Method of Images Segmentation by Dynamic Spectral Characteristics

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Abstract—In considered method we use basic principles of biometrics and bioradiolocation for solution of the problem of images segmentation. Using dynamic spectral characteristics, obtained by means of wavelet spectrum we extract biometric indicator in form of signal of brightness pixels modification at the face skin part, specified by heartbeat. It is proposed to use quasi-matched wavelet filters for efficient selection of human heartbeat signal and it is shown the possibility of its frequency measurement practically at real-time mode. Obtained results can be used for many medical applications, security systems, object identification, etc.

Development of computer vision now is avalanche-like. Great commercial success of automated systems of recognition of faces, gestures, pedestrians, etc. predetermines development of new algorithms for computer vision systems becomes topical.

Specificity of all recognition systems is increased requirements to hardware productivity, especially when there are increased requirements to the recognition accuracy and learning set size is large [1]. Arbitrary recognition algorithm is characterized by restricted productivity and definite probability of erroneous solution [2, 3].

For problems of recognition of faces or gestures using two-dimension images, including preliminary image processing, selection of interested area, segmentation by features and decision about belonging to definite images class, there are restriction in application of obtained solutions. For example, in the systems of faces recognitions by skin colors features for segmentation of images parts belonging to the human face there are used skin features in color space HSV and color-difference filtering. This color basis gives invariance to the object illumination. But in case of operation with images of people with different racial feature the segmentation algorithm is essentially complicated and whole system performance decreased. At that in case of match of background color at the image to skin color the system malfunction is observed.

In [4, 5] it is proposed new approach in essence to problems of faces or gestures recognition by application of three-dimension models. In this case there are obtained essentially better recognition result for images where the face or gesture is rotated from the recognition camera with great angle. The cost of mentioned advantages is great requirements to the hardware, including cameras amount, great calculation productivity, etc. but in this case of operation with color features the mentioned problems can be solved both using greater cameras amount and three-dimension model application, these problems are defined by segmentation algorithm.

From the other hand it is clear that in case of images segmentation by color features the problem of face or gesture selection on a background with analogous color. In this case the problem of detection of face or gestures of people with different face colors requires essential expansion of the range of color-difference filters, i.e. the system complexity increases and recognition reliability decreases.

As an example we consider the result of segmentation of color RGB image of 576×720 24 bit (Fig. 1a) where pixel values of the human face are close to values of background pixels and pixels of other inanimate objects. In Fig. 1b the pixel values, belonging to the range of R(120:160) ∪ G(60:140) ∪ B(60:160) where substituted by the value of 255, corresponding to white color, the other ones are assumed zero.

Obtained result is satisfactory if the problem is segmentation of the faces at the image. The simple algorithm with morphological processing can select with confidence two faces: the person (in the left) and the face at the photo. For the problem of recognition of the faces obtained result is satisfactory, but for