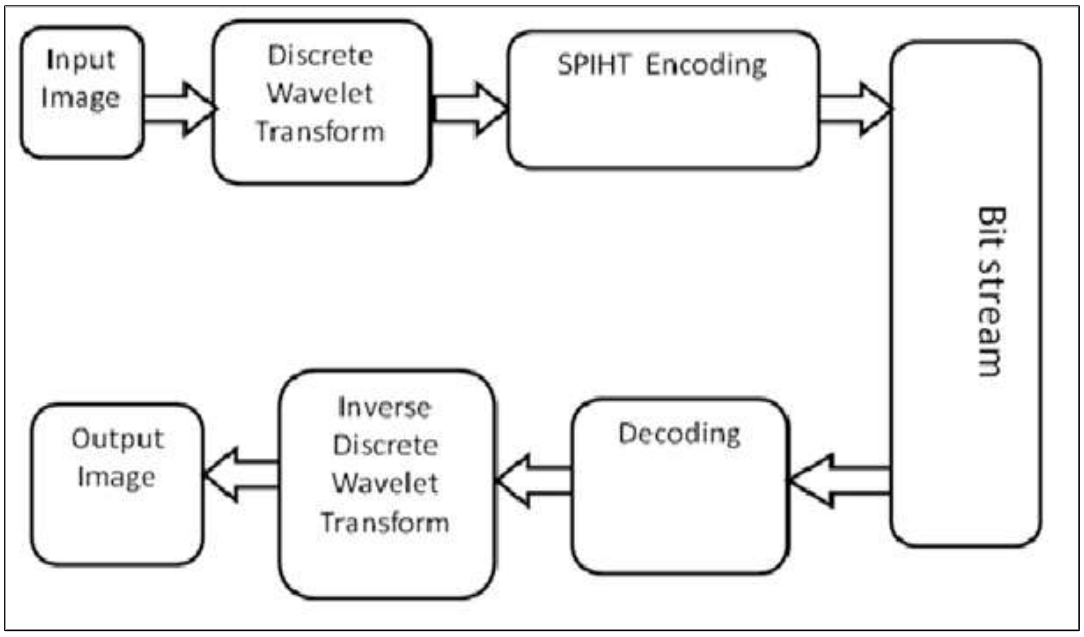

Fig 4 proposed block diagram for DWT-SPIHT encoding and decoding

RESULTS: In this paper we are showing of brain tumour extraction from the MRI scan images using matlab.

Input MRI Image For Detecting Tumour: The input image is MRI scanned image and which is in JPEG format ,here the tumour is detecting using matlab software.

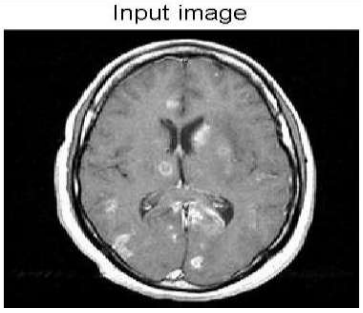

Fig 5.1 Input image

Converting Input Image into Gray Scale Image: Generally gray scale images are preferred in the image-processing .Therefore the given input image was converting into the gray scale image.

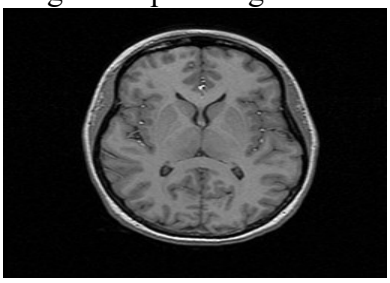

Fig 5.2 Gray scale image

Applying High Pass Filter: The gray scale image was given as input to the High pass filter for the sharpening the image .For the increasing the contrast of the image.

Fig 5.3 High pass filter image

Medain Filter Image: The image from high pass filter was given to median filter for noise removal in the image. The output image from the median filter is below

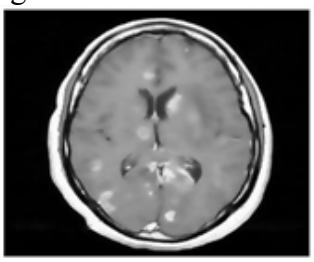

Fig 5.4 Median filter image

Tumour Detecting Using Bounding Box: The image from the median filter is given as input to the bounding box technology in the image Tumour in the brain image was decting using bounding box technology. The output image was below

Fig 5.5 Bounding box detecting

Threshold Segmentation of Image: The output image from bounding box under goes to threshold segmentation the image was

Fig 5.6 Threshold segmentation image

Watershed Segmentation of Image: After thresholding the image undergoes watershed segmentation. The output image was below

Fig 5.7 Watershed segmentation image

Output of Tumour Detection Using Mat lab: In this process tumour detects by bounding box technology, the output is executed by using matlab code. The tumour was detected using gray scale convesion,high pass filter,median filter,threshold segmentation ,watershed segmentation,morphological operation

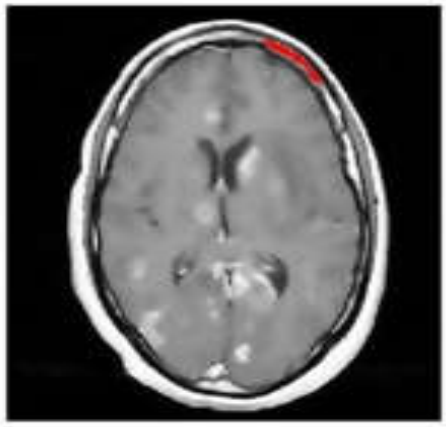

Fig 5.8 Tumor detected image

Conclusions: Every image contains some redundant information, which needs to be identified by the user to obtain compression. The floating point representation of the DWT gives small error in the system. The IWT is recommended for critical medical application because of its perfect reconstruction property. ROI-based compression is providing better results as compared with lossless methods, along with preservation of diagnostically important information. We have concluded that ROI based image compression is the best one. By this analysis we make sure that the compressed image will be helpful in telemedicine. After this compression we can send the medical image through mobile. In near future, a database can be created for different patients having different types of brain tumours and locate them. Tumour growth can be analysed by plotting graph which can be obtained by studying sequential images of tumour affect. Possible extension of the presented work could use more features. It would be beneficial to connect the system to cloud storage of patient's information in hospital. If this application is developed to analyse all types of MRI scans of same patient and result of all scans are integrated, it can suggest appropriate treatment and medication.

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