9. The whole logistics chain realizes online collaboration.
10. The automation rate of rural outlets has increased dramatically.

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AN IMPROVED LBP ALGORITHM IN FACE RECOGNITION

Wang KaiYu, Li Hao
Belarusian State University of Informatics and Radioelectronics
e-mail: wkyaixuexi@163.com, lhself@163.com

Summary. *Local Binary Pattern (LBP) is an algorithm that can be effectively used for face description and has made great contributions to research in the field of face recognition. This article introduces an improved LBP algorithm.*

The main purpose of LBP is to provide a simple and effective method to capture local texture information of images. It does this by comparing the intensity values of each pixel in the image with its neighbor pixels and generating a binary code based on the comparison. LBP has the advantages of high computational efficiency, strong robustness, and invariance to rotation changes, so it has been widely used in the fields of computer vision and image processing. In subsequent research, the LBP algorithm was expanded and improved to cope with different types of tasks and application scenarios, such as facial recognition, action recognition, and scene classification. This article introduces an improved LBP algorithm for face recognition.

The traditional LBP algorithm directly calculates the center pixel value as the threshold value, which only considers the influence of the center pixel, and it is easy to obliterate the details when the center pixel value is too large or too small. Therefore, this paper proposes an improved LBP algorithm that considers the effects of both the center pixel value and the neighbor pixel value. Specifically, the method calculates the neighborhood. If C is within the limit, the center pixel value is selected as the threshold value and the LBP value is calculated, which fully considers the role of the center pixel value and the neighboring pixel value, and effectively removes the influence of the center pixel value that is too large or too small on the image feature extraction and more accurately describes the local image features; otherwise, the median value of the neighboring pixel and the center pixel is selected as the threshold value, and a comparison is made to reduce the influence of the noise points. comparison is made to reduce the influence of noise points. The specific process is as follows.

1. Construct a 3-pixel × 3-pixel window and calculate the sum of squares C of the difference between the neighboring pixel value and the center pixel value in the window, denoted by

$$C = \sum_{P=1}^{8}\left(g_p - g_{i,j}\right)^2, \quad (1)$$

where: is the neighborhood pixel value; , is the center pixel value.

2. Set the limit value of C as W, judge the size of C and W. If C ≤ W, select the center pixel value as the threshold value and calculate the LBP value, i. e., use Equation (1) to calculate the LBP value; when C > W, select the median of the 9 pixel values as the threshold value and calculate the LBP value, expressed as

$$LBP(x_i, y_i) = \sum_{p=1}^{p} s(x)2^{p-1} s(x) = \begin{cases} 1, g_p - g_M \geq 0 \\ 0, g_p - g_M \langle 0 \end{cases} \quad (2)$$

where: is the neighboring pixel point; is the neighboring point pixel value; is the median of 9 pixel values; is the binary function, LBP is better robust to local area illumination, and after many experiments, the recognition rate is higher when W is 200.

3. Calculate the LBP value in step.

4. To get the LBP feature image.

5. Count the number of times the LBP value appears, and get the LBP histogram.

Comparative verification of the LBP algorithm before and after the improvement is performed using the Yale face database.The Yale face database has 15 people with 11 images each, and the image size is 100×100 pixels.The experiments change the number of each person in the training samples (from 3 to 10), and the rest are used as the test samples to compare the recognition of the LBP algorithm before and after the improvement.

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RESEARCH AND APPLICATION OF MICROWAVE MOISTURE SENSOR INFORMATION COLLECTION SYSTEM

Wang Shuhao
Qingdao Agricultural University
e-mail: shuhaow@163.com

Summary. *Methods for determining moisture content can be divided into two types: direct measurement and indirect measurement. Among indirect measurements, nuclear magnetic resonance, infrared radiation and radio waves are the most commonly used measurement methods. At microwave frequencies, moisture will be polarized and oscillate, and the transmitted microwaves will be scattered, projected, reflected, etc. Therefore, the moisture content of crops such as grain can be determined from measured parameters.*

Destructive methods are used to detect grain moisture content because the main body of grain must be physically crushed or the organic composition of the crop itself must be changed during the detection process. The method of non-