Flying-Spot Scanner with Omni-Directional Scanning for Two-Dimensional Processing of Radioisotope Images

N. NOHARA, E. TANAKA and T. TOMITANI

National Institute of Radiological Sciences, Chiba

A flying-spot scanner adopting a special scanning method has been developed for purpose of two-dimensional processing of radioisotope images. By application of two triangular signals of different frequencies $X_0(t)$ and $Y_0(t)$ to X and Y deflection electrodes of the flying-spot CRT, the spot on the CRT moves rapidly back and forth in two orthogonal directions, which results in anasynchronous Lissajous pattern. By application of rotation of angle ωt to $X^0(t)$ and $Y^0(t)$ (where angular velocity ω is small compared to both frequencies of $X_0(t)$ and $Y_0(t)$), the coordinates of the flying-spot is given below.

$$X(t)=X^0(t)\cos\omega t-Y_0(t)\sin\omega t$$
$$Y(t)=X_0(t)\sin\omega t-Y_0(t)\cos\omega t$$

The spot on the CRT is focused onto a 35 mm film and the density of the film is converted to video signal by measuring transmitted light with a photomultiplier tube. Any point on the film is scanned uniformly in every direction and one can observe an image in superposition of the video signal along the omni-directional scan line.

By processing the video signal with an electric filter, one can realize two-dimensional image processing such as deblurring, differentiation and low frequency cut-off, etc.

Smoothing is performed by defocusing the flying-spot tube. Two slide systems are provided in order to correct non-uniformity in sensitivity of the imaging device by taking the ratio of two video signals.

Various display modes are provided such as shaded image, bird's eye view, cross sectional view at any line and contour map.

Digital Simulation of RI Image Processing

F. KAJIYA, H. NISHIMURA and T. SAKAGUCHI

Department of Electronics, Faculty of Engineering

K. KIMURA, H. INADA, T. FURUKAWA and H. ABE

First Department of Internal Medicine, Faculty of Medicine, Osaka University, Osaka

Paper phantoms have been used to evaluate the efficiency of computer processing techniques in radioisotope scintigraphy.

In this paper, a "digital phantom" method was proposed for the evaluation. The merits of this method are those; 1. phantoms are able to be made with absolute accuracy and without trouble of unexpected unevenness of radioisotope distribution that often occur in paper phantoms, 2. the original patterns are precisely known beforehand and the effectiveness of the processing are easily compared and evaluated by both vision and mathematical analysis.

Simulating the scintigram-formation process, the digital phantoms were constructed by following three steps; 1. design of original pattern as a two-dimensional array of numbers that represent the concentration of radioisotope in some source organ. The four classes of numbers, i.e., 2, 10, 20, 30, were assigned to the array. 2. Modulation by Pois-