it is found that the Y rhombic system is suitable for high-speed scintillation camera and the X rhombic system for high-resolution scintillation camera applications.

Operating Characteristics of a Multi-Crystal Positron Camera

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A multi-crystal positron camera has been constructed for diagnostic investigations with short-lived positron emitters produced by the NIRS cyclotron. The camera has two identical detectors each consisting of a rectangular array of 14 × 14 small crystals (20 mmφ × 38 mm) viewed by an array of 112 photomultiplier tubes (38 mmφ). Each crystal in the detector is in coincidence with 25 crystals in the opposite detector to form 4096 coincidence crystal pairs in total. The electronic system is simplified by OR-ing the signals from the photomultiplier tubes in each row and column prior to coincidence operation between the detectors. Signals presenting four coordinates for the crystal pairs are converted to 4-bit binary code each and are further packed into 12-bits (64 × 64 levels). Coindence events are stored in one of two 4KW 18-bit memories and the accumulated data are decoded and displayed on a CRT as an image focused in any plane between the detectors.

Detection efficiency and high countrate characteristics of the camera system were tested as a function of coincidence resolving time and energy discrimination level. From these results, we selected these parameters to be 24 nsec as the coincidence resolving time and 50 keV as the discrimination level. The detection efficiency of the camera without collimators was 18.4 cps/μCi for a plane source of $15\times15\ cm^2$ in air, positioned at the center of the detectors separated by 50 cm. The high countrate characteristics were also tested with a phantom of goldfish-shaped toy balloon filled up with $^{11}CO_2$ gas (initial activity: 127 mCi). The maximum coincidence rate was 120 kcps, but a clear image was observed below 60 kcps.

Application and Evaluation of the Computer Program for the Correction of Non-uniformity of Gamma Camera

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In order to study the effect of correction of non-uniformity of gamma camera for better images, a computer program inherent to Scintipac 200 (Shimazu) was evaluated.

A flood phantom (40 cm in diameter, 1 cm thick) filled with Tc-pertechnetate was used. A image of the phantom was taken by LFOV gamma camera (Searl Inc.) with high resolution collimetor. The data with 25,000K counts were simultaneously stored in Scintipac to be used as original data for the correction of non-uniformity. Various numbers of bakelite plate absorber (3 × 3 cm, 1 mm thick) or filtration paper (3×3 cm) moistened with ^{99m}Tc-pertechnetate were placed on the phantom to make cold or hot spots, respectively. The distinguishability of those cold and hot spots were evaluated on the images displayed on teletypewriter, CRT and color CRT. The following five conditions for data handling were compared.

1) Data without uniformity correction.
2) 9 points smoothing of 1).
3) Correction of 1) using computer program and original data.
4) Correction of 2) using computer program and original data.
5) 9 points smoothing of 3).

The best image resolving cold and hot spots was obtained in the data processing 5). Effective field of view was significantly expanded by the correction of non-uniformity. The better images were obtained as the total counts were increased.

We concluded that scan images obtained from patients may be significantly improved by the correction of non-uniformity, provided that enough counts can be collected. Clinical evaluation of uniformity correction is now under study.

Rapid Data Processing for Whole body Gamma Camera Images

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A computer program for the rapid processing of whole body gamma camera images was developed in order to answer the clinical needs for speeding up the conventional data handling. Whole body gamma camera (LFOV, Searl Co.), scintipac 201 minicomputer (Nova model 01) and color display unit were used. The program allows simultaneous data collection from whole body gamma camera in list mode and image reconstruction on core memory both performed in the CPU of the minicomputer.

Data processing such as image transfer, 9 points smoothing and back ground cut off can be done in high speed, which takes less than 10 seconds. The processed whole body image (128 × 128 matrix) or half body image (256 × 256 matrix) is displayed in color. The pre- or post-processed data can be transmitted to a magnetic tape for later replay, which takes about 30 seconds. Representative ^{67}Ga tumor scans processed with this program were demonstrated.

Characteristics of this program as compared with the one inherent to scintipac 201 are as follows; 1) rapid data collection, processing and display, 2) color display, 3) easy procedures through conversation on CRT and 4) free from limitation caused by total counts when magnetic disk is used.

Development of Two Screen Polaroid Camera and Its Clinical Application

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Radioisotopic distribution of the organs were recorded by the Polaroid camera attached to the Anger scintillation camera. Three eye Polaroid camera is widely used to obtain different density images at the same time.

In this study, we tried to develop a two screen Polaroid camera using a filter (ralf mirror) and a surface mirror.

This Polaroid camera is consisted of a lens (EL NIKKOR f = 80 mm), a Polaroid film holder and a 60 × 70 mm roll film holder. The advantages of this camera are to be able to obtain two images of different density or one Polaroid and one translucent negative images.