Proceedings of
INTERNATIONAL CONFERENCE ON COMPUTING, COMMUNICATION AND ENERGY SYSTEMS
(ICCCES-16)
In Association with IET, UK & Sponsored by TEQIP-II
29th -30th, Jan. 2016

Paper ID: E&TC18

ROBUST TECHNIQUE FOR HUMAN IDENTIFICATION BASED ON FACE AND GAIT BIOMETRICS FOR SECURITY SYSTEM

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Abstract –Nowadays, face and gait identification system in video have been received in sufficient attention. In their identification problem have challenges due to their large varying appearance and high complex pattern distributions. In this paper the most important issue in face and gait identification is the feature extraction from their images and fusion of them. In face to identify person images, which is captured by camera when person is close to the camera and it is represented by active lines face landmark points (ALFLP) feature vector. On the other hand, gait is suitable for human identification at a distance and gait image represented by active horizontal levels (AHL) feature vector. Face and gait feature vector are fused using a proposed by effective fusion method. The experimental results expose the effectiveness of our proposed method against other identification methods to achieve better accuracies.

Keywords - Face identification, Gait identification, Feature level fusion and Biometric authentication

I. INTRODUCTION

Biometric based technologies include identification based on physiological characteristics are related to the shape of the body for examples face, fingerprints, finger geometry, hand geometry, hand veins, palm, iris, retina, ear, voice. Behavioral traits are related to the pattern of behavior of a person for examples gait, signature and keystroke dynamics. Biometric identifiers are the distinctive, measurable characteristics used to label and describe individuals.

Identification of face is individually performed number of times in every day. In many face analysis and face modeling techniques have progressed significantly in last decade. It is natural, intrusive and easy to use. The basic face information consists of landmark points is set of coordinates that describes facial feature like eyes, nose and mouth corners. Face is an important field for many identification techniques. It is considered as a biometric authentication in many surveillance systems. The most important issue in Face identification is the features extraction from the Face's images of the person's images.In this paper, the proposed method has been introduces o identify person images, which are captured by cameras. This method depends on the distance values between Face landmark points. Gain ratio feature selection has been used to choose the Active Lines that lead to the highest identification rate. The proposed method was evaluated against BioID face database, to identify person from one image.

Gait identification has recently gained attention as a method of identifying individuals at a distance. It utilizing gait as identification for the certain distinct phases and stances. Human gait analysis is applicable for different areas like surveillance, medical diagnosis, car parking, banks, and video communication etc. It can be detected in low resolution video and it recognizable from distance. Gait identification is a term used in computer vision community to refer automatic extraction of visuals cues that characterize the motion of a walking person in video for identification purposes. For the gait image, gait feature extraction is extracted by horizontal alignment.

The normal size of image will be done by proportionally resizing the each silhouette so that all silhouettes have same height. In gait person identification a new feature extraction algorithm is introduced. The extracted feature represents person's presence at different horizontal levels. Active Horizontal Levels are selected to create a set of horizontal levels that achieves the best identification results.

Multimodal biometric data used for the tasks sensory as well as non-sensory. The integration of multimodal biometric and their associated features or the intermediate decisions are perform an analysis task is referred to as multimodal fusion. Multimodal Biometric systems can be designed to operate in different scenarios: multiple sensors, multiple biometrics, multiple units of same biometrics, multiple snapshots of same biometrics, multiple representations and matching algorithms for the same biometrics. Thus, identification of the frontal face is generally easier than that of the side face. However the situation happens to be reverse in case of gait. It is easier to identify the side view of gait than frontal view gait due to the motion characteristics in the side view of a walking person. These complementary properties of face and gait inspire fusion of them to get more accurate results.

II. LITERATURE ON RELATED WORK

Image fusion is a technique that used to integrate multiple images into a single image to retain more features, so that

fused image is more suitable for the human visual perception and computer processing. The new image should have more accurate, more comprehensive and more stable information compared with the input images. The advantages of image fusion are improving reliability and capability. Image fusion is a powerful tool used to increase the quality of image. Image fusion technique classified into two categories: direct image fusion and multi-resolution image fusion. Multi resolution image fusion techniques based on pixel level fusion and feature level methods and direct image fusion technique based on decision level fusion. Levels of fusion are used for integrating data from two or more biometric systems. Fusion consists of image registration, which brings the input images to spatial alignment and combining the image functions in the area of frame overlap. Image registration works usually in four steps: Feature detection, Feature matching, Transform model estimation, Image re-sampling and transformation.

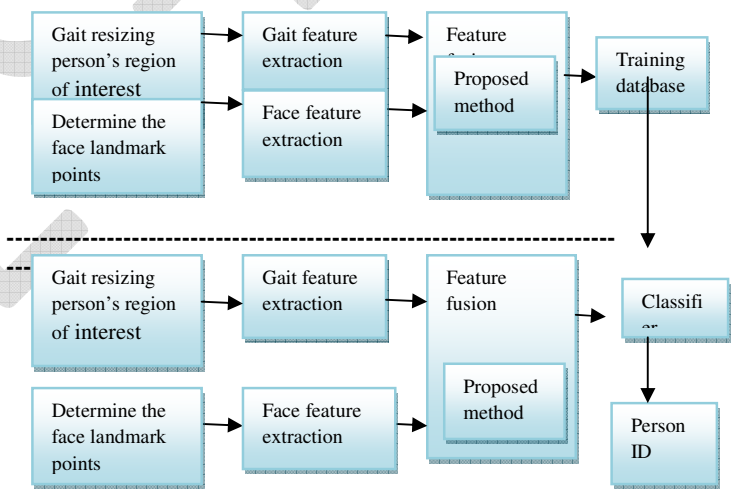
In feature level fusion method, the input images are first transformed to multi-resolution representations. The source images are segmented into adjacent regions and regions are extracted from the transform coefficients in each scale. For every segmented region some activity level are calculated and the regions are fused at all scales which are based on these activity levels. The fused image is obtained using the inverse transformation. In this feature-level methods are proposed that use soft computing algorithms to select the most important coefficients or regions from the source images, using the features extracted in transform domain. The feature level fusion attempt to process features within the image as the image feature and objects in the scene are more important than the individual pixels.

The discrete wavelet transform is one of simplest and commonly used in wavelet transform for image fusion. Discrete wavelet transform is a spatial frequency decomposition that provides a flexible multi-resolution analysis of an image. Discrete wavelet transforms (DWT), which are multi-resolution image analysis tools that decompose an image into low and high frequencies at different scales have been successfully used in a face and gait identification schemes as a dimension reduction technique and as a tool to extract a multi-resolution feature representation of a given face and gait image. The multi-resolution property of DWT enables one to efficiently compute a small sized feature representation that is particularly desirable for face and gait identification.

Presently there are several methods available on fusion of face and gait Biometric. For example, Xiaoli Zhou et al [1], introduce a new video-based recognition method to recognize non cooperating individuals at a distance in video who expose side views to the camera. Information from two biometrics sources, side face and gait, was utilized and integrated for recognition. For side face, an enhanced side-face image (ESFI). For gait, the gait energy image (GEI). Xin Geng1 et al [2], proposed the adaptive multi-biometric fusion, which dynamically adjusts the fusion rules to suit the real-time external conditions. Two factors that the relationship between gait and face in the fusion are considered i.e. the view angle and the subject-to-camera distance. L.Q.Shen et al [5], introduces to integrate information from gait and face for recognizing individuals at a distance in video. Gait energy image and side face image both of which integrate the information over multiple frames in video. Alice J. O'Toole et al [6], presented the database contains a variety of still images and videos of a large number of individuals taken in a variety of contexts. Zhou and Bhanu [11], present a new approach that utilizes and integrates information from side face and gait at the feature level. Kale et al. [12] present a fusion of face and gait cues for the single camera. A view invariant gait recognition algorithm was employed for gait recognition.

ARCHITECTURE OF PROPOSED MODEL

(Training process)



(Testing process)

1. Preprocessing phase: The preprocessing phase of face is to determine the Face landmark points on the gray level image in BioID face datasets. Mark up the active points with a numbers to the center and corners points of eyes, nose and mouth. The BioID face image is the largest database that is used in human identification using face.

The preprocessing phase of gait is includes resizing the silhouette images in gait database to the each pixels. Then, the resized silhouette is followed by the person's region of interest in dataset. The main reason for the preprocessing is the attempt to reduce the size of pattern vector and to isolate only information that distinguishes individuals for images.

2. Feature extraction phase: Each preprocessed face image will be contains 12 landmark points i.e. eyes, nose and

mouth center and corner. Then, the discrete wavelet transform is decomposes the image with maximum possible lines that connect those points. The function of active lines face landmark points (ALFLP) algorithm will find the active lines that are used in human identification. The feature selection is process of removing features from the data set that are irrelevant with respect to the task that is to be performed and it can be extremely useful in reducing the dimensionality of the data to be processed, reducing execution time and improving predictive accuracy. In extraction, the each length of line will be recorded and that recorded lines have valid number. We will be denoting the length of line by some number and then it varies 1 to N. In that, N will be number of active lines face landmark points. Then the extracted vector will be divided into maximum line value for normalization of vector. The active lines face landmark points will be represented by a matrix where the number of active lines of face landmark points and number of images in sequence.

On the other hand, each preprocessed gait image has been number of horizontal levels. In that using active horizontal levels algorithm (AHL) and the discrete wavelet transform will be performed to obtain the maximum possible effective horizontal levels that can be used for person identification. At each horizontal level, the valid number of human pixels will be recorded. Thus, for each silhouette a vector of the valid number of human pixels in these horizontal levels will be recorded so as to obtain a vector of human pixels counter along all horizontal levels. We will be denoting the projection level where that will be varies from 1 to M, where M is the maximum number of levels. Then, for the normalization, the extracted feature vector will be divided in number of pixels. The gait image will be represented by active horizontal level feature vector i.e. represented by matrix, where number of horizontal levels and number of sequential images are represented.

3. Proposed fusion method: This proposed method depends on matrices properties for fusing the sequence of gait and face images which are represented by AHL (active horizontal lines), ALFLP (active lines face landmark points) features and discrete wavelet transform features for reducing the dimension of extracted features. Then, calculate the Eigen vector by representing the fusion feature vector for the proposed method.

4. Training Database: The database consists of fusion of gait and face landmark points.

5. Classifier: The comparison of the face and gait fusion points in training database and testing process will be carried out by neural network classifier. The neural network is a mathematical model or Computational model based on biological neural networks. It consists of an interconnected group of artificial neurons and processes information using a connectionist approach. The Neural Network is built with a systematic step-by-step procedure to optimize a performance criterion. There are used the feed-forward neural network that allow signals to travel one way only; from input to output. The input layer takes the input fused features and distributes them to the hidden layers which do all the necessary computations and give it to the outputs. Training neural network with Trained Image-In the training database stores the fused images or points. Once the training will be completed on this data set, the network is ready to be use the image or points. Testing the neural network with Tested Image-Neural network will be trained with fused images. Neural network will feed with these data. Log-sigmoid function values are used to compare the images with images of trained neural network to get finest match. The nonlinearity is removed using the neural network.

CONCLUSION

In the proposed system, the problem of feature level fusion using face and gait identification depends on the features in human face and gait, with considering the issues of distance metrics and scales. The major contribution of this method is to fuse face and gait features. These features are invariant under scale and transform. The results on database indicate that the proposed algorithm is to achieve a better accuracy.

REFERANCES

[1]X. Zhou, B. Bhanu, and J. Han, “Integrating face and gait Human recognition at a distance in video”, IEEE Trans. on systems, man, and cybernetics—part b: cybernetics, vol. 37, no. 5, October 2007.

[2] X. Geng, L. Wang, M. Li, Q. Wu and K. S. Miles, "Adaptive Fusion of Gait and Face for Human Identification in Video," Int. Conf., on Application of Computer Vision (WACV), pp. 1-6, Jan, 2008

[3] E. Hossain and G. Chetty, “Multimodal Face-Gait Fusion for Biometric Person Authentication” International Conference on Embedded and Ubiquitous Computing, Vol.11. No.6, p. 77-86, June, 2011.

[4] G. Shakhnarovich, L. Lee, and T. Darrell, “Integrated face and gait recognition from multiple views,” in Proc. Comput. Vis. and Pattern Recog. 2001, vol. 1, pp. 439–446.

[5] L. Q. Shen, L. Z. Tian and Z. D. Dan, "Integration of Gait and Side Face for Human Recognition in Video," 2009 Second Int. Symposium on Electronic Commerce and Security, pp. 65-69, 2009.

[6] “A Video Database of Moving Faces and People” Alice J. O’Toole, Joshua Harms,Sarah L. Snow, Dawn R. Hurst, Matthew R. Pappas, Janet H. Ayyad, and Herve´ Abdi,May 20

[7] Y. Gao and M. Maggs, “Feature-level fusion in personal identification” In Proc. of the 2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, 2005.

[8] P. S. Huang, C. J. Harris and M. S. Nixon, "Canonical Space Representation for Recognizing Humans by Gait and

Face," IEEE Trans. on Image Analysis and Interpretation, pp. 180-185, April, 19

[9] A. Kale, A. Roychowdhury, and R. Chellappa "Fusion of gait and face for human identification" In Proc. Acoustics, Speech, and Signal Processing 2004, volume 5, pages 901–904, 2004.

[10] Ju Han, Student Member, IEEE, and Bir Bhanu, Fellow, IEEE," Individual Recognition Using Gait Energy Image", IEEE Trans. on pattern analysis and machine intelligence, vol. 28, no. 2, February 2006

[11] X. Zhou and B. Bhanu, "Feature Fusion of Face and Gait for Human Recognition at a Distance in Video," in 18th Int. Conf. Pattern Recognition. [12] A. Kale, A. Roychowdhury and R. Chellappa, "Fusion of Gait and Face for Human dentification," In Proc. ICASSP"04, PP. 901-904, Montreal,2004