Processing Of Information Resources In Network Systems

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Abstract: digital processing algorithm capable of converting images to improve their visual perception, ensuring their storage, transfer, visualization in electronic form and further analysis laid down in them.
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In the world in the field of information and communication technologies, close attention has been paid to the system for managing the processing of digital television images in video information systems. In the context of intensive improvement of modern information and communication systems to increase the volume and information flow, one of the topical problems is improving the quality of television images and managing filtering processes from redundant information. In this direction in the field of information and communication technologies in the leading countries of the world, the demand and the need to improve the methods of filtration and increase the brightness of digital television images are increasing.

At the present time, one of the most important issues is the formation of digital television images, based on them, the improvement of the management system of image processing processes, the methods of numerical models and algorithms for solving the problems of filtering various digital television images using Fourier and wavelet methods. In this area, focused research is being carried out, including close attention in the following areas: an improved method of classification and selection of criteria for monitoring and evaluating image quality, methods for controlling the clarity of images for specified values of medium-intensity pixels, creating algorithms for modeling the image processing process, methods Control processes to ensure the level of clarity of the television image.

In the world to improve the quality of digital television images, methods of modeling filtering processes and highly effective control systems in a number of priority areas, scientific research is carried out, including: on the formation of mathematical models of filtration processes to improve the methods of wavelet, Fourier, Haar, Walsh-Hadamard, Karkhunen- Loeva in increasing the clarity and brightness of images based on linear and nonlinear differential equations; Creation of methods for eliminating additive, impulse and adaptive-Gaussian types of noise in images using additive and adaptive filtering; Methods of algorithms and software for intra-frame and inter-frame image transformation; Methods of the adaptive method of controlling the brightness system using the Chebyshev matrix series; Methods of gradient, static and Laplace methods for segmenting the image and dividing it into contours; The formation of criteria and conditions for assessing the quality of images.

The main objective of sharpening is to emphasize the small parts of the image or improve those details because of errors or imperfections of the shooting method. Image sharpening is used quite broadly — from e-printing and medical imaging to technical control of industrial and automatic pointing systems in the military sphere.

Consider the grid system equations

$$-a_{ij}z_{i-1,j} - b_{ij}z_{i,j-1} - c_{ij}z_{i+1,j} - d_{ij}z_{i,j+1} + e_{ij}z_{ij} = f_{ij} \qquad (1)$$

approximating two-dimensional boundary value problems on rectangular grids (or topologically equivalent rectangular). The equations are considered in internal nodes of the computational domain indexes.

$$i = 1,2,...,I, \qquad j = 1,2,...J_i,$$

where J_i — the number of Interior nodes in the i - grid lines. It is expected that sites odds and right parts of equations (1) determined by the boundary conditions (e.g., if the nodes $(i-1, j)$ and $(i, j-1)$ external, $a_{ij} = b_{ij} = 0$). All coefficients in (1) we assume non-negative and possessing property of diagonal dominance. In other words, the matrix A the system is written in vector form as

$$Az = f \tag{2}$$

where $z = fz = \{z_{ij}\}, f = \{f_{ij}\},$ is $M-$ matrix.

Entering under vectors z_i dimension J_i represent values of the grid functions on i grid lines, the system of equations can be represented as

$$-L_i z_{i-1} + D_i z_i - U_i z_{i+1} = f_i,\ i = 1,2,...,I,\quad L_1 = U_1 = 0 \tag{3}$$

There $D_i = \{-b_{ij}, e_{ij}, -d_{ij}\} -$ square three diagonal $M-$ matrix order J_i, L_i and $U_i -$ in general, rectangular matrices, with its rows of one nonzero element a_{ij} or c_{ij} respectively.

The system matrix can be written in the form.

$$A = D - L - U = \begin{Vmatrix} D_1 - U_1 & \\ -L_i \quad D_i - U_i & \\ & \\ & \end{Vmatrix}$$

where $D = \{D_i\}, L$ and $U -$ accordingly, block-diagonal, lower and upper triangular matrices. We will also assume symmetry matrix A, $D = D^1, L = U^1,$ where the bar denotes the transpose.

To solve the system of equations (1)-(3) consider an iterative Conjugate gradient method.

$$r^n = f - Az^n,\ \ \overline{z}^n = K^{-1}r^n,\ \ p^0 = \overline{z}^0,$$

$$z^{n+1} = z^n + a_n p^n,\ a_n = \frac{(\mathrm{r}^n, \overline{\mathrm{z}}^n)}{(Ap^n, \mathrm{p}^n)},$$

$$p^{n+1} = \overline{z}^{n+1} + \beta_n, p^n,\ \beta_n = \frac{(\mathrm{r}^{n+1}, \overline{\mathrm{z}}^{n+1})}{(\mathrm{r}^n, \overline{\mathrm{z}}^n)}, \tag{4}$$

with the downsizing of the matrix

$$K = (\mathrm{G} - L)\mathrm{G}^{-1}(\mathrm{G} - U) \tag{5}$$

There $G = \{G_i\} -$ block-diagonal matrix whose blocks G_i the essence of band matrices and are determined from recurrences.

$$G_1 = D_1,\ G_i = D_i - L_i(\mathrm{G}_{i-1}^{-1})^{(\mathrm{p})}U_{i-1} - \theta S_i,\ i = 2,3,...,I, \tag{6}$$

where $p = 0,1,3,...$ — an odd number, $0 \le \theta \le 1$ — iterative "compensating" option $(\mathrm{G}_{i-1}^{-1})^{(\mathrm{p})}$ — "band part" of the matrix with a width of strip p, S_i — diagonal matrix, calculated by using the equality.

$$S_{ie} = L_i\left[\mathrm{G}_{i-1}^{-1} - (\mathrm{G}_{i-1}^{-1})^{(\mathrm{p})}\right]e \tag{7}$$

where e denotes the vector with single components.

Note that if $p = 0$ (this implies $(\mathrm{G}_{i-1}^{-1})^{(\mathrm{p})} = 0$), then $G_i = D_i - \theta S_i$ and the resulting algorithm can be viewed as a generalization of the method of block symmetric consistent top relaxation with "compensation" or close to him to implement alternately-triangular method and explicit methods of variable directions.

Implementation methods (4) —(7), call implicit because matrix G_i no longer are the diagonal contains at least two notable algorithmic aspects. its solution is easily carried out using the oncoming amount. In the end, to find each of the matrices G_i the required number of operations is proportional to the $p^2 J_i$, These calculations must be performed only once before beginning the iterations.

The second point is the finding in (4) of vector z^n. By definition K and block structure matrices G, L and U, calculation under vectors z_i^n when known G_i and r_i^n is based on the following formulas:

$$G_i v_i^n = r_i^n + L_i v_{i-1}, \quad i = 1, 2, ..., I, \tag{8}$$

$$G_i w_i^n = U_i z_{i+1}^n, \; z_i^n = v_i^n + w_i^n, \; i = I, I-1, ..., 2, 1. \tag{9}$$

Here the decision support systems with three diagonal (p -diagonal when $p \geq 5$) matrices G_i is executed in turn, using the amount.

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