The ouput signal from the scanner is recorded on one of 4 channels of a magnetic recording tape through an ordinary count rate meter with a short time constant. X and Y signals representing the detector position are obtained by two herical potentiometers, and these signals are also recorded on another channel after being mixed. The recorded count signal is reproduced for enhancement using the operational count rate-meter with suitable parameters so as to have a frequency response of under-damping. The output of the operational count rate-meter is recorded again on one of the other channels while the above processing is done.

The disadvantage in this enhancement is that the impulse response of the enhancer is not symmetric. This asymmetric response can be avoided by using the serial bi-directional enhancing technique. To realize this, the same processing as the first one is carried out again about the one way processed signal but in the reverse direction. Finally the enhanced RI image is obtained on the X-Y recorder as a bird's-eye view by the bi-directionally processed signal and the X-Y signal.

Basic experiments using this system have been carried out with a line source, a filiform source and a thyroid phantom of ^{131}I. It has been found that the spatial resolution of the response (FWHM) for the line source can be improved by about 20% with overshoot less than 20%.

A Mathematical Consideration of Radioisotope Scan Image Processing Least Square Deconvolution Method

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Since "differential operator method" (Nagai, Fukuda and Iinuma) of deconvolution effectively multiplies image spectra by a complex polynomial in frequency, high frequency noise is very strongly enhanced, and noise smoothing procedures must be chosen to efficiently suppress high frequency noise without counteracting resolution enhancement effects of the deconvolution procedure.

Concerning the signal to noise ratio (S/N) of scan image, through analysis in frequency space has been reported by various workers. On the other hand, mathematical analysis of the average frequency arising from noise has not yet been reported.

In this note, at first this subject was investigated both from theoretical and experimental points of view.

Probability that arbitrary channel is local maximum in stationary Poisson process was proved to converge to one third as average channel count goes to infinity. On the same line of thought, one can calculate the average noise frequency as a function of average channel count. Such data may be useful for estimation of cut-off frequency in Fourier smoothing and optimum filter methods.

Second, maximum likelyhood method of deconvolution of radioistotpe image which is essentially stochastic process was considered.

When non-stationary Poisson process is supposed as image process, conventional discrete convolution equation is derived by the maximum likelyhood method. While, when Gaussian process is supposed, the maximum likelyhood method is equivalent to the least square method from which one can derive normal equation with respect to effective object.

Applying the differential operator method to approximately solve this normal equation, reasonable enhancement of resolution of image obtained by scanning ^{131}I parallel lines source was performed.

This method is practically nothing but application of differential operator method by using twofold moment of collimator response function to matched filtered scan image.

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