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NUCLEAR MEDICINE DATA PROCESSING SYSTEM WITH IC MEMORY OF LARGE CAPACITY AND 16 BITS MICROCOMPUTER.

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Minicomputer has been commonly used for processing data in nuclear medicine, and its main memory is used as buffers for data acquisition, process and display. But such an approach has a few defects. As follows: First memory units costs a lot. And yet does not have enough capacity to handle the image data. Secondaly, because the system requirs magnetic disc, it has some disadvantages for high speed data acquisition, process, display etc. Thirdly, the system can not avoid to be big. In order to solve these probrems, we have developed the new system. The outline of this sytem is described below. 1) Not only for data acquisition, but for ROI and for display, we use LSI memory. Especially for acquisition memory we use 64 K bits/chip dynamic ram. It can be extended to 12 bits, 1M words. As a result, it allows gated image acquisition in image mode 2) Multi-microcomputer system "SHIP-9" that we developed utilizing 16 bits microcomputer chip (TMS-9900) is used as CPU. 3) Hardwear image processor is built in. 4) Special DMA circuit has been developed. It makes both static and dynamic image processing much easier, and makes it possible to form functional image with high speed. 5) Image interpolator that can display image with high resolution and high speed is built in. 6) High resolutional CRT display with 64 gray or color levels at maximum is used. 7) As operating system, we have developed "BICOMS" which is based on BASIC. This system is useful for both static and dynamic study and is available for routine clinical diagnosis.

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COMPARATIVE STUDY OF 3-D RECONSTRUCTION METHOD USING MULTIPLE PIN-HOLE COLLIMATOR – ITERATIVE & FOURIER METHOD.

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Recently, a multiplaner emission tomography using a multiple pinhole collimator, has been developed. It uses a wide-field scintilation camera and a multi-pinhole collimator. Multiple planers are reconstructed from the original multi view data through the use of the reconstruction algorithm. Two methods of the reconstruction are comparably studied. Experimental date of computer-simulation phantom and radio isotope phantom are reconstructed by these method. And also clinical images are shown. Shimadzu-Searle Scintilation Camera LFOV with a 7 pin-hole collimator of our our own making and Scintipac using Data General's minicomputer Eclipse AP-130 with an array processor are used. Various computer simulation phantoms such as disc, point, ring etc, have been reconstructed and the resolution, accuracy etc. are tested. As a cardiac application, multi-gated cardiac tomogram-images of cardiac muscle and pool, have been excised.

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DATA PROCESSING SYSTEM OF RADIOIMMUNOASSAY.

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Recently, Radioimmunoassay has been widely used for measurements of many kinds of hormone. Many customers have required more efficient equipments to get through the ever increasing samples. For accomplishing these requirements, we have developed a new automatic data processing system for Radioimmunoassay. This system is composed of four units; an automatic well counter, a personal computer, an automatic measuring condition selector, and a dual drive floppy disk system. The automatic well counter and the computer program have been already developed for our Radioimmunoassay total system. The automatic measuring condition selector changes the kinds of nuclide and counting time by detecting the group marks. The floppy disk is used for memorizing the program and measured data. The newly developed programs calculate the absolute amount of hormone. Each program is loaded to memory from the floppy disk according to selected program numbers, which are marked on the sample holder. The user can change measuring parameters of the program in the floppy disk. The parameters which can be set are as follows; the kinds of approximation curve, the kinds of measuring method (Bound or Free), the kinds of Y-axis (B/T or B/Bo), replication of samples (Background, total, standard and unknown), the print out format, and the necessity of standard curve drawing, etc. When I/O typewriter is attached to this system, the work sheet is made by inputting patient names and measuring items before counting, and inspection results are printed after measuring. Thus, many kinds of samples are processed and individual data are filed automatically.

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DEVELOPMENT OF A POSITRON CT FOR BRAIN DIAGNOSIS.

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A positron CT having a ring detector array is now in development. The 64 scintillation detectors, each of which consists of a 12x20x26mm^3 BGO crystal and a 1-1/8" diameter photomultiplier tube, are arranged on a circle with non-uniform spacing. The detector array makes an endless rotation around the object. The rotating non-uniformly spaced detector array enables us to get flat sampling density. Each spacing between the adjacent detectors is selected so that the coincidence pair lines are most uniformly scattered within the field of view. The result of calculation computed by an iteration method gives 11 to 12 samles per 2mm distance within the 160mm diameter circle and in the rest region within the field of view (240mm in diameter) 10 to 15 samples per 2mm distance.

Aperture ratio of this machine is 0.53. This relatively small value is caused by rather practical reason than by theoretical limitation resulting from the non-uniformly spaced detectors. Theoretically, the aperture ratio of this machine can be increased as large as 0.969.

This work is going on in cooperation between the National Institute of Radiological Sciences, Hitachi Medical Corporation and Central Research Laboratory of Hitachi Ltd.