470

A SCAN METHOD FOR A RING TYPE SPECT SYSTEM.
E.Tanaka and H.Toyama*. National Institute of Radiological Sciences, Chiba and *Tokyo Metropolitan Geriatric Hospital, Tokyo.

A new scan method for a SPECT system having a multi-detector array is proposed. A number of detectors, provided with a focussing collimator each, are arranged on a circular ring, and each detector scans a field of view with parallel translation. The scan mechanism is as follows. The detectors are mounted on a rotating gantry, and the detectors are rotated on the gantry with the same angular speed with the gantry rotation so that the angle of each detector axis is kept constant. The linear sampling interval is determined by the angular step of the rotation. The number of views are equal to the number of detectors in the single scan, but it is easily increased by repeating the scan with appropriate angular shifts of the gantry.

The system has the following advantages: 1)Non-uniform sensitivity of detectors does not produce ring artefacts; 2)Diameter of field of view is variable depending on the object size; 3)Scan speed can be controlled so as to yield uniform statistical accuracy over the field of view, which results in saving of scan time for a given statistical accuracy; 4)Fine linear sampling is easily obtained with a simple scan mechnism; and 5)Projection data are obtained in parallel beam mode without data re-arrangement.

The work was supported by a Grant-in-Aid for Cancer Research (58-42) from the Ministry of Health and Welfare.

471

STATISTICAL ACCURACY OF SPECT IMAGES RECONSTRUCTED WITH WEIGHTED BACKPROJECTION.
E.Tanaka. National Institute of Radiological Sciences, Chiba.

Magnitude of statistical noise of SPECT images recosntructed with weighted back-projection algorithm[1] is evaluated. The variance of noise at a point (X,Y) is given by, in a good accuracy,

$$V(X,Y) = K \int [W^2(y)\exp(2\mu L)p_o(x)], \quad (1)$$

where (x,y) is the rotated coordinate of (X,Y), W(y) is the weighting function in backprojection, L the y-coordinate of the object boundary, and p_o the observed projections. K is a factor of noise propagation in convolution. With the Shepp-Logan filter, $K=.5/d^3$ for nearest neighbor interpolation and $K=.25/d^3$ for linear interpolation, where d is the linear sampling interval.

Noise magnitude was evaluated for various source distribution, and the results were confirmed by computer simulation. Proper positioning of the coordinate origin is important for reducing the largest noise in the image, and the best result is obtained when the origin is at the noisiest point. The use of positive reconstruction index is effective for reducing the noise in areas apart form the origin.

The work was supported by a Grant-in-Aid for Cancer Research (58-42) from the Ministry of Health and Welfare.

[1] Tanaka E: J Comput Assist Tomogr 7:692-700, 1983.

472

EXPERIMENTAL EVALUATION OF WEIGHTED BACK-PROJECTION METHOD FOR SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY.
H.Toyama, S. Yonamine, K.Kumagai,S.Chiba,H,Murata, H.Yamada,Tokyo Metropolitan Geriatric Hospital,Tokyo.E.Tanaka.National Institute of Radiological Science, Chiba.

In order to get a more quantitative reconstructed image for single photon emission computed tomography(SPECT),development of the correction method for the effect of photon attenuation and scattering in object is desired. By a generalized weighted back-projection method, t is found from a computer simulation that the effect of photon attenuation is almost completely compensated. The method was tested for experimental data obtained by phantoms filled with Tc-99m solution and clinical data. The imaging device was a rotating gamma camera system. The number of linear and angle sampling were both 64. The reconstruction was done with two sets of constant assuming μ =0.15cm . The effect of scattered photon was estimated from phantom studies with cold legion at the center with different energy window. It seems that the image density due to the scattered photon at the center of the image for middle slice of 30cm length cylinder is about 24% of that of the active region for the centered window. For 20cm length cylinder, the percentage of the scattered photon was about 18%. The transverse images of brain and liver were also succesfully reconstructed using this method.

473

EFFECTS OF PROJECTION IMAGE FILTERING ON THE MULTI-PLANARY IMAGES RECONSTRUCTED BY SPECT (SECOND REPORT).
R. Ban, M. Hosoba, S. Takahashi and H. Wani. Shimadzu Corporation, Kyoto, Japan.

In general the quality of the original projection data in SPECT is inferior to that of conventional scintigrams mainly for the short acquisition time and the long distance between the patiet and the camera.
In the first report we indicated that we could attain the great improvements in quality in SPECT when we choose special filters considering the inferior quality characteristics.
In this report we have checked the inferior characteristics using phantom data and seeked for the suitable filters.
Moreover we ascertained the improving effects on transverse, sagittal and coronal images under the practical conditions.