Analysis of Images of Scintillation Camera with the Use of the Hardwired Imaging Processor

A. MURANAKA, Y. ITO, T. ICHIKAWA & T. YOKOBAYASHI
The Department of Nuclear Medicine, Kawasaki Medical Dollege

A color display device (Elscint) which processes images by pushbutton operation has been connected to a scintillation camaera (Nuclear-Chicago) and to a whole body scanner (Elscint) in order to perform image processing quickly and easily in routine clinical diagnosis.

Its usefulness is considered to be significant particularly with connection to the scintillation camera since it is matched to versatile and quick nature of the camera because the data being taken by the camera is displayed simultaneously on C.R.T. of the Processor and data processing while detecting is possible.

As for uniformity correction of the scintillation camera, non-uniformity of the detecting system of the camera including a collimator, crystal and photomultiplier tubes was easily corrected by the hardwired circuit. Clear color display with 8 colors (9 colors including overrange color) was obtained on 12″ C.R.T. by dividing the field view of the camera into a matrix of 96 by 96 cells at maximum. The use of cassette tapes and a color dot printer was useful for recording and storing of images. In addition to the above, since such data processing as profile and histogram display of x and y axes, counts in certain region of interest to be set discretionally, change in color range for eight colors and baseline shift, background subtraction, 9-point smoothing, isocount display and subtraction is performed easily by push-button or dialing operation, the Processor is considered to be useful for routine clinical diagnosis.

On the Peripheral Decrease of Density of the Life Size Images

M. AKISADA
Department of Radiology, Mitsui Memorial Hospital
K. KINOSHITA and T. YAMAGUCHI
Hitachi Denshi Co., Ltd.

The images on CRT of about 85 mm in diameter can be magnified photographically on the medical film of about 24 cm in diameter by means of the lens system; life size adaptor. The lens attached with the apparatus now available is rather toy-like gadget and it is difficult to magnify the CRT images on the life size film without distortion or non-uniformity in its density by life size adaptor.

Our experiment was done to examine why the peripheral decrease of density on the life size film was caused and how much did it reach using microdensitometric method.

A dose of 200 μCi of ^{99m}Tc was used as a flood source at a distance of 140 cm apart from the collimator face, counting 999 K counts in 40 sec.. The peripheral decrease of density was increased as the diameter of the life size view increased and was reached to 75% decrease at its outermost portion (42.4 degree in 2θ) as compared with the center, whereas the density photographed on the 35 mm film of low-γ value obtained from the same CRT image was uniform within the range of $\pm 5\%$ error.

The peripheral decrease of density is thought to be caused by three factors: cos $^4\theta$ law, vignetting and film γ.

The second step of our experiment was to determine how much percentage of decrease of the peripheral density was caused by each three factors respectively when an enlarging camera with the lens of No. 4 F and 75 mm long f was used.

The results showed that the percentage of the decrease caused by $\cos^4\theta$ law factor, vignetting factor and film γ factor were 11.0%, 11.5% and 14.0% respectively, thus ensuing up to 36.5% decrease at the periphery of 27.4 degree in 2θ.

Several methods for correcting the above adverse effect were also discussed.

Non-Uniform Sensitivity of Delay-Line Scientillation Camera Measured with a ^{99m}Tc Plane Source

T. IINUMA, T. MATSUMOTO, K. FUKUHISA
The National Institute of Radiological Sciences

Non-uniform response of a scintillation camera has an important effect on the interpretation of radionuclide image by doctors, since it may give false hot or cold spots on the image. It is caused by non-uniform transmission of collimator and inherent non-uniformity in sensitivity of the camera. The latter is a function of many factors such as energy of incident γ-rays, window width of a single channel analyzer and relative position of γ-ray peak compared to the center of window etc., even if the camera is properly adjusted. The former is mainly affected by energy of incident γ-rays, but usually remains constant.

Here we report the non-uniform sensitivity of a delay-line scintillation camera measured with a ^{99m}Tc plane source, and compared it with a "flood" image obtained by the uncollimated camera and a ^{99m}Tc point source. The plance source is made of a lucite vessel in which ^{99m}Tc solution of 2 cm thick can be contained. Non-uniform activity distribution of the plane source was checked by scanning it with a whole body scanner and its standard deviation was found to be $\pm 1.5\%$. Non-uniformity measurements were made by accumulating 2×10^6 counts into 64×64 pixels of our on-line computer system, TOSBAC 3400. A 140 KeV peak of ^{99m}Tc was selected with window widths varying from 5 to 80%.

The results are critically dependent upon the window width and the collimator.

(1) High resolution collimator and 1600 hole collimator are found to be uniform in their transmission, but slanted-hole tomographic collimator has a non-uniform transmission.

(2) With window width of more than 20%, the "flood" image with scatter can be used to correct