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"Resolution Improvement by Generalized Wavelet Thresholding for Set Of 2d Ct Scan Image"

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Abstract:-DICOM image is formed from set of a projections that is sinogram. Due to the intersection of one or more projections radon transform and iradon transform does not obey bijective function. Hence information at this intersection is lost. This issue is removed by a partially fixed the radon transform. Information lost can be gained but it will add noise. Further various combinations wavelet and thresholding approach is applied for DICOM images of different parts of the body. And maximum signal to noise ratio obtained from suitable combinations wavelet and thresholding the method.

Keywords:-*Radon Transform, wavelet thresholding, DICOM image.*

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1. INTRODUCTION

CT scan imaging is popular and plays a unique role in clinical diagnosis and treatment because it is a noninvasive and real-time. Now -a- days diseases like cancer need to be diagnosis at only early stage. So there is need for high resolution image to analyze 2D CT scan image. Approach satisfaction of bijective function using generalization suitable of wavelet and its proper thresholding method is targeted to improve resolution of image 2D DICOM image.

DICOM image is formed from set of projection that is sinogram. Major issue is radon transform and inverse radon transform as pair of function does not satisfy bijictive function. This leads to loss of information while constructing image from sinogram obtained from CT scan machine. This artifact is removed by using partially "fixed" the radon transforms [1]. The displacement of the off centered distance of the projections is made to shift by appropriate angle. By doing this information will not get lost but it add noise.

Analysis is done for DICOM Images of Face, Skull and Throat obtained from Sion Hospital, Mumbai. Radon transform of these images taken to obtain sinogram which is collection of projections. This projection represents column of radon transformed matrix. Signal to Noise ratio for set of projections of respective DICOM images for harr, daubechies , coiflets , biorthogonal , symlets and morlet is then obtained from Wavelet toolbox-Mutisignal Analysis from MATLAB . Signal to noise ratio(SNR) obtained for each column(that is for each projection) using maximum level of decomposition and fixed form thresholding technique . These set of projections are then imported in Matlab workspace. Then maximum mean signal to noise ratio is calculated among all wavelet used .From wavelet which got maximum SNR is analyzed by using different thresholding techniques that is fixed form thresholding, Rigorous SURE, Heuristic SURE, Minimax, Penalize high, Penalize medium.

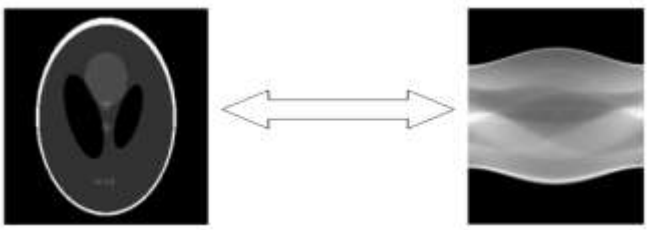

Figure 1 :Image and its radon transform

The maximum of Mean SNRs which is calculated using various wavelets and thresholding techniques for DICOM image is the different. And we could get one perfect combination of wavelet and thresholding techniques which will have highest SNR and will be dynamically chosen for different part of body.

2. BIJECTIVE FUNCTION FOR RADON – IRADON TRANSFORMS FUNCTION

A bijection, or a bijective capacity, is a capacity f from a set X to a set Y with the property that, for each y in Y, there is precisely one x in X such that f(x) = y. It takes after from this definition that no unmapped component exists in either X or Y.

On the other hand, f is bijective in the event that it is a coordinated correspondence between those sets; i.e., both balanced (injective) and onto (surjective).

The arrangement of all bijections from X to Y is meant as X ↔ Y. (Once in a while this documentation is saved for twofold relations, and bijections are meant by X ⤖ Y rather.) Occasionally, the arrangement of changes of a solitary set X might be indicated X!.

3. ISSUE OF RADON-IRADON BIJECTIVE FUNCTION:

Each radon and converse radon change ought to need to go about as bijection capacity. Here radon change makes soinogram and on the off chance that we take its reverse radon change we ought to get unique picture. This shows radon and Iradon change fulfills bijection. Figure 1 demonstrates DICOM picture and its radon change.

Gives us a chance to take picture of green squared at corner. Radon change of this picture at specific edge comprises of

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group of sinogram that is numerous sines like waveform (projections) covering with each other. At this circumstance in the event that we take converse radon change it will give blunder in from of jumbling or not obeying Bijective Function.

On the off chance that we take radon change of DICOM picture then it doesn't fulfills Bijective Function. Figure 3.1 shows Original picture, Radon change and reverse radon change with bijection fall flat. For picture green squared at corner can be watch that when the measurement of A will be a different of 2, pixel data is lost.

In figure 2 from Left to Right demonstrates a unique picture green, then its MATLAB's radon change (sinogram), then its MATLAB's backwards radon change reed (otherwise known as iradon), then the position examination between the first and reproduced, non-coordinating pixel position: separate hues.

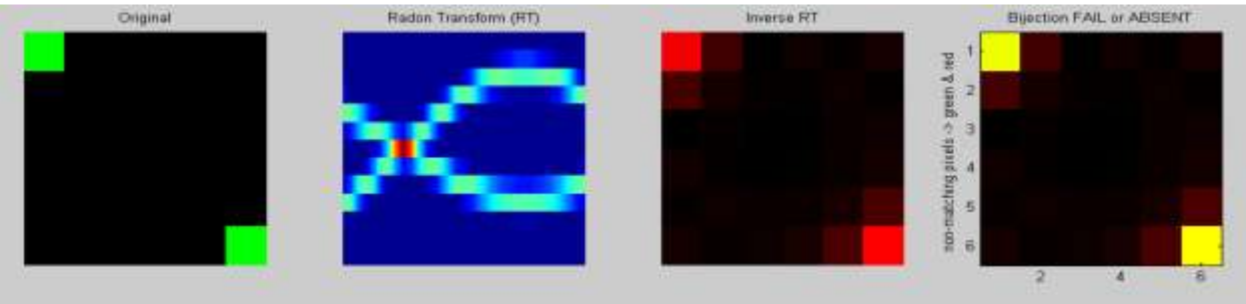

Figure 2 : Original image, Radon transform and inverse radon transform with bijection fail

4. PARTIALLY "FIXED" THE RT

Partially "fixed" the RT of the image so IRT would interpret the positions of the back projections in the proper place. Partially because changed all projection values to a new (better) relative distance for iradon to interpret, which here is enough to show the radon-iradon reconstruction issue. The cross-like pattern surrounding the main FIXED reconstructed pixel because the precise fixed potbp should follow a sinusoidal shifting pattern , thus it would give no cross-like pattern.

Figure 3 form left to right Shows my manually modified sinogram, then its MATLAB's iradon reed, then the position comparison between the original and reconstructed, MATCHING pixel position: GREEN+RED=YELLOW. This indicates that information lost is recovered but it will add noise. To remove this noise generalization of suitable wavelet and its thresholding technique need to generalized in order to remove maximum noise.

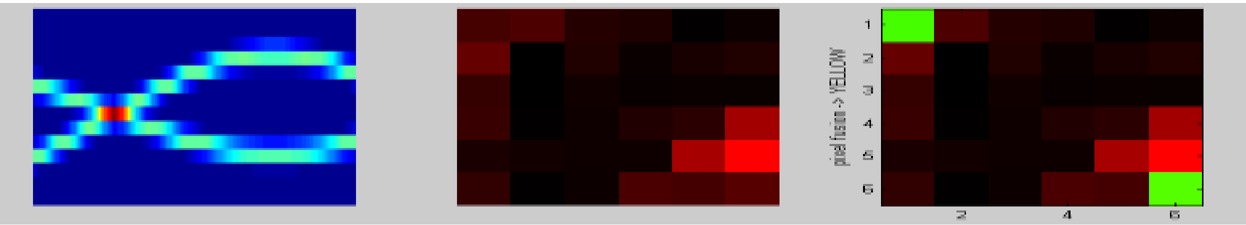

Figure 3: Original image, Radon transform and inverse radon transform with bijection improvement

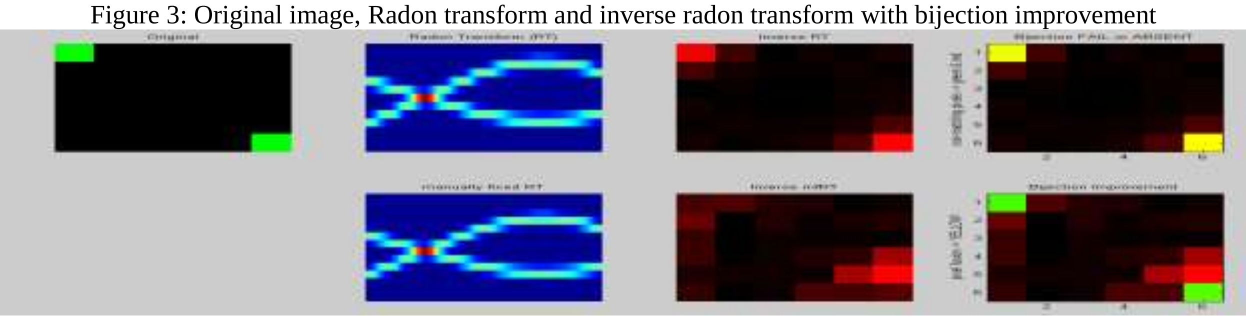

Figure 4:Comparision Original image, Radon transform and inverse radon transform with bijection fail or absent and bijection improvement

5. WAVELET THRESHOLD FIXATION APPROCH

At each projection that is every angle from 0 to 180 degree. The collection of projection now represent matrix such that each column represents one single projection at given set of angle.This matrix of set of projections then imported in Mutlisignal Analysis of Wavelet Toolbox of Matlab and analysis is done columnwise . All Harr, Daubechies, Coiflets , Biorthogonal, Symlets and Morlet wavelet has applied for set of projection of DICOM Images of Face, Skull And Throat obtained from Sion Hospital ,Mumbai. All analysis is done for level 6,fixed soft form thresholding. It can observed from figure 5 that signal to noise ratio (SNR) is for each column (that is for each projection) using level of

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decomposition 6 and threshold technique fixed is different. Maximum mean signal to noise ratio is then calculated among all wavelet used.

Wavelet which has got maximum mean of signal to noise ratio is kept constant and different thresholding techniques are varied. In figure 6 it can be seen that mean maximum signal to noise ratio is different for different thresholding method.

If considered other part's DICOM image then get different combination of wavelet thresholding method which give maximum signal to noise ratio.

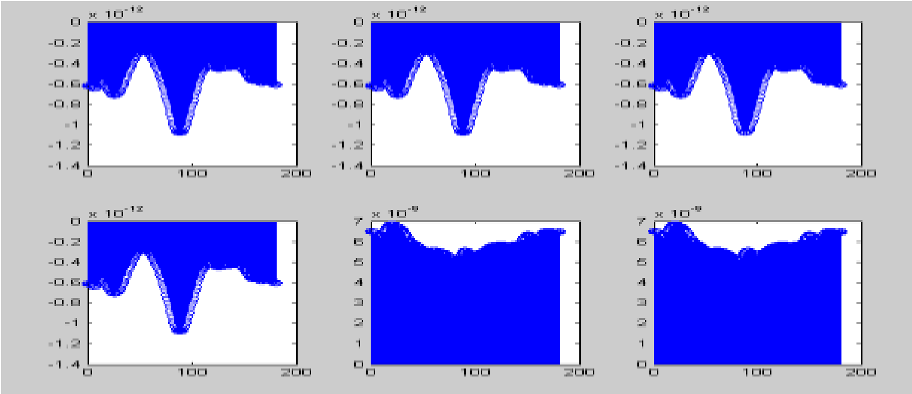

Figure 5 Comparison of different thresholding method for face DICOM image

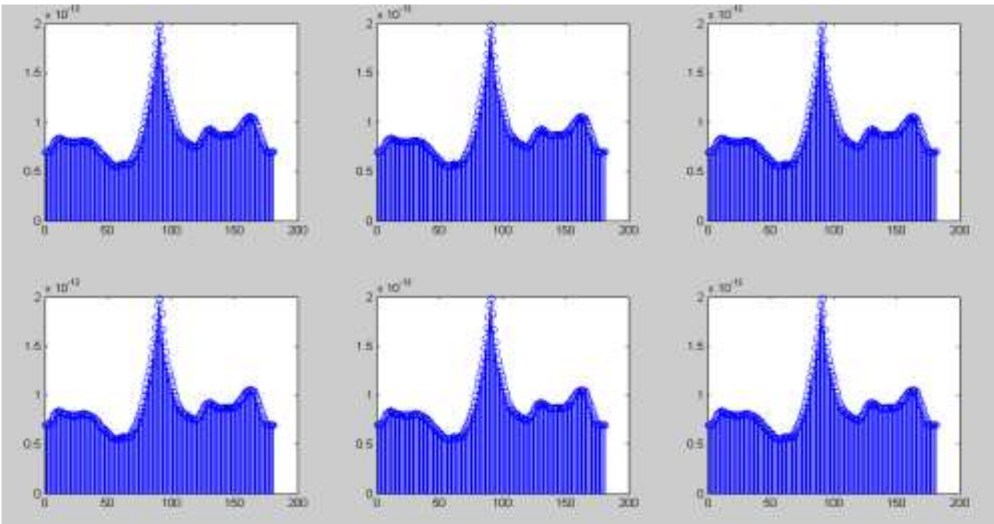

Figure 6: Comparison of different thresholding method for face DICOM image

6. CONCLUSION:

Overlapping point or sometimes area of intersection of two or more sinogram will give of signal give situation of dilemma that which intensity point is belongs to which projection. This leads to major issue for of satisfying bijictive function for radon transform and inverse radon transform as pair of function. This leads to loss of information while conduction of image from sinogram obtained from CT scan machine. This artifact is removed by using partially "fixed" the radon transform. The displacement of the off centred distance of the projections is made to shift by appropriate angle. But it adds extra noise to set of projection. So to remove this noise wavelet generalization has done. For particular part of the body only valid combination of wavelet transform and thresholding method should be use and that is obtained from highest signal to noise ratio for set of projections from wavelet toolbox.

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