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Multi-Algorithm of Palmprint Recognition System Based on Fusion of Local Binary Pattern and Two-Dimensional Locality Preserving Projection

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Abstract

This work based on fusion of multi-algorithm used for palmprint identification system. This piece of work is primary addressing different mechanism like Competitive Valley Hand Detection methods (CHVD) which used for extract Region of Interest (ROI). While in feature extraction the work was divided into three scenarios based on feature extraction like Local Binary Pattern (LBP), Two-Dimensional Locality Preserving Projection (2DLPP) and fusion of LBP+2DLPP. The experimental results show that fusion of LBP and 2DLPP give the best result with high accuracy reach to 98.55% which improve by 1.22% and 2.85% for LBP and 2DLPP respectively when they are applied separately.

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1. Introduction

Today's the technology is grow day by day, in another side the security system also is increase related to the technologies. The biometrics recognition system is active research work nowadays, which including many biometrics characteristics such as (biological and behavior)[1],[2]. Conventional authentication methods such as passwords, PINs, tokens, and smart card no relevant for application on systems that require security high .The biometrics system replacing conventional methods by utilizing physical characteristics or behavior characteristics of human that actually represent a person's identity and advantages that are difficult to duplicate, stolen , and falsified[3]. There are three main challenges facing the biometric system [4], namely accuracy, scale, and usability. Various proposed ways to improve the accuracy of biometrics systems such as by combining more than one biometric characteristic for the introduction or referred to as multimodal biometric system [5]. Here let us first definition of palmprint which defines as a small area of palm surface which containing more information which is useful for person authentication system, in additional it has a unique feature (uniqueness means no two people has same this feature) also it called permanence it will not change in all period of time in the life. For this reason, palmprint are reliable and confident modality between the same categories of palmprint like fingerprint and face .etc.In the recent years, there are numbers of technologies were developed related to biometrics authentication system but the palmprint get less development depend on reliability and cost [6]. The palmprint approach can be classified into three categories depend on the palmprint image data type such as grayscale[7],[8], 3D[9]and multispectral. There are many of researchers working in grayscale image compare with the less researcher working in 3D and multispectral palmprint images. Recently the multispectral data are used in many areas such as face[10] ,iris[11] and palmprint[12]. The palmprint recognition system is most confident and reliable system compare with another biometrics modalities, also comparing with fingerprint, palm has a lot of feature such as minutiae feature which is a similar to fingerprint. The second feature is principle line feature which includes three types of lines: heart, head and life. Also it has texture feature. Furthermore there are geometry, wrinkle and Delta feature [1]. So this many features are inside the palm area .There are many problem of palm print like Skin distortion, Diversity of different palm regions and Computational complexity [13]. The increasing in security system the palmprint recognition system has applied with different feature extraction techniques, also with different results which are improving the performance of palmprint identification and verification system. There are various techniques of feature extraction is proposed to improve the performance of biometric systems among which the LDA, PCA, ICA, LBP, and the LDP [14],[15],[16]. This feature extraction technique are classify into 5 categories like local feature[17],[18],[19],[20],[21],statistical feature[22],[23],[24],[25],[26], appearance feature[27],[28], [29],[30],[31], texture feature [32],[33],[7],[34],[35],[36] and hybrid feature[37],[38]. The work concentrated on texture feature specially in Local Binary Pattern (LBP) [39], and Two-Dimensional Locality Preserving Projection (2DLPP) for use in identity recognition proven successful with high accuracy [40],[41]. The LPP techniques is one of appearance based approach for biometrics system. And the main objective of LPP is to preserve the local structure of the image space for this D.Hu et al[42] they are working on 2DLPP by extract the feature directly from images matrices, while the X.He et al[43] they are used LPP for image feature extraction and dimension reduction and apply to face recognition and called first one implemented this technique and they get good results. In general the 2DLPP technique use to solve the generalized Eigen values problem [43], also in another hand the 2DLPP required more coefficients which are one of the disadvantages of 2DLPP technique for image representation and recognition [44]. 2DLPP can apply in column direction with help of 2DPCA projection in row direction [45] and some of related work paper show in[45],[46],[47],[48]. This paper is arranged in four sections, the remaining sections will be explained the methodology given in section 2. In section 3 the Experiment and result analysis are given. Finally the conclusion and future work are given in section 4.

2. Methodology of the System

The system organized by different stages for identification proposed. These stages like acquisition stage, pre-processing stage, feature extraction stage, fusion stage, matching stages and finally the decision stage which applied over CASIA palmprint dataset. The figure 1 shows the block diagram of methodology process and the details of each stage are discussed in the next section.

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