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Histogram Analysis of Human Brain to check the Carcinogenic Abnormalities in Spatial Domain

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Abstract - This paper discusses the carcinogenic abnormalities of human brain with the help of MRI images by histogram analysis. Human brain is a very important organ of the human body and need precise imaging. Magnetic Resonance Imaging (MRI) is one of the methodologies to obtain quality images. We have developed a data set of histograms for normal and abnormal images of human brain in time domain. We have marked the abnormal region area the histogram. This paper further leads to the mathematical representation in spectral domain

***Index Terms* – Carcinogen, Histogram, Human brain, Magnetic resonance imaging, Time domain,**

I. INTRODUCTION

MRI is short form of Magnetic Resonance Imaging. It is a procedure used in hospitals to scan patients and determine the severity of certain injuries. An MRI machine uses a magnetic field and radio waves to create detailed images of the body. [2]

Magnetic resonance imaging (MRI) of the brain is a safe and painless test that uses a magnetic field and radio waves to produce detailed images of the brain and the brain stem. An MRI differs from a CAT scan (computed axial tomography scan) because it does not use radiation. MRI can detect a variety of conditions of the brain such as cysts, tumours, bleeding, swelling, developmental and structural abnormalities, infections, inflammatory conditions, or problems with the blood vessels. It can determine if a shunt is working and detect damage to the brain caused by an injury or a stroke. MRI of the brain can be useful in evaluating problems such as persistent headaches, dizziness, weakness, and blurry vision or seizures, and it can help to detect certain chronic diseases of the Nervous system such as multiple sclerosis in some cases, MRI can provide clear images of parts of the brain that can't be seen as well with an X-ray, CAT scan, or ultrasound, making it particularly valuable for diagnosing problems with the pituitary gland and brain stem. [6]

Most MRI machines look like a long tube, with a large magnet present in the circular area. When beginning the process of taking an MRI, the patient is laid down on a table. Then depending on where the MRI needs to be taken, slides a coil to the specific area being imaged. The coil is the part of the machine that receives the MR signal. A strong magnetic field is created by passing an electric current through the wire loops. While this is happening, other coils in the magnet send and receive radio waves. This triggers protons in the body to align them. Once aligned, radio waves are absorbed by the protons, which stimulate spinning. Energy is released after "exciting" the molecules, which in turn emits energy signals that are picked up by the coil. This information is then sent to a computer which processes all the signals and generates it into an image. The final image is a 3-D image representation of the area being examined. [5]

Imaging plays an integral role in intracranial brain tumour management. Magnetic resonance (MR) imaging in particular has emerged as the imaging modality most frequently used to evaluate intracranial brain tumours, and it continues to have an ever-expanding, multifaceted role. In general, the role of MR imaging in the workup of intra axial tumours can be broadly divided into tumour diagnosis and classification, treatment planning, and post treatment surveillance. [4]

II. EXPERIMENTAL WORK

To perform the result in Time domain first we have taken the MRI Images of human Brain in Normal and abnormal condition. This is shown in below fig.1 (a) and fig.1 (e). Then using mat lab (metrics Laboratory)

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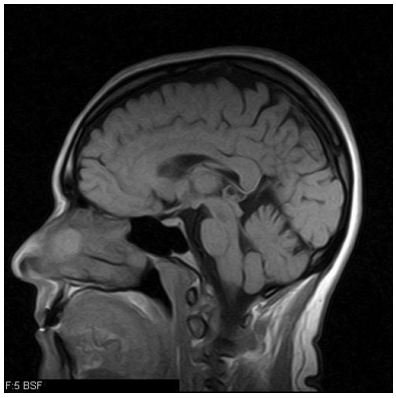
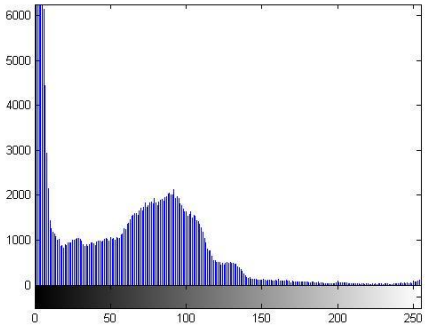
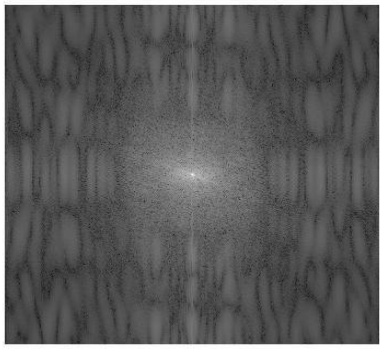
codding has done histogram of Normal and Abnormal MRI Images which is shown in fig.1 (b) and (f) as well as Fourier Spectrum and their histogram graph shown in fig. (c), (d), (g) and (h). Similarly, we have taken the abnormal image 2 and abnormal image3 to check the abnormality level by using histogram analysis. The abnormal region has marked by circle which is very useful to analyse the various types of diseases in human brain.



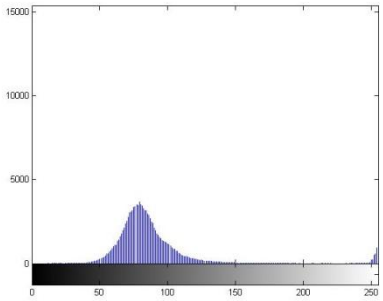
(a) Normal 1 Image



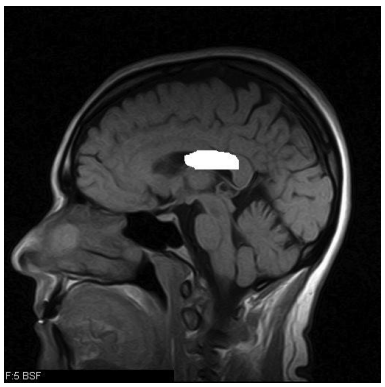
(b) Normal 1 Histogram



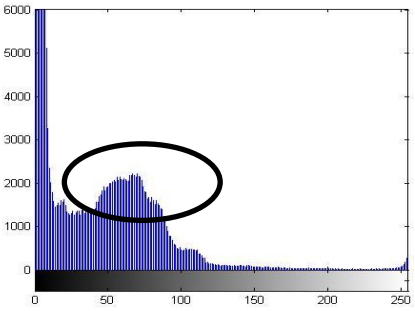
(c) Normal 1 Fourier Spectrum



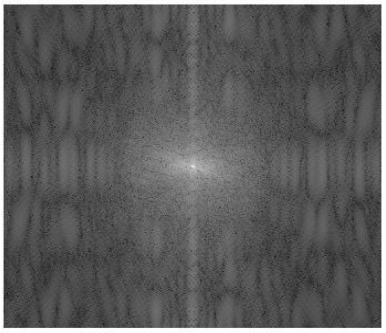
(d) Normal 1 Fourier Histogram



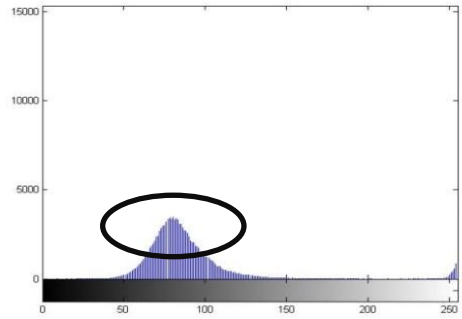
(e) Abnormal 1 Image



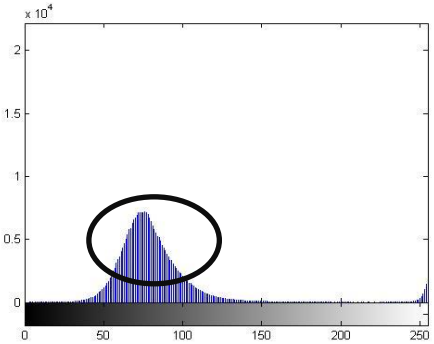
(f) Abnormal 1 Histogram



(g) Abnormal 1 Fourier Spectrum

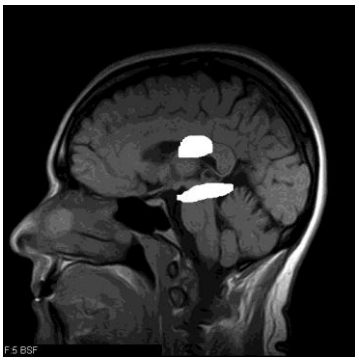


(h) Abnormal 1 Fourier Histogram

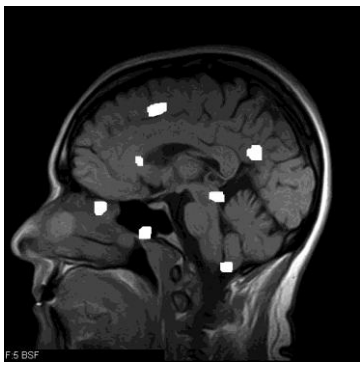


Abnormal 2 Fourier Histogram

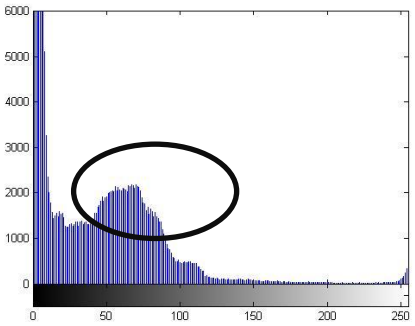
Fig.1-MRI Images of human brain in Normal and Abnormal Condition and their Histogram and Fourier Spectrum



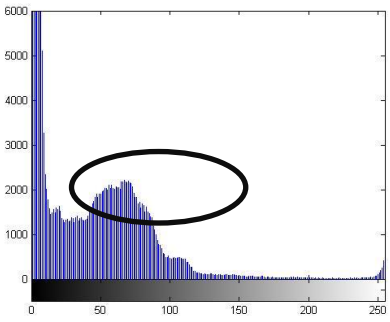
Abnormal Image 3



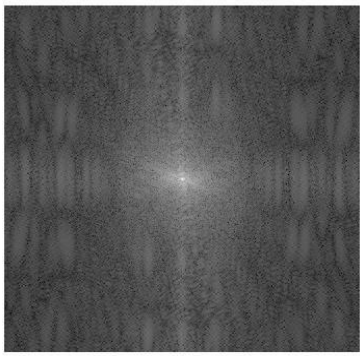
Abnormal Image 2



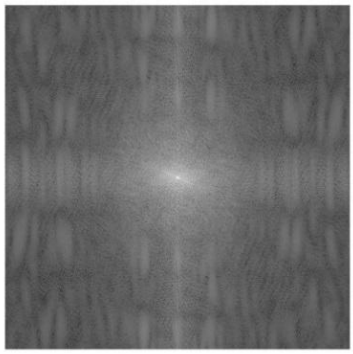
Abnormal 3 histogram



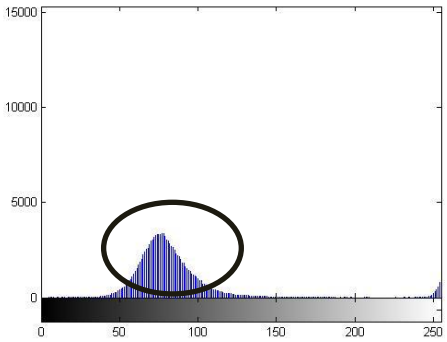
Abnormal 2 Histogram



Abnormal 3 Fourier Spectrum



Abnormal 2 Fourier Spectrum



Abnormal 3 Fourier Histogram

Fig.2-MRI Images of human brain in various Abnormal Conditions their Histogram and Fourier Spectrum's histogram

III. GENERATION OF HISTOGRAM

To obtain the Histogram and Fourier spectrum of normal and abnormal MRI Images of human brain as shown in above fig.1 & fig.2 we used Mat Lab codding and gated the histogram in Time domain.

We used this Mat lab codding for Normal MRI Image histogram and spectrum

```
>> f = imread('img1normal.jpg');

>> imshow(f);

>>imhist(f);

>> F = fft2(f);

>> S = abs(F);

>> imshow(S, [])

>> Fe = fftshift(F);

>> imshow(abs(Fe), [ ])

>> S2 = log(1 + abs(Fe));
```

For Abnormal MRI Image histogram and spectrum

```
>> j = imread('img1abnormal.jpg');

>> imshow(j);

>>imhist(j);

>> F = fft2(j);

>> S = abs(F);

>> imshow(S, [])

>> Fe = fftshift(F);

>> imshow(abs(Fe), [ ])

>> S2 = log(1 + abs(Fe));
```

IV. RESULTS

We have analysed the histogram for the three location disturbances in human brain and computed with the normal histogram. The region of abnormality has shown in abnormal histogram this doesn't show the location on spatial domain but give inference in histogram only by the virtue of which we can develop a mathematical function in frequency or spectral domain

V. DISCUSSION

The main Aim of this paper was to obtain the histogram and Fourier Spectrum for normal and abnormal MRI images of Brain. And we have done this analysis by using of histogram. These results are very useful for Physician to overcome the abnormality level by using regular therapy and proportionate medicine to the patient.

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