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IMPROVEMENT OF THE RELIABILITY OF IMAGE RECOGNITION WITH THE USE OF A WAVELET TRANSFORM

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The authors suggest a new technique for improvement of recognition reliability. The procedure is based on analysis of an image at several degrees of detail produced in the course of discrete wavelet transformation of the image. The results are presented by efficiency analysis of the algorithm for recognition of images by their distinctive points.

Creation of effective systems of navigation and orientation of flying vehicles by video-images of the Earth's surface depends substantially on the availability of highly reliable and efficient methods of pattern recognition. The main lines of inquiry are as follows: coding of images permitting reduction of the dimensionality of the image description by eliminating insignificant fragments; and development of such sets of criteria, which could lead to high-speed algorithms of recognition of visual images showing robustness with respect to many interfering factors.

In the task of image processing, of importance is the problem of detection and identification of group low-contrast objects against noise-bearing images, since it does not always happen that the available algorithms guarantee the required quality of recognition of such images. In this connection, it would be appropriate to reduce the algorithm of recognition of sophisticated images to analysis in several different scales of resolution of the objects to be recognized. To lower the redundancy of the data under processing in such an algorithm, the identification of group objects, in the event of their great number, may be performed judging by their coordinates of a group's center rather than by the object shape, i.e., based on description of the image to be recognized with the aid of a group of distinctive points (DP). This method of recognition based on certain criteria, such as DP, also makes it possible to lower the impact of noiselike interference. In order to eliminate the procedures of preliminary alignment of the initial and reference images, we suggest performing the recognition of a group of point targets along the contour associated with the coordinates of the points in a continuous manner (association in continuous manner —ACM) [1]. In other words, the contour takes the form of a 1-connected figure, and the recognition algorithm becomes invariant with rotation and scale of the image.

The method of coding the images by DP, which is suggested in the recognition algorithm, is based on the results of the contour analysis in combination with the algorithm of discrete wavelet transformation of images (DWTI) and the threshold filtering procedure (TFP), which makes it possible to analyze the initial image at different levels of resolution. In this event each DWTI iteration carries out a space-scale transformation resulting in approximation of the initial image with the resolution reduced by half. The form of the approximation produced depends only on the wavelet used in DWTI [2–4]. This transformation makes it possible to build a system of pattern recognition based on the ability of human vision to decompose the frequency range of the visible image under analysis into bands with different frequencies and a certain orientation. In such a system the image is decomposed into a number of images each containing information concerning only the objects with certain physical dimensions, i.e., we create a wavelet pyramid [5]. Every level of this pyramid is formed by a sequence of approximations of the initial images, where each approximation is distinguished with its own

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