Chapter 4

Palmprint Recognition Based on Image Segmentation of Region of Interest

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ABSTRACT

To carry out an effective recognition for palmprint, this paper presents an algorithm of image segmentation of region of interest (ROI), extracts the ROI of a palmprint image and studies the composing features of palmprint. This paper constructs coordinates by making use of characteristic points in the palm geometric contour, improves the algorithm of ROI extraction, and provides a positioning method of ROI. Moreover, this paper uses the wavelet transform to divide up ROI, extracts the energy feature of wavelet, gives an approach of matching and recognition to improve the correctness and efficiency of existing main recognition approaches, and compares it with existing main approaches of palmprint recognition by experiments. The experiment results show that the approach in this paper has the better recognition effect, the faster matching speed, and the higher recognition rate which is improved averagely by 2.69% than those of the main recognition approaches.

INTRODUCTION

Rapid development of information technology has prompted the society progress, and the society gives a renewal and a further demand to the information technology. The occurrence of computer has prompted the development of network and society informationization. On the other hand, the networked and informationized society demands a higher security for the information and systems (Janarthanam, Rama-lingam et al., 2010). The body biometric recognition technology is to use the biological characteristics owned by the human body to carry out an automatic identification, biology recognition technique for
short, which is one of fundamental methods which are used for enhancing the security of information and systems. The palmprint recognition technology is an important part of the biology recognition ones (Yue and Zuo, 2010). Since the palmprint has a fine uniqueness and stability, as well as a wealth of texture information, the palmprint recognition technique has got a rapid development and been widely used in the field of information security. Currently, the palmprint recognition technique has been widely used in police department, military branch and so on. Therefore, the research on palmprint recognition technique is of important theoretical and practical significance.

Although the research of palmprint recognition started relatively late, it has also experienced stages of emergence, development and maturation during its development of more than ten years. Now it is experiencing the deeper and more detailed development.

In 1985, Matsumoto introduced the application of palmprint recognition in the field of identification firstly, however, without deeper research (Matsumoto, 1985). In 1991, Kovesip and Shiono gave an experimental result of identification using the comprehensive features of palmprint (Kovesip and Shiono, 1991). They proposed an identification method in combination with the palm shape and the texture of palmprint. In 1998, the idea of automatic identification by using palm recognition was described systematically and comprehensively by Hong-Kong Polytechnic University and Tsinghua University (Shu and Zhang, 1998), which summarized comprehensively the characteristic of palm and the palmprint and opened up the research areas of palmprint recognition technology. Based on high resolution palmprint images, Jane You et al used the point of interest in the palmprint to carry out identification (You, Li et al., 2002). Duta et al utilized the binarization and resampling approach to extract 300-400 characteristic points from a palmprint image, and implemented the palmprint recognition based on the location and direction of these points (Duta, Jain et al., 2002). Ze Zhang et al put forward the method of palmprint classification based on the triangular points formed by the papillary ridge in the area of lower part of finger roots (Zhang, Shu et al. 2002). In 2004 and 2006, Kong and Zhang D improved the Palmcode method by using 2-dimension Gabor filters (Kong and Zhang, 2004), (Kong, Zhang et al., 2006), and formed a new kind of palmprint feature code called Fusioncode. However, both Palmcode and Fusioncode do not contain the direction information of every point in palmprint, which reduces their distinguishing performance. Additionally, some fruitful researches had been implemented by many universities and institutes in the world.

Among algorithms of image segmentation (Xie, Wu et al., 2013), (Lo, Pickering et al., 2011), (Long and Younan, 2013), the Fuzzy C-Means clustering (Yu 2011) that was one of algorithms has some better features which can meet the human cognition pattern, be described concisely and clearly, be easy to implement and so on. However, this algorithm has some disadvantages such as its performance depends on the initial clustering center, poor antinoise capability, and slow convergence and so on. From the research of traditional Markov Random Field (MRF) known, the segmentation effect of MRF to micro texture was better, but the segmentation result to macro texture had many isolated islands or small areas.

The palmprint recognition approach proposed in this paper mainly focuses on the segmentation and extraction of region of Interest (ROI) of a palmprint image, and the concrete algorithm of segmentation and extraction is given. In the stage of feature extraction, this paper extracts the features of texture principal lines, papilla ridges and bifurcation points of ROI. At the same time, this paper divides up the ROI of palmprint image by wavelet transform, extracts the energy feature of palmprint and constructs characteristic vectors. In the stage of matching and identification, this paper calculates the distance between the characteristic vector of identified palmprint and that of known palmprint, and estimates
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