

**PROCESSING OF DYNAMIC IMAGE SEQUENCES****BeknazarovaSaida Safibullayevna<sup>1</sup>, Nuraliyev Nurbek<sup>2</sup>, Salimov Mirzohid Muhammadjon o'g'li<sup>3</sup>,  
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Khwarizmi, Tashkent, Uzbekistan<sup>2,3,4</sup>**ABSTRACT**

The article describes an adaptation of the brightness control mechanism for processing dynamic image sequences, that in video codecs, the main compression of the video stream is provided by eliminating inter-frame redundancy using motion compensation methods for image fragments of adjacent frames. However, the use of motion compensation methods requires the formation of additional data (metadata) containing information about the types of image blocks used, the coordinates of their movement, etc. At the same time, in order to increase the compression of the video stream without compromising its quality, higher accuracy of motion compensation is required, which leads to an increase in the number of blocks and, accordingly, to an increase in the volume of metadata that reduces the effectiveness of motion compensation. This is the main problem of compressing streaming video without degrading the quality of images. In addition, the higher accuracy of positioning blocks with motion compensation dramatically reduces the speed of image processing, which is not always feasible in real-time systems. Therefore, MPEG-4-10 codecs use a rectangular block structure of variable size, which provides acceptable image quality at speeds of more than 3 Mbit/s.

The widespread use of digital video surveillance systems leads to the need for the constant processing of digital signals in the form of a digital image. Modern video monitoring lines are based on the latest technical means that allow digital processing of the received video image [1]. Digital video surveillance is effective because its operation can be linked to computer systems. One of the main tasks that digital video surveillance systems solve is the task of providing video monitoring of the observed object. In video monitoring and access control systems, the processing and identification of digital images should be as fast as possible. The autonomy of objects of digital video surveillance systems imposes restrictions on the size of such devices and their energy efficiency. For this reason, there is a continuous search for new, better, and more reliable means of digital signal processing (DSP), as well as the improvement of known processing methods [2-4].

On the other hand, video surveillance systems that work directly with digital signals in the form of an image must solve three main tasks that arise during the operation of the system. These tasks consist of processing, storing and analyzing the digital signal received at the input [3]. The task of signal processing requires the use of effective digital filters in the objects of digital systems, which in turn change the image in accordance with the processing algorithm used. The analysis of the digital signal in video surveillance systems consists of the recognition (identification) of the received signal in the form of an image [6]. Thus, solving the problems of image processing and its analysis are closely related, since the use of advanced processing methods will improve recognition results [3].

In turn, the solution of the designated tasks facing the objects of digital video surveillance systems impose certain conditions on their development. There is a contradiction between the need to design the main computational structures of video surveillance objects, allowing, on the one hand, to best transform the processed image for further pattern recognition, and on the other hand, to minimize the time spent on their processing in real-time [3, 4]. The solution to this contradiction is the parallel organization of computing, which is a promising tool in solving the problem of minimizing the time required for processing. One of the ways to ensure the parallel

execution of operations at the arithmetic-logical level is the use of non-positional number systems instead of the traditional binary number system, which is a positional number system.

The purpose of the research is to develop mathematical models, methods and algorithms for improving the speed of digital image processing filters of video surveillance systems based on the integration of a system of residual classes and analyze an adaptation of the brightness control mechanism for processing dynamic image sequences.

A significant scientific contribution to the theory of modular computing and its applications were made by domestic and foreign researchers: I.Y. Akushsky, D.I. Yuditsky, V.M. Amerbayev, A.A. Kolyada, A.I. Galushkin, I.T. Pak, M.V. Sinkov, V.A. Torgashev, N.I. Chervyakov, I.A. Kalmykov, O.A. Finko, D. Svoboda, N. Szabo, M. Valach, H.L. Garner, A.S. Fraenkel, A. Huang, B. Purhami, W. Ienkns, H. Krishna, A. Omondi, A. Premkumar, I. Ramires, A. Curcik, L. Yang, D. Zhang, P. Steffan, G. Pirlo, L. Sousa and others.

Additionally, the quality of images is indirectly affected by the amount of compression of audio signals, since both video and sound are transmitted in a single stream at a speed of 2 Mbit/s. At the same time, the volume of audio information, depending on the sound quality, can reach 10-20% of the video. Therefore, we must strive to increase the compression of audio signals. In this regard, the works aimed at improving the methods and algorithms of compression of streaming video and sound, to increase the compression coefficients without a noticeable decrease in the quality of the restored images and sound are of great scientific and practical importance.

Currently, one of the most important issues is the formation of digital television images, based on them, the improvement of the image processing control system, methods of numerical models and algorithms for solving problems of filtering various digital television images using Fourier and wavelet methods. Purposeful scientific research is being carried out in this area, including close attention is paid in the following areas: improved method of classification and selection of criteria for monitoring and evaluating image quality, methods for controlling image clarity at given values of medium intensity pixels, creation of algorithms for modeling the image processing process, methods for controlling the processes of ensuring the level of clarity of a television image.

In the world, scientific research is being conducted to improve the quality level of digital television images, methods for modeling filtration processes and highly efficient control systems in a number of priority areas, including on the formation of mathematical models of filtration processes, improving the methods of wavelet, Fourier, Haar, Walsh-Hadamard, Karhunen-Loev in increasing the clarity and brightness of images based on linear and nonlinear differential equations; creation of methods for eliminating additive, pulsed and adaptive-Gaussian types of noise in images using additive and adaptive filtering; methods of algorithms and software for introducing intra-frame and inter-frame image transformations; methods of adaptive brightness system control using Chebyshev matrix series; methods of gradient, static and Laplace methods for image segmentation and separation into contours; formation of criteria and conditions for assessing image quality [4].

To increase the performance of the algorithm, it was decided to use the previously found control parameters to correct the brightness of the image on the frames following the reference one.

However, before such use, it is necessary to take into account that the image defect for which the brightness is adjusted could shift from its initial position in one direction or another in the following frames. To compensate for this displacement over the new frames, a procedure should be performed to localize the new position of the image defect, as a result of which new coordinates of the corrected area will be obtained.

To localize the new position of the image defect, the method of comparing image sections by key points was used. The essence of the method is as follows: after determining a new correction area, the colors and the

relative location of the reference points of this area are remembered (the so-called signature of the reference points), then, when localizing this area on new frames, in the vicinity of the initial position of the corrected area, a search is carried out for points whose color and relative location will coincide as much as possible with the previously fixed signature of the reference points of the corrected area. This method is quite effective, but at the same time it has some drawbacks, in particular, it can confidently recognize only linearly moved areas of the image that were not rotated in one direction or the other [5].

The search for new coordinates of the corrected area is carried out as follows: on a new frame, the tested area of the image is determined, the coordinates of which coincide with the original coordinates of the corrected area. Then the signature of the reference points is removed from it and compared with the previously recorded signature of the corrected area.

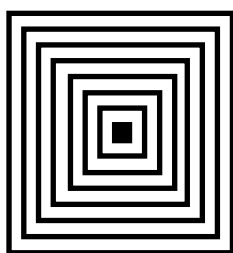


Figure 1. Testing squares.

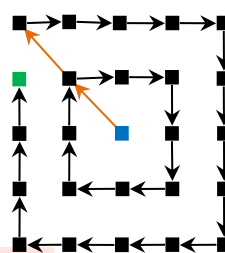


Figure 2. Traversing the first three squares of testing.

Orange arrows represent the transition between squares, blue square – the upper left corner of the corrected area, green – the end of the search.

In the event that the signatures match, the coordinates of the tested area are remembered and the search is completed, otherwise the tested area is shifted to the side according to the following rules: if its upper-left corner is in the upper-left corner of the testing square and the current square has already been completely passed, then the transition to the next testing square occurs, otherwise the area is shifted clockwise along the perimeter of the testing square. The testing square here is considered to be sequentially arranged squares centered at the location of the upper-left corner of the corrected area, each subsequent square is two pixels larger than the previous one, the smallest square has a side of 1 pixel, the largest is determined by the value specified in the search width field in the program window.

The quality, accuracy and speed of determining the new position of the corrected area largely depends on the correctness of the choice of the number and location of reference points: if there are too few of them, there may be false positives due to the fact that individual areas in the image may coincide enough to determine them by reference points as identical, however, too many points, although it reduces the probability of false positives, instead increases the number of operations required to determine the identity of the corrected and checked areas. It follows from this that the number and relative location of reference points should be selected in such a way as, on the one hand, to exclude false positives, and on the other, to minimize the resource intensity of determining the identity of the tested areas [6].

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