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TEXTURE FEATURE EXTRACTION METHOD BASED ON GRAYSCALE RECOGNITION

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Аннотация. The quality of feature extraction has a great impact on the accuracy and efficiency of image recognition. Traditional image texture feature extraction consumes a long time and the efficiency is low. Therefore, a new method based on gray image is proposed in this paper. The texture feature image is collected, and then the gray processing is carried out, so the image texture feature extraction based on gray recognition is realized. Through a large number of experiments, the results shows that the new method has high speed and efficiency.

Ключевые слова. Grayscale recognition; texture features; feature extraction.

Currently, there are very many kinds of image features, and image texture features are one of the most basic ones. In image recognition technology applications, technicians can efficiently recognize images based on their texture differences. At present, image texture recognition techniques are widely used in industrial and agricultural production, etc [1]. The purpose of image texture recognition is to extract the texture features of different images. The texture features of images are very complex, and the traditional texture feature extraction methods are slow and have low extraction efficiency. Grayscale recognition is a special feature extraction technique that can greatly improve the extraction efficiency of image textures. Therefore, this paper designs a grayscale recognition based image texture feature extraction method.

The captured color image pixels are composed of 3 color components: red, green and blue. In order to reduce the complexity of the image to be processed, the acquired color image needs to be grayed out to reduce the difficulty of image processing and shorten the recognition processing time. In this paper, the grayscale transformation method is used to grayscale the image to be processed and convert it into grayscale image digital information to reduce the storage space occupied by the original image. Although the grayscale processed image reduces the difficulty of feature extraction, there is still a pixel point transformation problem. Therefore, this paper designs a grayscale co-occurrence matrix to increase the effectiveness of texture feature extraction by further judging the position relationship between pixel points. From the relationship between image pixels, it is known that there is a joint distribution factor between adjacent pixels, which can be used to determine the spatial relationship between pixels, and the quality of grayscale processing of the image can be further ensured by judging the information difference between pixels through the design of a symbiotic matrix [2].

Before the image texture feature extraction is implemented, the image needs to be binarized and edge detected. The values of the pixel points in the image are uniformly set to a fixed data format, and the binarization segmentation is performed using the thresholding method to ensure that the threshold value is within the pixel target range at this point. While retaining the original features of the image, the texture features of the image are initially extracted in order to further reduce the image complexity.

In order to verify the extraction effect of the image texture feature extraction method based on grayscale recognition, it is compared with the traditional image texture feature recognition method. The simulation experiments were conducted by Matlab 2020a software using a computer with Intel(R) Core(TM) i7-7200U@2.50 GHz CPU and 20 GB memory, and the specific experimental steps are as follows.

400 raw photos of chip images captured by industrial cameras were randomly selected for texture feature extraction test. The pixel size of the raw images was uniformly adjusted to 200×200 and normalized, and the normalized data were subsequently used as the data set. The home-made color images of the chip are selected as the data set, and uniform standard experimental parameters are set. To ensure the test images match the actual extracted information to the maximum extent, information processing is performed on the acquired images. All images are divided into grid blocks of the same pixels, and a nearest neighbor classifier is used to verify the validity of the evaluated color texture images. The experiments were cross-validated using the leave-one-out method, i.e., all the sample images were used as the training set except for one sample left as the test set image. After repeating the experiment 5 times, the average value is taken as the final result. In this experiment, three types of images are selected as the original images, the first type is the color image of the building surface cracks taken by ourselves, the second type is the image on the randomly selected color chip data set, and the third type is the image in the standard data set Colored Bordatz. The extraction results of the three types of images are compared below, and the results are shown in figure 1, figure 2, and figure 3.

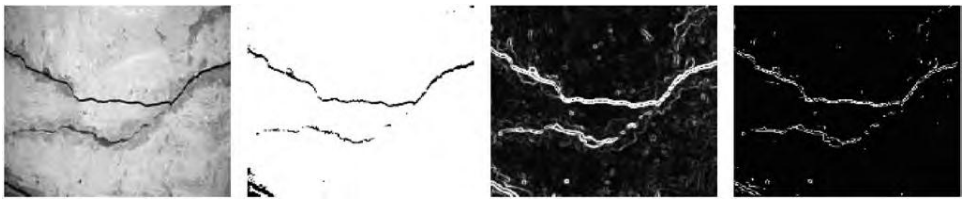

Figure 1 – Extraction results of the first type of image

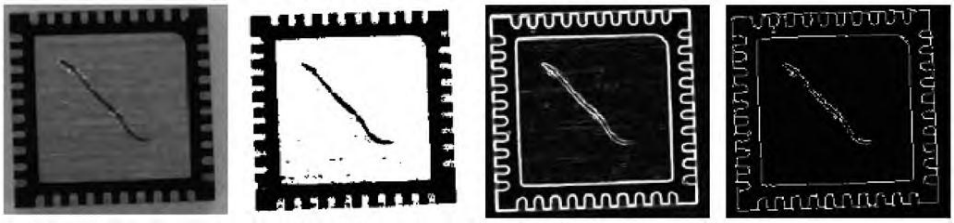

Figure 2 – Extraction results of the second type of image

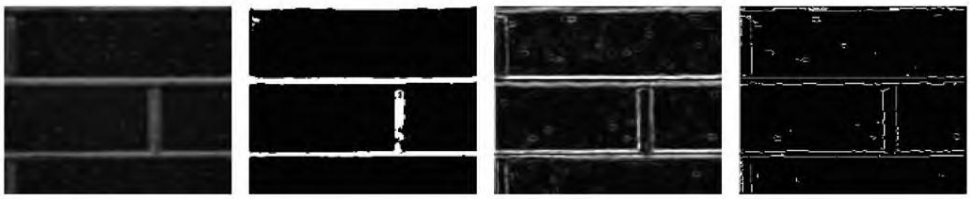

Figure 3 – Extraction results of the third type of image

Tests were performed on the standard color dataset Colored Bordatz, which contains a large amount of color and texture content. It consists of 1792 samples of size 160×160 pixels, divided into a standard data-set consisting of 112 texture classes (16 samples drawn from each class). A total of 112 image samples containing different texture classes are selected for the experiment, and 10 images to be tested are extracted for detection. If the detection length value is higher than 0.1, it is proved to meet the subsequent testing requirements. The size detection results of serial numbers 1 to 10 are 0.565, 0.366, 0.264, 0.367, 0.547, 0.632, 0.469, 0.355, 0.415 and 0.326, respectively, which are all higher than 0.1 and prove that the selected images meet the requirements of the testing experiment and the texture features are extracted reasonably.

The experiments were performed on three color images with grayscale transformation and binarization, respectively. For extraction convenience, the technicians performed edge detection on the images and feature extraction. The experimental results show that the grayscale based recognition method helps to extract the features of the images to be detected.

Список использованных источников:

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