TO IDENTIFY THE PERSON USING GAIT: KNN BASED APPROACH

P.B.Shelke[1], P.R.Deshmukh[2]

[1]*Assistant Professor, Department of E&TC, Pankaj Ladhad Institute of Technology, Maharastra, India*
[2]*Professor, Department of CSE, Sipna College of Engg &Technology, Maharashtra, India*

Abstract

In human identification, the process of identifying the person by their gait is an emerging research trend in the field of visual surveillance. Gait is a new biometrics, has been recently used to recognize a person via style of his walking. While person walking variation becomes take place in different parts of body. On the basis of these variations, proposed method is evaluated on CASIA gait database by using K-nearest Neighbor classifier. Experimental results demonstrate that the proposed method has an encouraging recognition performance also the results indicate that the classification ability of KNN with correlation measure perform better than with other type of distance measure functions.

Keywords: *Gait biometrics, KNN, visual surveillance, CASIA, silhouette.*

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1. INTRODUCTION

To identify the people, Gait biometrics play very important role. The fusion of human gait and biometrics [1] has become a popular research direction over the past few years. This concept is used for automated person identification systems for visual surveillance and monitoring applications in security-sensitive environments such as banks, railway stations, and shopping malls. Main aim of person identification system is to discriminate individuals by the way they walk. Gait has some unique features such as it is unobtrusive in natures. It can be captured at a distance without prior consent of the observed object and difficult to hide and steal [2] compare to face, iris, palm biometrics applications. This paper is organized into five sections as follows: Section1Introduction.Section2 Literature review Section3 Proposed Methodology Sections 4.Experiments and Results finally Conclusion and Future Scope are presented in section 5.

2. LITERATURE REVIEW

Gait identification approaches are classified into two categories namely model based methods and model free methods [2]. In the model-based methods, the human body silhouette structure or motion is model and then the image features are extracted by the measure of structural components of models or by the motion trajectories of body parts [3, 4, 5, 6]. Most existing model free approaches can be further divided into two main classes, state-space methods and spatiotemporal methods [7, 8, 9, 10]. In the state-space methods consider gait motion to be composed of a sequence of static body poses, and recognize it by considering temporal variations observations with respect to those static pose. The spatiotemporal method characterizes the spatiotemporal distribution generated during their gait motion. Model based approach it has high computational complexity and more difficult in low resolution images so found difficulty in real time system due to feature extraction process. In model free approach as its computational complexity remain low. This approach is well suitable for real time system as it is easy to extract the features comparatively. Philips et.al [11] demonstrated human ID gait analysis and presented the result on Baseline algorithm.

Raul MartinFeiez, Ramon A.Mollineda, J.Salvador Sanchez [13] proposed a realistic appearance based representation of gait sequences for automatic gender recognition. It is based on the method where set of appearance based feature of gait sample is used for gender recognition where silhouette appearance of gait sequence was recognized and resulting part of silhouette were fitted by a collection of ellipses. As a result of more realistic ellipses and more meaningful feature space are obtained.

Sun Xiaoying, Zhang Qinhong,Xu Yangun[14] proposed a use of new robust gait recognition algorithm based on kinematics characteristics optical and establishes a multi area ellipse model of human body structure by dividing the human body area into several Sub areas according to characteristics of human body and fitting each sub-area with an ellipse model into which Optical flow feature are integrated. For this experiment they have used CASIA gait database and have achieved 84.25% correct classification rate.

Haitao Liu, Yang Cao, Zengfu Wang [15] proposed a simple and effective approach for gait recognition based on stereo vision .In this methods, 3D silhouette Silhouette vector then stereo gait features are extracted for analysis and recognition.PCA is used for dimensionality reduction of gait features. Finally by using NN and ENN classifiers, achieved 59.27% and 70.18% correct recognition rate.

3. PROPOSED METHODOLOGY

The proposed system consist of four phases namely, preprocessing, segmentation, feature extraction and classification. Initially gait video sequence is captured by using static camera. By using approximate background subtraction method binary silhouette of the moving objects are extracted. By using morphological operation irregularities present in the silhouette are removed. Using segmentation, Silhouette body is divided into six components. From these components, gait features are extracted by using two dimensional discrete wavelet transform method. By using K-nearest neighbor classifier, distance between train features and test features are computed and achieve better classification accuracy.

3.1. Preprocessing

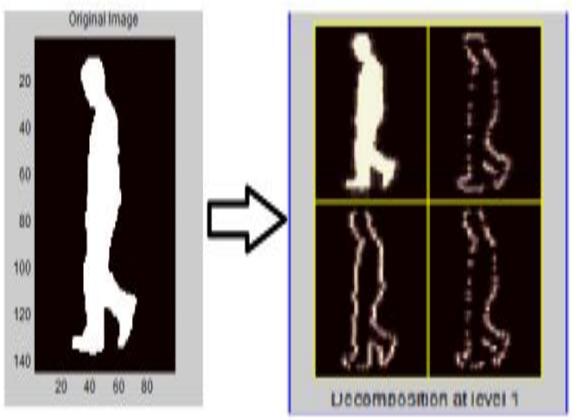
For this stage, it is assumed that background is remaining to be static. Approximate median background subtraction method is used to extract silhouettes object. In this method frame difference between current frame and known background frame is computed and is compared to predetermined threshold level. If this difference is greater than threshold then it is foreground otherwise it consider as background frame. By using morphological technique, irregularities present in foreground silhouette become removed.

3.2. Segmentation

In this stage, foreground silhouette is segmented into head, torso, right hip(rhip), left hip(lhip),right leg(rleg) and left leg(lleg) regions .By considering its anatomical knowledge [12] that will facilitate the person recognition task. These features are then used to recognize individuals by their walking.

3.3. Feature Extraction

Discrete wavelet transform (DWT) is an useful tool for decomposition of the image to extract its low frequency approximation information and high frequency detail information by using low pass and high pass filter.



(a) **(b)**

Fig-1: (a) Original image (b) single level DWT Decomposition

In single level, image become decomposed in four sub-frequency bands which contains approximate, horizontal, vertical, diagonal coefficients as shown in fig.1(a) and (b). As level of decomposition increases, approximation image becomes split up into approximation, horizontal details, vertical details, diagonal details accordingly to their decomposition level. Notice that the detail coefficients are small and consist mainly of high-frequency information, while the approximation coefficients contain only the low frequency information. In the proposed method, Haar, coif4, db4, Rbio3.3 wavelet families are considered. Using DWT method, approximate wavelet features coefficients are extracted.

3.4. Classification

K-nearest neighbor (KNN) is one of the simplest but widely used machine learning algorithm. An object is classified by the “distance” from its neighbors, with the object being assigned to the class most common among its k distance-nearest neighbors. If k = 1, the algorithm simply becomes nearest neighbor algorithm and the object is classified to the class of its nearest neighbor. Distance is a key word in this algorithm, each object in the space is represented by position vectors in a multidimensional feature space. To calculate distances of all training vectors to test vector, distance measures such as Euclidean distance, City block distance, Cosine distance, Correlation, Hamming distance can be used. With the help of K-nearest neighbor classifier computation take place between extracted train features vector and test feature vector. According to their majority vote of nearest neighbors, their classification is take place.

4. EXPERIMENT AND RESULTS

The proposed method is tested on both CASIA A and CASIA B gait databases with a frame rate of 29fps and 25fps respectively. For this experiment we have used ten different objects with side view video consideration. Each object consists of 35frames with 2.5 gait cycle. We have used tenfold cross validation method for reliable accuracy. This experiment tested on four distance measures such as euclidean,correlation,cityblock and cosine and four wavelet families such as Haar, ,coif4,db4,dmey,and Rbio3.3 wavelet families.

First experiment is conducted on all body regions by considering both four wavelet features and four distance measures .As shown in Table.1 recognition rate is increased to 93.14% for coif4 wavelet and correlation distance measure parameter.

By considering coif4 wavelet and correlation distance measure parameters, second experiment is conducted on individual body regions. From this we get individual contribution to recognize person by their walking. These results are given in the table 2. Similarly performance result of KNN classifier for complete body region and individual body region are summarized in chart-1. and chart-2.

From this, we have observed that lower body regions namely right hip, left hip, right leg, left leg give more recognition contribution than the torso region.

Table-1: Result of KNN classifier for all body region

Wavelet families	% correct classification rate			
	Euclidean	Correlation	Cosine	City block
Rbio3.3	90.00	92.86	92.86	91.71
Haar	88.00	88.29	88.86	90.86
Db4	88.57	92.29	92.29	90.29
Coif4	90.57	93.14	93.00	92.57

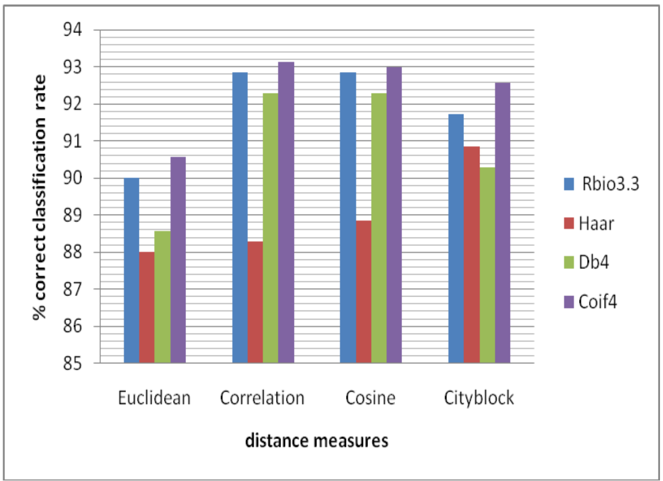


Chart-1: Comparative performance result for all body regions

Table-2: Correct classification rate for different body regions

Body Region	% CCR
Head	83.34
Torso	82.37
Lhip	83.28
Rhip	84.02
Lleg	82.28
Rleg	82.31
All	93.14

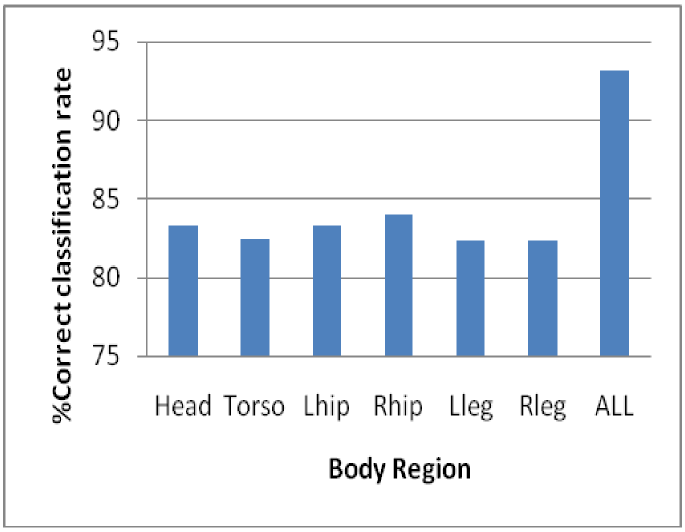


Chart-2: Classification result using different body regions

5. CONCLUSION AND FUTURE SCOPE

The proposed method is tested on CASIA gait database by using K-nearest Neighbor classifier and discrete wavelet feature extraction method. From this we have achieved 93.3% correct classification rate for all combined body regions. For individual region based performance, leftleg region gave least recognition contribution than other regions of the body. This performance of the proposed method can be improved further by using more sophisticated classifiers.

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BIOGRAPHIES

Mr.P.B.Shelke received the B.E degree in Industrial Electronics Engineering from Sant Gadge Baba Amravati University, Amravati, India in 1992 and M.E degree in Electronics Engineering from Sant Gadge Baba Amravati University, Amravati, India in 2007. He is currently working as a Assistant Professor at PLITMS, Buldana and pursuing his PhD degree from Sant Gadge baba Amravati University Amravati, India. His research is interests includes video and Image, processing, computer vision.

Mr.P.R.Deshmukh received his PhD degree in Electronics Engineering from Sant Gadge Baba Amravati university, Amravati, India in 2005.He is currently working as a Professor and PhD Supervisor in the faculty of Electronics Engineering and Technology. He has more than 50 publications in International journals and conferences. His area of interests includes VLSI, Embedded System, computer vision, Artificial Intelligence.