son's random numbers, the averages of which are the assigned numbers. 3. Blurring by point spread function which was obtained by scanning a point source and which consists of 7×7 elements of 3×3 mm square.

Assuming this "digital phantom" as starting data, an image restorating procedure of the iterative approximation by convolution integral with point spread function was examined and the series of patterns were demonstrated.

By smoothing with 9 points moving averages, the valley parts of the image were imbedded and the peaks were cut down. After iterative approximation of 3∼10 times, the vally parts were restored but the restoration of the peaks were not satisfactory. Without smoothing process, noise in the image was increased after 2∼3 times iteration.

Conclusion: 1. This digital phantom method is useful in the evaluation of image restoration methods. 2. The iterative approximation is an effective technique but the slope with point spread function transfers in series of iterative patterns so that step-functional images were not restored.

Digital Simulation of Radioisotope Imaging Process

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In an attempt to evaluate effects of various factors in R.I. imaging process upon the image quality, a method to simulate the imaging process is investigated using an on-line digital computer. As an image object, a phantom of a square defect in a uniform background source was employed. Position, size and contrast of a defect in the phantom was generated by a uniform random number. For the point spread function of an image detector, a two-dimensional Gaussian distribution was assumed. A simulated R.I. image was synthesized by convoluting the point spread function with the phantom and then by generating the noise of Poissonian distribution.

Thus, 30 simulated images that contain a defect of various configuration were generated by the computer simulation mentioned above. Then, 14 persons were asked to judge whether or not there was a defect in the 30 simulated images. From the result of the answer, the defects were classified into three categories: (1) "Detected" which is such a defect that all persons can recognize its presence, (2) "Not Detected" which is such a defect that all persons can not recognize its presence and (3) "Not Easily Detected" which is such a defect that some persons can recognize its presence, but others can not.

In order to estimate human detectability of the defect quantitatively, a signal-to-noise ratio (S/N) was defined by the maximum count in defect depth after convolution of PSF divided by square root of background count in an image cell. The defects of "Not Easily Detected" category have a S/N value of about 1.0 which is not dependent upon the size and background count.

From this finding, we have been able to derive the relationship between S/N and other parameters of imaging system which can be applicable to the clinical situation. The detail will be described elsewhere.