

COMPRESSION OF IMAGES ON THE BASIS OF AUTOMATIC AND INDISTINCT CLASSIFICATION OF FRAGMENTS

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The paper in question has suggested and investigated the method of image compression based on automatic and indistinct classification of fragments of various dimension which allowed one to decrease essentially, several times, the volume of data for images saturated with details, for example prints of seals as compared with results obtained by methods based on cosine and wavelet-transformations.

Let the totality of p -dimensional vectors X be given. One is to partition it into the given number of classes k so that the sum of intraclass variances would be minimal. In other words, it is necessary to find the partition $S = (S_1, \dots, S_k)$ of totality X and the set of vectors e_1, \dots, e_k (called the centers of classes) such that the minimum of the functional

$$F(S) = \sum_{l=1}^k \sum_{x \in S_l} \|x - e_l\|^2,$$

would be obtained, where $\|v\|^2 = v_1^2 + v_2^2 + \dots + v_p^2$ is Euclidean length of the vector $v = (v_1, v_2, \dots, v_p)$ for any vector v of X .

The indistinct classification of the set X of p -dimensional vectors by k classes $S = (S_1, \dots, S_k)$ suggests the association of each element x from X of the set k of nonnegative numbers $(a_1(x), a_2(x), \dots, a_k(x))$ amounting to 1. These numbers are called the coefficients of belonging to the class and can be treated as probabilities of the given element belonging to one or the other class. The basic advantage of the compression algorithm based on automatic classification is its very high speed and efficiency of encoding background structures. By degree of image compression of portrait type image this algorithm yields to the algorithm based on LPG-technologies for small values of MSE (<12 %). When processing contrast images with small number of halftones, like seal images, the compression coefficient under admissible distortions attains the value around 20, whereas the methods based on cosine and wavelet-transformations give 4-6 times compression and those with indistinct classification —13.7 times.

The efficiency of image encoding in the region of small MSE for methods based on indistinct and automatic classification is almost identical. In the region of large MSE (> 12 %) of obvious advantage is the method of indistinct classification but requires much more time of processing.