ISSN No. 0976-5697

Volume 4, No. 3, March 2013 (Special Issue)

International Journal of Advanced Research in Computer Science

REVIEW ARTICLE

Available Online at www.ijarcs.info

Comparative Study of Various Approaches for Human Identification and Gait Recognition

Ms.Snehal.Kathale
(M.Tech Student)
Department of Computer Science and Engineering
G.H.Raisoni college of Engineering
Nagpur University, Maharashtra, India
snehal.kathale@gmail.com

Mrs.Veena Gulhane
(Asst.Prof)
Department of Computer Science and Engineering
G.H.Raisoni college of Engineering
Nagpur University,Maharashtra,India
veena.gulhane@raisoni.net

Abstract: Biometrics is totally based on contactable human body parts. But there is a need of such a biometric technique which is non-contactable, non-invasive and which should not be get hide by using some aspect. Gait is the pattern of movement and comes under the biometrics and it is the unique characteristic of individuals. The approach of this paper is to introduces the comparative study of various approaches of recognize the human by their gate. This paper represents the various gait recognition and human recognition techniques.

Keywords: gait cycle, pattern recognition, biometrics

I. INTRODUCTION

Biometrics recognition is a common and very reliable and effective way to authenticate the person based on physiological or behavioral characteristics. It is science which using for detecting and identifying the person. Biometric systems for human identification at distance have ever been an increasing demand in various significant applications A physiological characteristic is relatively stable physical characteristics, such as fingerprint, iris pattern, facial feature, hand, silhouette, etc.A physical characteristics such as hand, iris, and face have some limitations for identification; if someone wraps the face then it is difficult to identified the person, goggle creates the problem in iris identification. But Gait is the very effective parameter for identification because the walking style of human is unique from all that parameter. A gait cycle corresponds to one complete cycle from rest (standing) position to-right-foot-forward-to-rest-to left-foot-forward-to-rest position .This paper represents the survey on recognition techniques of human by their physical characteristic which is gait.

Gait is a dynamic feature of humans which has been proven to have strong recognition abilities. However, it is greatly affected by varying viewing angles, surfaces, shoe and clothing types, passed time, and even emotional moods [1]. Because of this inherent variability, gait recognition often winds up to be not as accurate as other biometrics, such as Iris, and finger print, used for human identification. On the other hand, current image-based human recognition methods, such as fingerprints, face, or iris biometric modalities, cannot accurately indentify non-cooperating individuals at a distance in the real world, where surroundings are changing all the time [2]. The principal ascendency gait recognition offers, is that it can be applied without being noticed, i.e., without any attention or cooperation from the observed individual [5]. In addition to that, gait recognition also offers potential to be successfully done at low resolution imaging, where the walking individual encompasses few image pixels.

A careful analysis of gait would reveal that it has two important components. The first is a structural component that captures the physical build of a person, e.g., body dimensions, length of limbs, etc. The second component is the motion dynamics of the body during a gait cycle.

Gait analysis is the systematic study of animal locomotion, more specific as a study of human motion, using the eye and the brain of observers, augmented by instrumentation for measuring body movements, body mechanics, and the activity of the muscles[1] Gait analysis is used to assess, plan, and treat individuals with conditions affecting their ability to walk. It is also commonly used in sports biomechanics to help athletes run more efficiently and to identify posture-related or movement-related problems in people with injuries.The study encompasses quantification, i.e. introduction and analysis of measurable parameters of gaits, as well as interpretation, i.e. drawing various conclusions about the animal (health, age, size, weight, speed, etc.) from its gait.

The remainder of this paper is organized as follows. Section II describes the different gait recognition techniques, section III provides conclusion.

II. GAIT RECOGNITION TECHNIQUES

Literature review based on number of research papers which based on various approaches such as model based, appearance based for gait recognition as well as human recognition. Model-based approaches aim to describe both static and dynamic characteristics of a walking person using a finite number of model parameters for recognize the human the necessary term is silhouetted image. Description and analysis of that research are described below:

CONFERENCE PAPER
II International Conference on
"Advance Computing and Creating Entrepreneurs (ACCE2013)"
On 19-20 Feb 2013
Organized by
2nd SIG-WNs, Div IV & Udaipur Chapter , CSI , IEEE Computer Society Chapter India Council ,
IEEE Student Chapter Geetanjali Institute of Technical Studies, Udaipur, Rajasthan, India

A. Gait recognition by neural network:

NN ensemble appears to be a reasonable choice to address the gait recognition problem. The proof is found in, where walking human body parts are studied in a disjoint manner, and are shown to have markedly different discrimination potentialities. The outcome of combining the disjoint results, turns out to be more accurate, then considering them as a whole. Therefore, designing an NN ensemble, in form of a mixture of experts, each employed to classify one body part, and then mixing the outputs to get the final result, sounds rational. In that paper, an appearance-based gait recognition method is introduced. A learning vector quantization NN (LVQNN) ensemble is proposed in which, using the ability to disintegrate walking human body parts, each LVQNN deals with classification of one of body parts: face, upper-body and lower-body. The decision on the final class is made, based on the combination of all NN constituents outputs. NNs are able to derive implied knowledge on the input/output relationship, and construct nonlinear decision boundaries on the input data, as it is, without necessity of any priori information, or imposing any assumptions or simplifications on the data.[1]

A multi-projection-based silhouette representation for individual recognition by gait is presented in "human identification using gait" by Murat Ekinci[3]. Recognizing people by gait intuitively depends on how the silhouette shape of an individual changes over time in an image sequence. Unlike other gait representations, which consider only foreground pixels in a bounding box surrounding as silhouette and one aspect of gait, the proposed method represents human motion as a multi-sequence of templates for each individual and considers all background pixels in the bounding box. Unlike other gait cycle estimation algorithms, which analyze the variation of the bounding box data, the periodicity of gait is produced by analyzing silhouette data itself. The proposed algorithm has robustly estimated the periodicities in gait sequences obtained from all 3 views with respect to the image plane (lateral, oblique, and frontal). The approach for both gait cycle estimation and gait recognition is also fully automatic for real-time applications. In that algorithm divided into three parts human detection and tracking, feature extraction, and training and classification.

B. Recognition based on ICA:

A simple method for gait recognition on the basis of human silhouettes using multiple features representations and Independent Component Analysis (ICA) has been proposed by Jiwen Lu and Erhu Zhang [4]. In this they have offered a gait recognition method by fusing the multiple features and views on the basis of Genetic Fuzzy Support Vector Machine (GFSVM). Their proposed method is just recognizing human through three view fusions, i.e. perpendicularly, along and oblique with the direction of human walking, but in the real environment, the angle between the walker's direction and the camera is unpredictable. A useful experiment which can determine the sensitivity of the features from different views ought to be put forward and more multiple views fusion should be performed which can provide us with conviction results.

Stastical model for human silhouette and the corresponding 3D skleletal structure which model is used for determine the pose and structure of human body from monocular view. A different PDM is used to apply to the problem on non linear principle component analysis depending on pose estimation such as frontal, lateral,diagonal.apart from that the fitting is carried out by selecting the closest shape from the training set by using nearest neighbor classifier. The 3D skeletal structure model allows us to predict hidden human body parts in 2D images This idea is present in the paper "2D Silhouette and 3D Skeletal Models for Human Detection and Tracking Carlos" by Orrite-Uruñuela, Jesús Martínez del Rincón, J. Elías Herrero-Jaraba, Grégory Rogez[4].

Figure 1. Human silhouetted image[1]

C. Model based approach based on fourier series:

A model-based moving feature extraction analysis is presented by Cunado . It automatically extracts and explains human gait for recognition. First, the gait signature is extracted directly using the Fourier series to depict the motion of the upper leg and then temporal evidence gathering techniques were applied in order to extract the moving model from a sequence of images. The potential performance benefits even in the presence of noise are highlighted by the results of the simulation. Classification makes use of the k-nearest neighbor rule applied to the Fourier components of the motion of the upper leg. It is illustrated from the experimental analysis that an enhanced classification rate is provided by the phase-weighted Fourier magnitude information when compared to the usage of the magnitude information.

A gait recognition by using shape trace transform is presented by Porntep Theek hanont, Werasak Kurutach [8]. In that approach use the Euclidian distance for calculating the training data set.the input of the system is a binary silhouette from each frame which is converted from real time video or image. After that steps are delete some noise,crop the human body pictures and find the gait period using the maximum width of human walking step. next, the binary silhouettes are in one period which are transformed to the different trace transform images. This transform images are used for calculating the average of trace transform images in a single period. In the further step find the shape trace transform image by threshold and edge detection in the transform images. Finally for match the shape transform images they used the Euclidian distance and shape context .They used the avarege filter for removing the noise from width value.[3]

Jang-Hee Yoo,Doosung Hwang, Ki-Young Moon Mark S. Nixon presented the neural network approach in" Automated Human Recognition by Gait using Neural Network" in which 2D stick figure is obtained .The 9

co-ordinates i.e body points are extracted from the silhouetted image n obtained that stick figure by connecting that extracting coordinates Fig. shows the extracted stick figure. , the stick figure is closely related to a joint representation, and the motion of the joints provides a key to motion estimation and recognition of the whole figure..the proposed method in this paper is recognizing the humans by using back-propogation neural network by their gait[7].

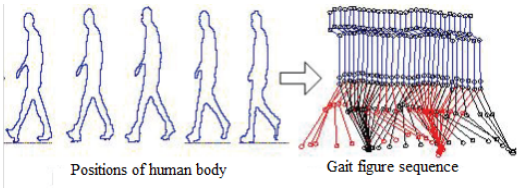

Figure 2: Gait Signature[5]

"Recognition of Affect Based on Gait Patterns" in that paper Michelle Karg, Kolja Kühnlenz, and Martin Buss focusses on the all knee joints and human emotions.Because human emotions affects the walking style of human.in this approach collects the all data of joins n gait data and classifies this data by usng neive classifier and NN.They address inter individual versus person dependent Recognition. Recognition based on discrete affective states and recognition based on affective dimensions, and efficient feature extraction with respect to affect. Compared the temporal information by using Principal component analysis (PCA), kernel PCA, linear discriminant analysis, and general discriminant analysis in gait or extract relevant features for classification.[7]

D. A view-based approach for gait identification:

A view-based approach in order to identify humans from their gait is proposed by Kale *et al*. [10]. Two distinct image features have been taken into account: the width of the outer contour of the binary silhouette of the walking person and the entire binary silhouette itself. The first method is referred to as the indirect approach in which the high-dimensional image feature is transformed to a lower dimensional space by means of generating the frame to exemplar (FED) distance. The gait information in the FED vector sequences is captured in a hidden Markov model (HMM) for compact and effective gait representation and recognition. In the second method, direct approach, works with the feature vector directly (as opposed to computing the FED) and trains the HMM.

Xiaoli Zhou and Bir Bhanu [11] have presented an approach that utilizes and integrates information from side face and gait at the feature level. The features of face and gait are obtained separately using principal component analysis (PCA) from enhanced side face image (ESFI) and gait energy image (GEI), respectively. Multiple discriminant analysis (MDA) has been made use on the concatenated features of face and gait to attain the discriminating synthetic features. Their process allows the generation of better features and also reduces the curse of dimensionality. It is illustrated from their experimental results that the synthetic features, encoding both sides face and gait information carry more discriminating power when compared to the individual biometrics features. This feature level fusion scheme outperforms the match score level as well as traditional feature level fusion schemes.

The next method explains the shape variation based frieze pattern (SVB frieze pattrn) for matching the SVB frieze pattern feature used dynamic time wrapping (DTW).here use gait energy image for shape feature;it is less sensitive to the silhouette noide, then extract the further information by using histograms oriented gradients .for redusing the dimensions use the coupled subspaces analysis(CSA) and discriminant analysis with tensor representation(DATER)[13]

Patch distribution method explains the S patch distribution feature (PDF) (i.e., referred to as Gabor-PDF) for human gait recognition. We represent each gait energy image (GEI) as a set of local augmented Gabor features, which concatenate the Gabor features extracted from different scales and different orientations together with the X–Y coordinatesHere devlop a classification method develop a new classification method referred to as LGSR by enforcing both group sparsity and local smooth sparsity constraints,and we also show that the standard GSR-based methodis a special case of LGSR.[14]

A novel incremental framework based on optical flow, including dynamics learning, pattern retrieval, and recognition. It can greatly improve the usability of gait traits in video surveillance applications. Local binary pattern (LBP) is employed to describe the texture information of optical flow. This representation is called LBP flow, which performs well as a static representation of gait movement. Dynamics within and among gait stances becomes the key consideration for multiframe detection and tracking, which is quite different from existing approaches. To simulate the natural way of knowledge acquisition, an individual hidden Markov model (HMM) representing the gait dynamics of a single subject incrementally evolves from a population model that reflects the average motion process of human gait. It is beneficial for both tracking and recognition and makes the training process of the HMM more robust to noise[16]

III. CONCLUSION

The human gait is usually described by kinetic or kinematic characteristics.It is the day-to-day activity and it is difficult to hide.Independent person have their unique walking style. By using that approach we proposed the real time application which is used for security purpose in working areas such as banking sectors,airports,high security locations ,public sector areas,military installations etc.. Extraction of relevant features from gait patterns is crucial, because recordings of gait patterns are characterized by high dimensionality, time dependence, high variability, and nonlinearity. Gait Recognition is a traditional pattern classification problem which can be solved by calculating the similarities between instances.The neural network approach gives the more accurate output than other method. neural network requires less input features for each gait samples which might reduce the complication of feature extraction process, in

comparison to othet methods which gives better performance when more input feature is extracted from the gait sample.

IV. REFERENCES

[1] Neda Kordjazi Saeid Rahati" Gait Recognition For Human Identification Using Ensemble Of LVQ Neural Networks"2012 International Conference on Biomedical Engineering (ICoBE),27-28 February 2012,Penang

[2] M. Pushpa Rani and G.Arumugam."An efficient gait recognition system for human identification using modified ICA" International journal of computer science & information technology, Vol.2, No.1 Feb-2010

[3] Murat Ekinci **"**Human Identification UsingGait" Turk J Elec Engin, VOL.14, NO.2 2006, c T¨UB_ITAK

[4] Carlos Orrite-Uruñuela, Jesús Martínez del Rincón, J. Elías Herrero-Jaraba, Grégory Rogez**"** 2D Silhouette and 3D Skeletal Models for Human Detection and Tracking**"**Proceedings of the 17th International Conference on Pattern Recognition (ICPR'04)1051-4651/IEEE

[5] Jang-Hee Yoo,Doosung Hwang, Ki-Young Moon Mark S. Nixon"Automated Human Recognition by Gait using Neural Network" Image Processing Theory, Tools &Applications2008IEEE

[6] Yumi Iwashita, Adrian Stoica, Ryo Kurazume" People Identification Using Shadowdynamics"IEEE 17th International Conference on Image Processing September 26-29, 2010

[7] Michelle Karg, Kolja Kühnlenz, and Martin Buss"Recognition of Affect Based on Gait Patterns" IEEE Transactions On Systems, Man, And Cybernetics—Part B: Cybernetics, Vol. 40, No. 4, August 2010

[8] Porntep Theekhanont, Serge Miguet, Werasak Kurutach "Gait Recognition using Shape Trace Transform" 978-1- 61284-704-7/11/2011IEEE

[9] D. Kim D. Kim J. Paik "Gait recognition using active shape model and motion prediction" IET Comput. Vis., 2010, Vol. 4, Iss. 1, pp. 25–36 27doi: 10.1049/iet-cvi.2009.0009

[10] Kohei Arai Rosa Andrie "Gait Recognition Method Based on Wavelet Transformation and Its Evaluation with Chinese Academy of Sciences (CASIA) Gait Database as a Human Gait Recognition Dataset" 2012 Ninth International Conference on Information Technology- New Generations

[11] Deng-Yuan Huang1, Wu-Chih Hu2, Chuan-Wei Chuang3, Mu-Song Chen4, Chien-Chuan Ko5 "Gait Recognition of Different People Groups Based on Fourier Descriptor and Support Vector Machine" 2011 IEEE International Conference on Control System, Computing and Engineering.

[12] Cheng-Chang Lien,Chih-Ching,Tien,Jia-Ming Shih"Human gait recognition for arbitrary view angle"0-7695-2882-/07,2007 IEEE

[13] Bing Sun,Junchi Yan,Yuncai Liu"Human gait recognition by integrating motion feature and shape feature"IEEE 2010

[14] Dong Xu,Shuicheng Yan,Dacheng Tao,Lei Zhang,Xuelong Li and Hong_jiang Zhang,"Human Gait Recognition with matrix representation"IEEE Transctions on circuits and systems for video technology,vol.16,jul.2006

[15] Dong Xu,Yi HUANG Zinan Zeng and Xinxing Xu" Human Gait Recognition Using Patch Distribution Feature and Locality-Constrained Group Sparse Representation" Ieee Transactions On Image Processing, Vol. 21,No.1,January2011

[16] Maodi Hu, Yunhong Wang, Zhaoxiang Zhang,

[17] De Zhang, and James J. "Incremental Learning for Video-Based Gait Recognition With LBP Flow" Little Ieee Transactions On Systems, Man, And Cybernetics—Part B: Cybernetics

[18] L.R. Sudha,R. Bhavani" Biometric Authorization System by Video Analysis of Human Gait in Controlled Environments" IEEE-International Conference on Recent Trends in Information Technology, ICRTIT 2011