diam crystal of scintillation camera is currentry represented as a 64—64 matrix. A symple program was written to correct the inequalities on matrix element of computer.

Uncorrected scan was made with a sheet souce of Tc-99 m and 20,000 hole collimeter and then correction was made with the computer program using previously stored correction facters. The deviation of count on each was corrected from 11% to 1%. Then, many small phantoms of Tc-99m with same activity was set on many areas of camera and scan was made. ROI (region of interest) was selected enough to each small phantoms on 64—64 matrix. The deviation of each ROI was 19.2—12.2%. The correction was made with a correction facters obtained from sheet souce. However the deviation of ROI count 17.4%—9.8%. There is no comparison between sheet souce data and small phantom data. Quantitive studies on small phantom examination were made changing doses, form, size of phantoms, spectrometer window width and correction factors on time. The improvement on correction data was not obtained.

This study suggests that correction of scintillation camera field inequality by computer is unavailable on clinical studies such as renal scan, thyroid scan and so on.

Radioisotope Image Processing with a Digital Filter

Y. Yumoto, Y. Tanaka and K. Kosaka

The First Department of Internal Medicine Okayama University Medical School, Okayama, Japan.

H. Yamamoto and T. Misaki

School of Engineering Okayama University, Okayama, Japan.

M. Kuwabara

Faculty of Engineering, Kyoto University, Ugi, Japan

It is well known that two major cases make the radioisotope image obscure : (1) noise due to statistical fluctuations and (2) blurrig due to finite resolving power of a measuring system. In order to reduce the effect of the deteriorating cases or to enhance the information contained in image, a digital filter using the high speed Hadamard transform of RI image is presented.

The observed image is expressed by the convolution of true radioisotope distributions and the impuls response of instruments.

Then, $g(x, y)=\iint_{-\infty}^{\infty} f(x', y')h(x-x', y-y')\,dx'dy'$

and $g'(x, y)=g(x, y)+e(x, y)$.

Here, $g'(x, y)$ is the observed "digital RI image" under consideration, $f(x, y)$ is the true radioisotope distribution in a two dimmensional plane and $h(x, y)$ is the resolving power of system. For improveing the resolving power of the system, the Hadamard transform of the observed digital image is performed as follow : $[G'(u, v)]=[H(u, v)]\ [g'(u, v)]\ [H$

$(u, v)]$, where $[H(u, v)]$ is the Hadamard matrix of order 64. Here, a weighting operation to $[G'(u, v)]$, is performed, and its result is transformed by means of the inverse Hadamard transformation. As a result, the high frequency components are mederately intensified and can be enhanced the true information in RI image. It was confirmed that this image procedue was useful by applying to RI image of the liver phantome containing plastic cold bolle or liver image of 5 patients with hepatoma. With this method, caluculation time was shorten in comparison with conventional methods for image processing.

RI Data Processing System for Nuclear Medicine (Report 14) Fourier Transform Compartmental Analysis in RI Tracer Kinetics

F. Kajiya, Y. Yamano, M. Horii, Y. Yasumura, H. Inada
Faculty of Engineering, Osaka University

T. Nishimura, K. Kimura
Radiology and Nuclear Medicine, Medical School Osaka University

T. Furukawa, M. Inoue, A. Kitabatake, S. Takasugi, M. Hori, H. Takeda
1 st Department of Internal Medicine, Medical School Osaka University

Compartmental analysis has been in wide practical use for tracer kinetic studies using RI in biological system, because the data of radioactive process may be frequently represented by a linear combination of negative exponentials of the form:

$$f(t)=\sum_{i=1}^{n} Ai\exp(-\lambda i \cdot t)$$

Here, n, Ai and λi represent a number of compartments, the initial size and decay constant of compartment i respectively

In this analysis, these parameters n, Ai and λi have biological or physical significance. To estimate them, peeling method has been widely used among several methods owing to simplicity of the procedure. For automatic analysis by computer, however, it has difficult problems to estimate an accurate straight line on a semilogarithmic plot due to large statistical errors in the tail of a decay curve.

Fourier transform method proposed by Gardner, is insensitive to small random errors. The result of the analysis by this method is shown in the form of a spectral graph in which a number of true peaks indicates that of compartments, and the abscissa value at the center of each peak represents the decay constant λi, while the height of the peak is proportional to $Ai/\lambda i$.

Only a problem of this method is that "error ripples" due to the cutoff of the integral range, often obscure the true peaks. To improve S/N ratio, maximum likelifood method and maximum entropy method were applied to the frequency spectrum analysis.

The experiments using test functions and simulated data showed our method may possess certain advantage over previous methods of analysis and it was found to be useful for practical use.