Pattern kernels에 의한 Lip Print 인식 연구

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A Study of a Lip Print Recognition by the Pattern Kernels

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Abstract - This paper presents a lip print recognition by the pattern kernels for a personal identification. A lip print recognition is developed less than the other physical attribute that is a fingerprint, a voice pattern, a retinal blood-vessel pattern, or a facial recognition.

A new method by the pattern kernels is pro for a lip print recognition. The pattern kerne function consisted of some local lip print p masks. This function identifies the lip print known person or an unknown person.

The results show that the proposed algorith the pattern kernels can the efficiently realized.

1. Introduction

Biometric systems are technologies that use unique human physical characteristics to identify a person in some way, and have sensors that pick up a physical characteristic, convert it into a digital pattern, and compare it with stored patterns for personal identification.

Biometric measurement systems typically include voice recognition/verification, fingerprint identification, palm prints, hand/wrist vein patterns, retinal/iris eye scans, hand geometry, keystroke dynamics or typing rhythms, and signature verification.

Biometric systems can be used for identification purposes involving security access systems in management information services departments, government agencies, ATMs /banks, law enforcement, prisons, international border control, and military agencies.

A lip print is included among measurements of biometric systems [1]. Each person's lip has unique lip print and differs from the others. In this paper, a new personal identification method is proposed by the lip print by pattern kernels. Pattern Kernels use some local masks for analyze and identify a lip print. The discrimination criteria either recognize a person of the input image from classes or reject him if the input image is unknown.

The next section shows the pattern kernels method and the discrimination criteria.

2. The Pattern Kernels

This section presents the pattern kernels that analyze a lip print with some local pattern masks.

Fig. 1 illustrates the block diagram of a lip print recognition system. The input image of lip print is acquired by the CCTV camera with 8 bits gray scale.

Because of some noise of camera and needing of emphasized image information, the input image is preprocessed with histogram equalization.

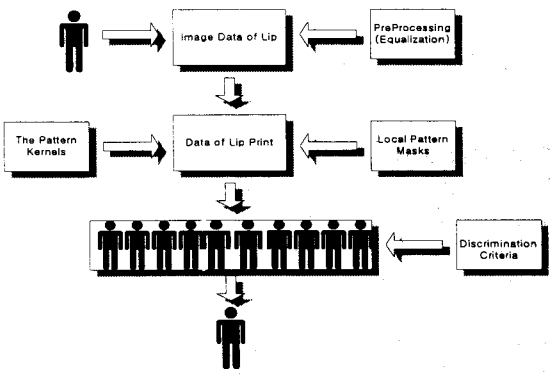

Fig. 1 The block diagram of a lip print recognition system

2.1 Local Pattern Mask

The local pattern mask is designed on 4x4 pixels, and extract the uniquely local pattern information from the preprocessed input image.

Some examples of local pattern mask are shown in Fig. 2, in which the arrows represent the relation between a pixel marked in white and a pixel marked in black. The relation is designed on a difference of pixel value.

The image of a lip print has a vertical or horizontal or diagonal edge that is called as a

lip print. A pixel value of the lip print has lower than other pixel value. (A gray value of the black pixel is 0 and a gray value of the white pixel is 255)

Each pattern mask is scanned over the entire input image, and the mask is compared with the input image. If the mask is matched with the region of the input image, the pattern kernels is computed in the region. The local pattern mask represents the pattern consisting of lip print's pattern.

The Fig. 2 shows that the mask 1 denote the horizontal pattern, and mask 3 denote from the horizontal to the diagonal direction pattern. The mask 9 denotes east-south direction pattern. The pattern of a lip print mixes all local pattern masks in limited region.

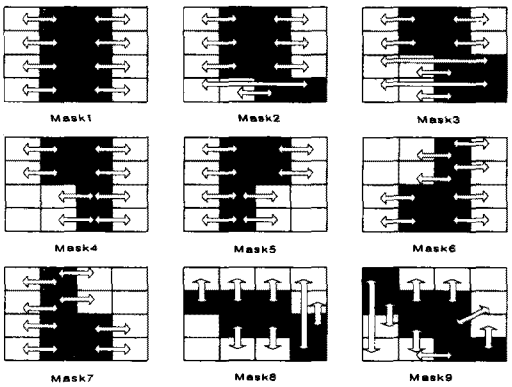

Fig. 2 The example of the local pattern masks

2.2. Pattern Kernel

The pattern kernels used throughout this paper consist of some kernels. Each kernel extracts a uniquely global pattern information on the input image.

It is important that the kernel acquire the global pattern information. A lip print is represented by the global pattern information. The pattern kernels use some masks to analyze the local pattern information.

The characteristic of a lip print is explained by three measures. The first measure is its length. The second measure is its frequency. The third measure is its shape. The pattern kernels must recognize these measures and convert them into digital data.

Therefore, the design of the pattern kernels are based on these measures. If any pattern of the object is detected by the local pattern mask, a kernel of the detected pattern is executed. All the products corresponding to a kernel are stored so as to provide the pattern information. This operation is performed using the 5 different pattern kernels, thus providing the 5-information vectors.

Fig. 3 illustrates the flowchart of the pattern kernel 2 that uses to provide the east-south direction pattern information. The mask(m)[i][j] denotes the local pattern mask representing the m^{th} 4x4 mask of the location[i][j] (i = row, j = column).

The C2 denotes the counted number of matching the mask(m) that is represented by coefficients of the direction pattern information.

Therefore, the length of a lip print is measured by the C coefficient. The frequency of a lip print is measured by the matched number of the pattern kernel. The shape of a lip print is measured by the matched number of the pattern kernel that describes any pattern print. These measures are stored in the information vector.

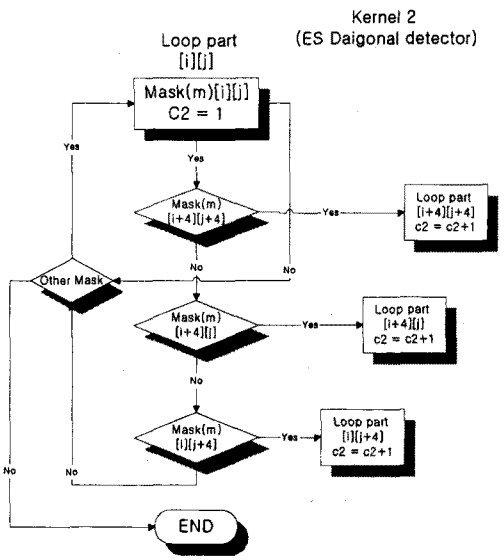

Fig. 3 The flowchart of the pattern kernel 2

2.3 Discrimination Criteria

The discrimination criteria discriminate a information vector of the input image from other vectors. The input image is transformed the 5-information vectors. The vectors consist of three part that is personal information, kernel name, pattern information and are row-vector.

Vector of Kernel (I)	Personal Information	Kernel Name	Pattern Information

(I = 1, 2, . . . 5)

Table. 1 The information vector structure

Table. 1 shows that the personal information denotes personal name, and the kernel name denotes the specific pattern kernel, and the pattern information denotes the pattern kernel's value.

Equation (1) illustrates discrimination criteria of the information vectors. A threshold value is set on the minimum value between the specific information vector and the information vector. If T exceeds a threshold value from the information vector, the specific information vector is rejected.

$$T = \sum_{m=1}^{N} \sum_{p=1}^{5} \frac{(K_p^s - K_p^m)}{(K_p^s + K_p^m)} \qquad (1)$$

K_p^s = the specific information vector

K_p^m = the information vector

3. Conclusion

Some examples of a lip print are shown in Fig. 4, in which the picture illustrates the various pattern of the lip print.

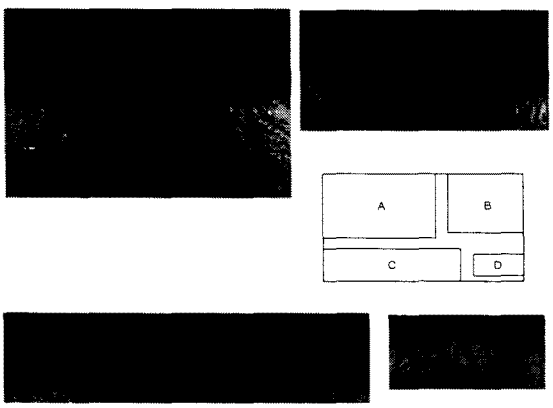

Fig. 4 Some sample of the pattern of a lip print

Fig. 4(A) shows the complex pattern of the lip print. The pattern of picture is consisted of the horizontal direction pattern and the vertical direction pattern. The pattern kernel 1 with a vertical detector and the pattern kernel 4 with a horizontal detector are used by this picture.

Fig. 4(D) shows the blurred pattern of the lip print. It is difficult to analyze the pattern of the lip print. However, if the combination of several pattern kernels is used, the characteristic feature of its blurred pattern can extracted.

The each picture has the various shapes and frequencies and lengthes of the lip print. These feature should be analyzed and transformed to get the discriminative data by the pattern kernel.

[Reference]

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