

Detection and Identification of Abnormalities of Kidney Using Histogram in Spatial Domain

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Abstract-This page discusses the abnormalities of human kidney with the help of (MRI) Magnetic resonance images by histogram analysis. Kidney is a very important organ of human body and need precise imaging. MRI is one of the tool methodologies to obtain quality images. We have development a data set of histogram for normal and abnormal images of kidney. In time domain we have marked the abnormal region ones the histogram. This paper the further leads to the mathematical representation in the spectral domain.

Key-words -Spatial domain, Human kidney, Magnetic resonance imaging, Histogram graph.

I. INTRODUCTION

Magnetic resonance imaging (MRI) is based on the absorption and emission of energy in radio frequency range of the electromagnetic spectrum. Magnetic resonance imaging (MRI) is a test that uses a magnetic field and pulses of radio wave energy to make pictures of organs and structures inside the body. In many cases MRI gives different information about structures in the body than can be seen with an X-ray, ultrasound, or computed tomography (CT) scan. MRI also may show problems that cannot be seen with other imaging methods.[1]

For an MRI test, the area of the body being studied is placed inside a special machine that contains a strong magnet. Pictures from an MRI scan are digital images that can be saved and stored on a computer for more study.[2]The role of computed tomography (CT) and magnetic resonance imaging (MRI) in the evaluation of renal abnormalities is ever increasing. The MRI machine is a large cylindrical tube machine that creates a strong magnetic field around the patient. The magnetic field along with a radio frequency after the hydrogen atoms the natural alignment in the body. Computer is then used to form 2D dimensional image of a body structure of organ based on the activity of the hydrogen atoms. Magnetic resonance imaging (MRI) is an imaging technique used primarily in medical settings to produce high quality images of the inside of the human body.[2] MRI is based on the principles of nuclear magnetic resonance (NMR), a spectroscopic technique used by scientists to obtain microscopic chemical and physical information about molecules.

MRI does not use the radiation, as X-RAYS or Computer tomography (CT scan). Magnetic fields create and pulse of radio waves are sent to scanner. The radio wave knocks the nuclei of the atoms in your body out of their normal position. As the nuclei realign into the proper position, they send to the radio signals. These signals are received by a computer that analyzes and convert them into an image of the part of the body being examined. The image appears on a viewing monitor.[4]

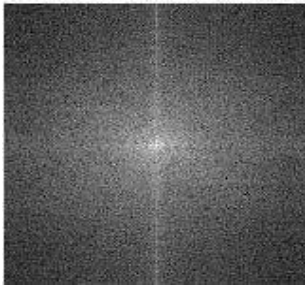
Magnetic resonance imaging (MRI) is done for many reasons. It is used to find problems such as tumors, bleeding, injury, blood vessel diseases, or infection. MRI also may be done to provide more information about a problem seen on an X-ray, ultrasound scan, or CT scan.[5]. Contrast material may be used during MRI to show abnormal tissue more clearly MRI can find problems in the organs and structures in the belly, such as the Liver, Pancreas, **Kidneys**, and Bladder. It is used to find tumors, bleeding, infection, and blockage.

II. EXPERIMENT WORK

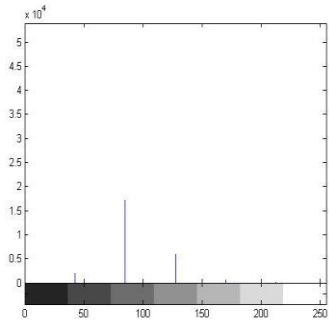
In this experiment we take MRI images of normal kidney and abnormal kidney. And take histogram graph and stem graph of normal images using matlab programming and analysis the graph for various diseases. This is shown in below fig 1(a) and fig1 (b). Then using mat lab (metrics laboratory) coding has done histogram of normal and abnormal MRI images which is shown in figures as well as Fourier spectrum and their histogram graph shown in figure which is very useful to analyses the various types of disease in human kidney.[2]



(a)Normal kidney image 1



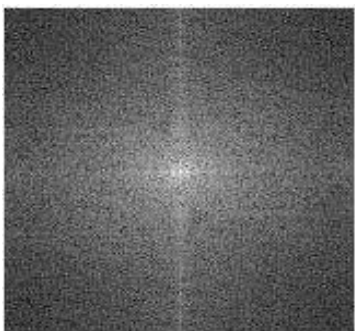
(c)Normal kidney Spectrum visually Enhanced by a log transformation image 1



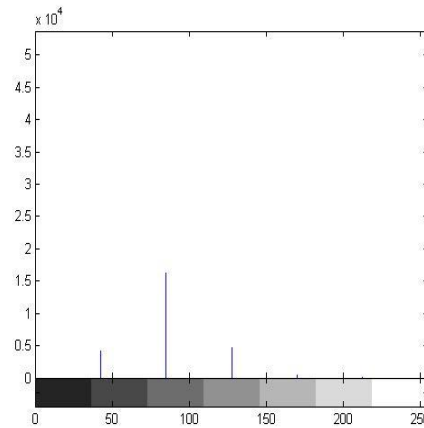
(e) Normal kidney of FFT spectrum log transformation of Histogram graph image1



(b)Abnormal kidney image 1

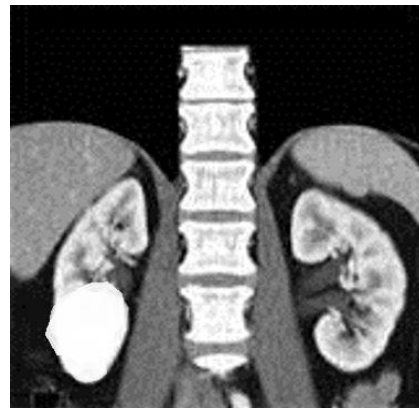


(d)Abnormal kidney Spectrum visually Enhanced by a log transformation image 1

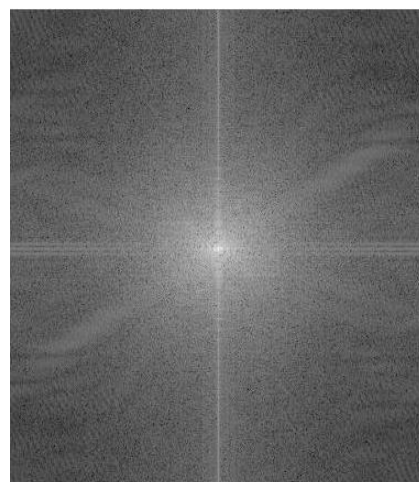


Abnormal kidney1 of FFT spectrum log transformation of Histogram graph image 1

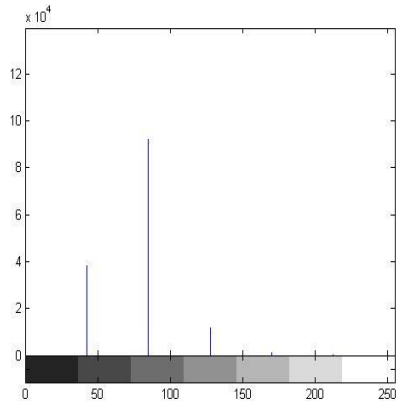
(f)



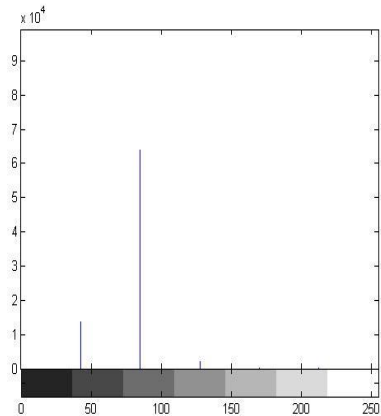
(g)Abnormal kidney image 2



(i)Abnormal kidney Spectrum visually enhanced by a log transformation image 3



(k) Abnormal kidney of FFT spectrum log transformation of Histogram graph image 3



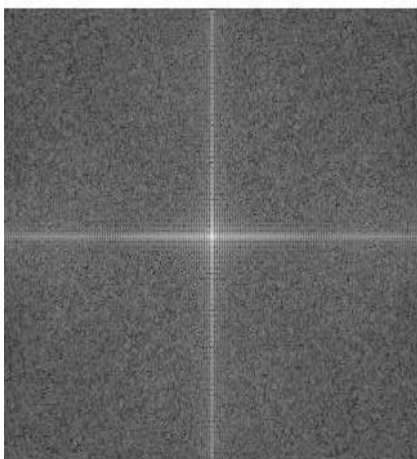
(l)

Abnormal kidney of FFT spectrum log transformation of Histogram graph image 3

Fig1.- MRI Images of human kidney in Normal and various Abnormal Conditions and their Histogram, Stem graph and Fourier Spectrum.
Generation of Histogram



(h) Abnormal kidney image 3



(j) Abnormal kidney Spectrum visually enhanced by a log transformation image 3

In this paper, we have converted the normal and abnormal kidney images the Spectrum visually enhanced by a log transformation by the Fast Fourier Transform (FFT) of the stem graph and histogram into a frequency domain by using the Fast Fourier Transform (FFT) with the help of mat lab program.[3] We used the Fast Fourier Transform or simply, Fourier Transform in Mat Lab and gated the Fourier spectrum.

We used this mat lab coding 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));
```

In this paper, the above figure 1 (e) and (f) the normal and abnormal kidney mat lab are used to help of the log transformation by the FFT of the histogram value as given below

Normal kidney image1 = [.865 .265 .219 .430 .330
.247 .199]*10⁴

Abnormal kidney image2 = [.984 .227 .367 .369
.154 .211 .245]*10⁴

And the above figure1(k) and (l) the abnormal kidney(2) and abnormal kidney(3) MRI images mat lab are used to help of the log transformation by the FFT of the histogram value as given below-

Abnormal kidney image2 = [5.4318, 1.3110,
2.0605, 2.0675, 0.9535, 11.543, 1.3098]*10⁴

Abnormal kidney image3 = [5.4185, 1.3179,
2.0922, 2.1023, 0.9585, 1.1406, 1.2584]*10⁴

In this above result are show the main difference of magnitude of abnormalities level of kidney. This difference in graph shows the magnitude of disease. With the help of this histogram graph Physician and Surgeon are choosing optimal treatment modality until the abnormal value exact equals the normal. Due to this side effect of medicine can be overcome.

III. RESULT

We analyzed the histogram for free location disturbances in human kidney and compared with the normal histogram. The region of abnormality has shown in abnormal histogram this doesn't show the location on spatial domain but give interference in histogram only by virtue of which can develop a mathematical function in frequency or spatial domain.

IV. DISCUSSION

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

REFERENCE

- [1] Rafeal C Gonzalez, Richard E. Woods, SteevenL.Eddins "Digital Image Processing Using Matlab" Second Edition 2009.
- [2] A. P. Guimaraes, I. S. Oliveira," Magnetism and Magnetic Resonance in Solids" John Willey & sons, INC. NewYork.
- [3] S. Salivahanan, A. vallavaraj, C. Gnanapriya "Digital Signal Processing" Tata McGraw-Hill Publishing Company Limited.
- [4] M. A. Bernstein, F. K. King, and p. X J Zhou, Handbook of "MRI pulse sequences" Burlington, MA: Elsevier Academic Press, 2004.
- [5] E. M. Haacke, R. W. Brown, M. R. Thompson, and R. Venkatesan, "Magnetic Resonance Imaging.

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