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Research Article

DATA FILTERING IN THE IMAGE PROCESSING TOOLBOX(IPT) ENVIRONMENT

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ABSTRACT

Analysis of the Aydar-Arnasoy lake system in the environment of IPT. A brief hydrogeological description of the Aydar-Arnasoy lake system. Digital filtering of the Aydar-Arnasoy lake system image. Development of a digital model of the image of the Aydar-Arnasoy lake system using discrete Fourier transformation.

KEYWORDS

MATLAB, LAPACK (Linear Algebra Package), BLAS (Basic Linear Algebra Subprograms), MATrixLABoratory, image, morphology, image, Image Processing Toolbox package, signal Processing Toolbox and Wavelet Toolbox other applications M-files.

INTRODUCTION

Experiments conducted on reproduction of boundaries show that photographic and television images with separate boundaries are better perceived by a person than a natural scene where colors blend imperceptibly.

This feature and the problems of removing interferences of the border in the image in the form of diffusion put forward the problem of automatic processing of images, strengthening the border, that is, increasing the difference between the background and object lights. Methods for solving this problem are widely used in image processing [23]. Usually, the threshold is enhanced using high-pass filters.

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$$A_1(m,n)=\begin{vmatrix}0 & -1 & 0\\ -1 & 4 & -1\\ 0 & -1 & 0\end{vmatrix}\quad A_2(m,n)=\begin{vmatrix}-1 & -1 & -1\\ -1 & 3 & -1\\ -1 & -1 & -1\end{vmatrix}\quad A_3(m,n)=\begin{vmatrix}1 & -2 & 1\\ -2 & 4 & -2\\ 1 & -2 & 1\end{vmatrix}$$

As you can see, the working masks of these filters will have an average (0) value. That is, the sum of negative and positive values in the mask is equal to 0. The reason for this is that when a mask is applied, a result of 0 should be obtained for a homogeneous area, and a result other than 0 should be obtained for a boundary area. Another way to enhance the boundary field is statistical differentiation. In this case, the value of each element is divided by the statistical estimate of the mean square constraint.

$$E_{ij} = f_{ij} / 0(i, j)$$

$$0^2(i, j) = \sum_{i} \sum_{ji} \left[f_{ij} - Z_{ij}\right]^2$$

$$i, j - N(i, j)$$

It is calculated according to some N(i,j) circle of the coordinate point (i,j). -is the average light value estimated by low-pass filtering of the source image at the point. The enhanced image G(i,j) differs from the source image in that the values in the boundary areas are large, and in other areas are small. There are many other methods of boundary enhancement that take into account different algorithms [4].

In recent years, medical filtering, which includes non-linear methods, has been widely used in image processing. This method is a classic leveling process and has the following advantages:

1. Sharp differences in field illumination - border areas are preserved.

2. Scattered point interferences are effectively smoothed out.

The essence of this method is to move through the image with a window, and the value of the center point is replaced by the value that appears when the values in the window are sorted by size. That is, if there are 5 in the center of the 3x3 window, 35, 40 on both sides, 1, 41, 52 above them and 23, 17, 89 below them, we sort them: 1,5,17,23,35,40,41,52,89 . The value in the center is 35 [5].

The result of this method largely depends on the surface of the window (or more precisely, the number of points on it) and the value, for a two-dimensional window, the shape of the window (rectangle, triangle, round, cross, circle, square, etc.) have. It is often worked with square windows of size (kQ1)x(kQ1), where k is an even and positive number. The median method is more effective in removing local (spurious) interference. Interferences whose size matches the filter size are completely lost. For example, interference consisting of three consecutive points in a line is completely removed using a one-dimensional 1x7 window filter, that is, interferences of size 1x1 (1≤k) are completely removed using a window of size 1x(2kQ1) loss is possible, if 1>k the interference does not change. Also, the median method does not change the background points.

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Indeed, if the light of the built -in interference point in the center of the window (for clarity, let's say that of the background a<) is a sequence of window points ordered according to the increase in value, and from there the number of lights a is the number of lights , then if the interference points are completely lost, if and all the interference points lie on the same side from the window center, they remain unchanged.

Now we can see that the background points will not change. Let the background point be in the center of the window. If we say that the background points are scattered over the image, then each window does not have more than one interference area (consisting of one or more points), which means that the center and either the right or left half of the window consists of background points , and as a result they remain unchanged [6].

For a two-dimensional window, the situation is slightly different. The fact is that the median method can miss a part of the object much larger than the window size k. But the points that "move into the background" consist of elements of a part near the boundary of the object, usually these are corner points.

At the same time, if there is a number of interference points and the interference area is not larger than half of the window area, this interference is eliminated. In filtering with the median method, interferences (or objects) consisting of points and interferences intersected by no more than k rows or columns are lost [7].

The number of object (interference) elements in the window will remain unchanged. The reason we say this is that a window can always have either only background points, or background and one object interference points. If the constraint consists of points , the window cannot intersect these points more than) times and the window area is less than half.

If the interference domain intersects the line, each window (kQ1) will have different line segments that do not intersect the interference domain. Although these discussions are made for the case where the background and object are homogeneous, they are also relevant for natural phenomena of random interference. [8].

Two-valued or binary representations have finite class interference due to their simplicity compared to multi-valued ones. Logical filtering methods are mainly used to lose them.

Algorithms of these methods are heuristic, that is, the user gets filter parameters depending on the quality of the source image. Interference in dual-valued images is mainly due to four reasons:

1. Contamination, that is, interference in the original copy of the image;

2. Poor painting quality;

3. Small errors in the process of entering the image into the memory;

4. Mistakes such as wrong selection of the threshold for converting multi-valued images to dual-valued images are caused [9].

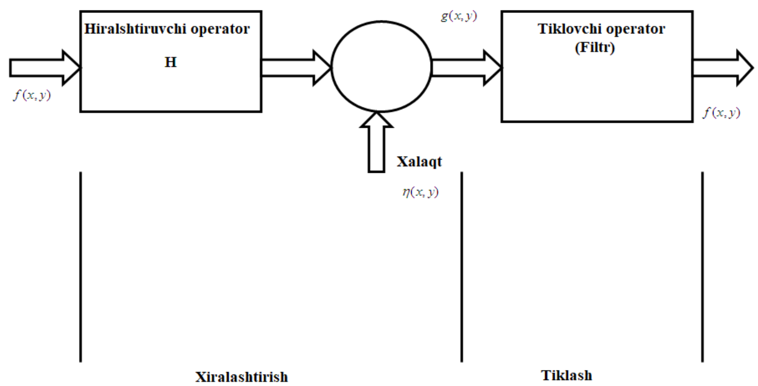

Figure 1. Modeling the image blurring/restoration process

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Image filtering commands in MATLAB environment:

conv2 - image comparison

convn - N-dimensional signal comparison

convmtx2 - calculation of comparison matrices

filter2 - two-dimensional linear filtering

freqz2 - two-dimensional AFR

fspecial is a predefined filter mask assignment

fsamp2 - form a linear filter mask according to AFR

ftrans2 - formation of a mask of linear filters by the method of frequency exchange

fwind1 - AFR custom linear filter masking using a one-dimensional window

fwind2 - AFR custom linear filter masking using a two-dimensional window

blkproc - image block processing

bestblk - determine block size

nlfilter is a combined nonlinear filter

colfilt - optimized filter operations

im2col - replace image fragments into a column

col2im - replace auxiliary images

ordfilt2 - color filtering

medfilt2 - median filtering

wiener2 - Wiener adaptive filtering

roifilt2 - filter area of interest

imfilter - filtering of two and multidimensional images

freqspace - detection of samples in two-dimensional frequency domain

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