Clinical Evaluation of Scanning Images Processed by an On-Line Computer System

E. YABUMOTO, T. MATSUMOTO, N. FUKUDA and N. ARIMIZU
Division of Clinical Research, National Institute of Radiological Sciences, Chiba

An attempt to evaluate the clinical usefulness of computer processed scans was made by 3 radiologists and a radiographer in terms of detectability of focal lesions. Prior to interprete processed scans, 50 sets of photoscans and unprocessed CRT images of the on-line computer were independently compared without any clinical information to see the overall performance of the system, including display device. Polaroid films of the computer processed images were then compared with unprocessed images of same objects. Image processing methods included weighted smoothing, non-linear matched filtering and iterative deconvolution.

Results can be summarized as follows:

1) The results of interpretation by 2 experts in nuclear medicine showed good agreement each other, while 2 non-experienced persons often missed small or ill-defined lesions.

2) Photoscans were superior to unprocessed CRT images of the computer.

3) Computer processed images by smoothing and non-linear matched filtering revealed better detectability of lesions than unprocessed images.

4) Iterative deconvolution failed to show increased detectability.

Data acquisition and processing of an Anger camera by the NIRS on-line computer system

K. FUKUHISA, T. IINUMA, T. MATSUMOTO, T. SHIMIZU and E. TANAKA
National Institute of Radiological Sciences, Chiba

We have previously reported that the NIRS computer system was used for the digital data processing of a scanner. Now, the same system is connected on-line to a new delay-line type scintillation camera. Here we describe an interface between the camera and computer and the software of data acquisition and image formation.

The scintillation camera has a several additional features to the conventional one: (1) it has a slanted hole rotating collimater and a rotating bed for tomographic imaging and (2) it has two channels of energy selectors for double radionuclide imaging. For the data collection by the computer, the camera generates X and Y positional signals, coincidence signal, energy signal for double radionuclide imaging and angular signal for tomographic imaging.

The X and Y signals are shifted to be unipolar pulses between 0 and 10 volts and coincidence signal is a unipolar pulse of +3 volts and 3.5 μsec duration.

The data acquisition are performed in 4 different modes: (1) static image in increment mode, (2) dynamic image in increment mode, (3) dynamic image of double radionuclides in sequential mode and (4) tomographic image in sequential mode. Programs for the data acquisition mentioned above are made as well as those for image formation and display. In addition, software for image processing and feature extraction are also being produced. The programs are stored in the magnetic disk and are called by their names from I/O typewriter at the camera room. The programs are proceeded in conversational mode.

The system is now used in clinical routine in which many cases are being accumulated and processed.

A program for iso-count contour display of radioisotope image by a digital computer of medium size

K. Fukuhisa and T. Iinuma
National Institute of Radiological Sciences, Chiba

We have reported several methods of radioisotope image display by peripherals of a digital computer in the previous work. In this report, programs for iso-count contour display are discribed with a CRT display unit and a curve plotter.

In order to obtain co-ordinates of points of an equal count level, interpolation of image cells are inevitable due to relatively small number of image cells. As a means for interpolation, Lagrangean interpolation or linear interpolation are often utilized, but difference between the two methods was within $\pm 2\%$ for the most of radioisotope images used, and no significant difference was observed in view of image visualization by human. Since the linear interpolation resuleted in faster speed of calculation and in use of smaller number of core memories than the Lagrangean, we have used the former method for the display of clinical image.

The program for CRT display unit consists of two subprograms linked in on-line, in which values of iso-count levels can be varied arbitrarily up to 8 levels. During the search and calculation of display point for iso-count levels, the letter "N" is shown on the CRT, but it is erased when all data points are searched and displayed.

The program for curve plotter is made to produce linearly interpolated points of smaller intervals than those of CRT display and to plot an iso-count contour by tracing a point of equal count at minimum distance from the present point. In this program, co-ordinates of the traced points are packed into one record and thus an image up to 128×128 cells can be processed.

We are also investigation on the applicability of the iso-count contour to the automatic recognition of lesions in the radioisotope image.

Practical Significance of "Counting Loss" in the Use of the 4096 Channel Analyzer with Scinticamera

T. Sakai, Y. Yamamoto, T. Tanaka and H. Asakura
The Second Department of Radiology, the Kanagawa Prefectural Center for Adult Diseases

On the daily use of the scinticamera and data-processor for the clinical radioisotope dynamic examinations, particularly when relatively a large dose is applied, we have recognized that an effect of counting loss caused by the apparatus can not be ignored and should be corrected to obtain accurate data.

The followings are our conclusions produced by the serial analytical studies on this subject.

1) The value of counting loss varied depending on the apparatus used; the TOSHIBA register matrix type, the Picker-the PhoGAMMA H. P., and the TOSHIBA delay line type.

2) Counting loss also varied depending on what kind of isotope was used: the higher the energy of the isotope was, the more counting loss