distributed noisy image also it does not provide any image enhancement of the reconstructed image.

3. Solution Methodology

This methodology works on noise free phase retrieval from linearly distributed noise of the oversampled diffraction pattern also it improves the retrieved phase by means of image enhancement filters. It also works for the non linearly distributed noise.

For Linearly Distributed Noise

Here an image is selected and (say 20%) poison noise is added linearly to the image and oversampled diffraction pattern of this noisy image is calculated. Now this noisy diffracted image is given as an input to the iterative phase retrieval OSS algorithm. After 1500 or more iterations the result is noise free phase information by which image is reconstructed but due to existence of noise it is now given for image enhancement through different filters where three different filters Inverse Filter, Weiner Filter, Lucy Richardson Filters give individually refined reconstructions. The outputs of all the three reconstructions are compared by means of MSE and PSNR values and a graph is plotted to visualize the reconstructions.

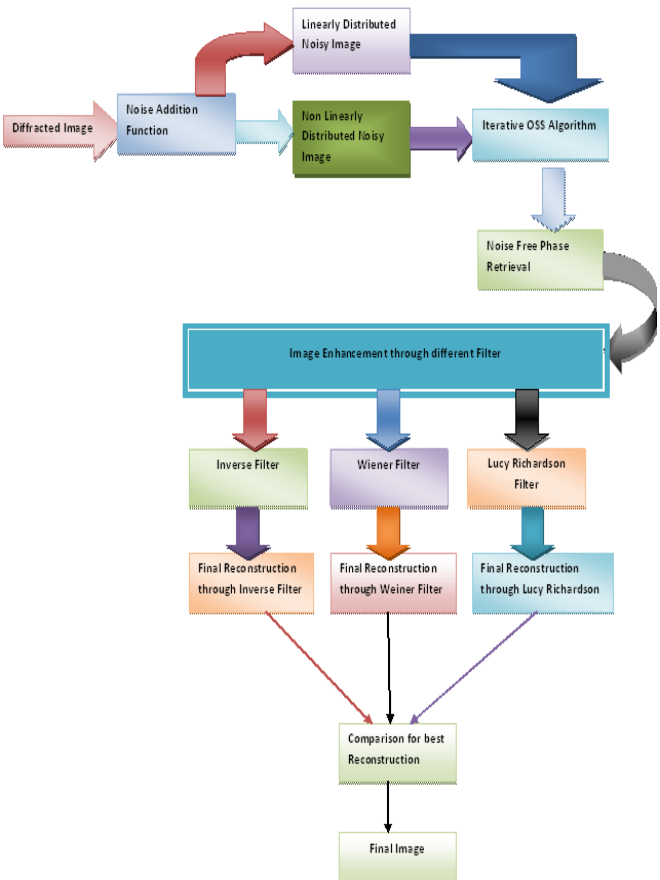

Figure 1: Process Flow Diagram

For Non-Linearly Distributed Noise

Image is selected and poison noise (say 20%) is added Non-linearly to the selected part of image now diffraction pattern of this noisy image is calculated. This noisy diffracted image is given as an input to the iterative OSS algorithm. After 1500 or more iterations the result is noise free phase information by which image is reconstructed but due to existence of noise it is now given for image enhancement through different filters where three different filters Inverse Filter, Weiner Filter, Lucy Richardson Filters give individually refined reconstructions. The outputs of all the three reconstructions are compared by means of MSE and PSNR values and a graph is plotted to visualize the reconstructions.

4. Result

After analyzing various images for linear and non linear noisy image the experimental values of MSE and PSNR for five sample images shows that the output generated by the inverse filtering gives better reconstruction, while the performance of other two wiener filters and Lucy Richardson filter gives near about reconstruction.

For Linear Noise						
Filter	Image Samples					
		1	2	3	4	5
Inverse	PSNR	54.9589	58.1579	56.1473	55.4831	53.3751
	MSE	0.20398	0.1003	0.15913	0.18543	0.30128
Weiner	PSNR	55.069	58.0997	55.4179	55.6163	53.30202
	MSE	0.20398	0.10151	0.18823	0.17983	0.30511
Lucy Richard	PSNR	54.7542	57.8144	55.932	55.7949	53.2388
	MSE	0.21931	0.1084	0.16722	0.17258	0.31088

The Graph shows the comparison of the performance of all the image enhancement filters. Comparison is done on the basis of the values of the MSE and PSNR of the individual filters.

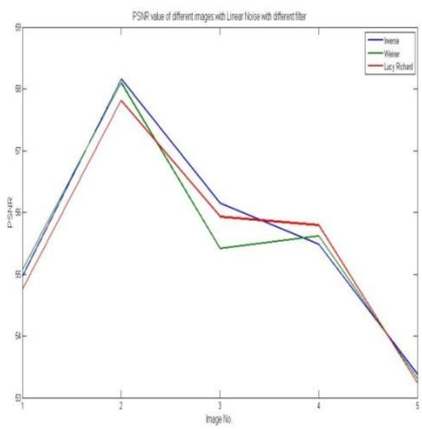

Figure 2: For Linear Distributed Noise the PSNR high for inverse filter

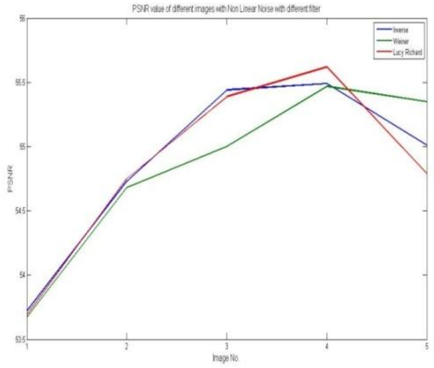

Figure 3: For linearly distributed MSE Least for Inverse filter

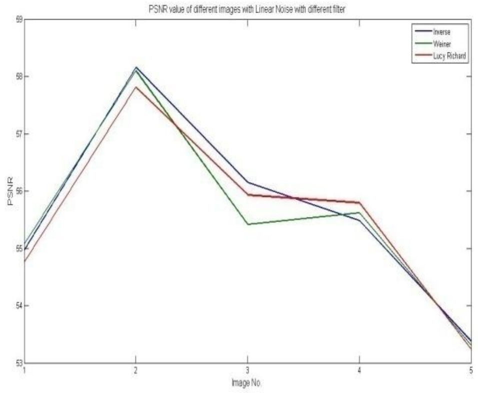

Figure 4: High PSNR for non-linearly distributed noise Inverse filter

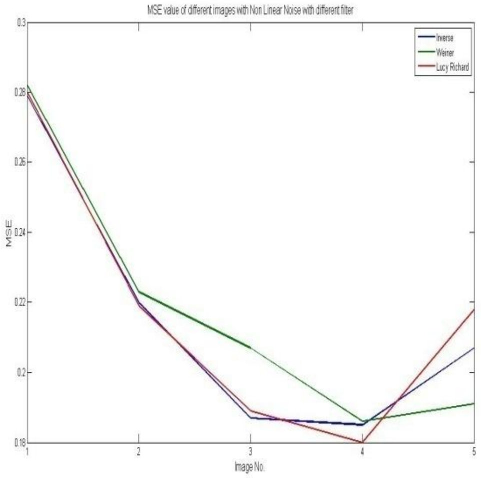

Figure 5: 4 Least MSE for inverse filter

For Non Linear Noise						
Filter		Image Samples				
		1	2	3	4	5
Inverse	PSNR	53.72	54.73	55.44	55.49	55.01
	MSE	0.279	0.22	0.187	0.185	0.207
Weiner	PSNR	53.67	54.68	55	55.47	55.35
	MSE	0.282	0.223	0.207	0.186	0.191
Lucy Richard	PSNR	53.69	54.75	55.39	55.62	54.79
	MSE	0.28	0.219	0.189	0.18	0.218

5. Conclusion

By applying iterative phase retrieval algorithms we cannot retrieve the actual phase of the signal (image) due to presence of noise but the retrieved phase is partial reconstruction of the input image along with noise. This noisy image can be enhanced by applying filtering technique by using filters. Here three filters are used to enhance the image they are Inverse filter, Wiener Filter, Lucy Richardson filter. Individually all the three filters process the image for enhancement and the output of all the three are compared for better reconstruction. By experimenting on different images for linearly /Non linearly distributed noisy diffracted image using Oss algorithm with image enhancement with different filters i.e. Inverse, Wiener, Lucy Richardson. Inverse filter gives better reconstruction then other two filters.

This work can be extended further by amalgamation of other phase retrieval algorithms and filtering techniques. This approach can be extended by applying on some specific images like medical images, satellite images, and biological images and under water images. Performance of this system can also be extended by using more number of image enhancement filters like Median Filter, Highpass Filter, and Lowpass Filter, etc to check for more consistency, accuracy and better reconstruction.
Present work can also be extended by adding different noise like Gaussian Noise, salt and pepper, Shot Noise, Anisotropic Noise etc

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