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THREE DIMENSIONAL DEMONSTRATION OF RIGHT AND LEFT VENTRICLES BY COMPUTER GRAPHICS TECHNIC USING SPECT. T.Kashiwagi, T.Koizumi and K. Kimura. Osaka Kosei-Nenkin Hospital and Osaka University School of Medicine, Osaka.

Three dimensional demonstration of right and left ventricles were developed from SPECT images using computer graphics technic. Twenty mCi of in vivo-labeled RBC were administered and tomographic data were recorded at 12-14 frames/cardiac cycle over 180° rotation divided into 32 angles. Then the left ventricular short-axis plane was reconstructed. Contours for ventricles were extracted from the short-axis images at each frame of cardiac cycle and stacked in computer memory. Three dimensional models for ventricles were constructed from these contour data and displayed on the color CRT as solid and/or wire-frame models. Using this technic, shape and motion of right and left ventricles were viewed from any direction realistically and dynamically in linking with cardiac cycle. In patients with left ventricular aneurysm, regional wall motion abnormalities were clearly demonstrated in three dimension. Therefore, this technic is considered to be clinically useful for evaluating the cardiac wall motion in heart diseases.

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THE FIXED POINT OF V FILTER AND ITS APPLICATION TO THE CONTOUR DETECTION FOR SPECT ATTENUATION CORRECTION. K. Minato, M.Komori, A.Hirakawa, M.Kuwahara and A.B.Brill. Kyoto Univ. Hosp., Kyoto and BNL, NY.

V filter is a nonlinear filter which was proposed by Hachimura in 1976 and since then it has been widely used in the field of RI image processing because of its edge preserved smoothing characteristics. This study shows a property of the fixed point image of V filter which is obtained by applying the filter repeatedly until to reach an invariant and therefore is unchanged by the filtering operation. Linear filter generally results a flat image or infinite components when it is applied repeatedly on a same image, while V filter results a piece-wise constant function in its fixed point.

Using this fixed point property, a new contour detection method for a gamma ray attenuation object is proposed in order to make attenuation correction of SPECT imaging. The method is a combination of a polar transformation of a SPECT image, the fixed point image of V filtering and an edge tracing algorithm. The method was applied to a phantom SPECT image and resulting in a reasonable outline of the phantom even in a low S/N image. This outline could be used successfully in Tanaka's RPC attenuation correction method.

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DIGITAL FILTERING OF RI IMAGES USED McCLELLAN TRANSFORMATION. M.Uemura, A.Ohgushi and H.Tabuchi. Hitachi Medical Corp., Chiba.

Two-dimensional (2-D) digital filtering is used for RI image processing. Digital filters are low-pass filters used for noise reduction and high-pass filters used for edge sharpening. The filtering is usually performed with FFT (Fast Fourier Transformation) in frequency-domain. We tried to apply an algorithm proposed by McClellan. This algorithm is based on the technique to design 2-D filter by applying a change of variables to one-dimensional (1-D) filter, and performed using the coefficients of Chebyshev polynomial approximating the frequency response of 1-D filter, and the speed of computation is faster than FFT when the number of terms is small. We applied this algorithm to Butterworth filter and Wiener filter used for RI image processing, and examined the number of terms necessary for approximation and computation time. As examples, we performed filtering of RI images using this algorithm.

References :

- (1) T.R.Miller, et al.: J Nucl Med 24: 625-628, 1983
- (2) J.H.McClellan, et al.: IEEE Trans. CAS-24: 372-378, 1977