Review On: Hybrid Approach for Gait Recognition with GPPE and SURF technique

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Abstract- Human Gait is a behavioral characteristic of a person. Gait includes both the body mechanics and activity of muscles of human walking motion.Gait recognition is a behavioral biometric technology which involves people being identified at far distance without their interaction, through the analysis of the way they walk.This paper describes the importance of automatic gait recognition acquire from motions of the different parts of the silhouette using different techniques, and classifiers.The purpose to develop an automatic GAIT recognition system that to provide best method to identify threats on highly security needed places such as banking sector, airports, parking slots.

Keywords:**Gait Recognition, Linear Discriminant Analysis (LDA), Neural Network (NN), Support Vector Machine (SVM), Gait Pal and Pal Entropy (GPPE).**

I. INTRODUCTION

Human Gait recognition is a new biometric technique which is used to detect, track and identify the people at a distance without their interaction, by the mannerthey walk or run.

An initial attempt for human gait-based recognition approach is done by Niyogi and Adelson in 1994, which provides the new way to biometric. Many biometric measures can be used to identify individual's identity. They can be grouped into two distinct categories:**Physiological and Behavioral.** Physiologicalbiometrics derived from a direct measurement of a part of a human body. The most successful examples of these types of measures include fingerprints, face recognition, iris-scans and hand scans, DNA. Behavioral biometrics is related to behaviour of the person. They extract features based on an action performed by a particular person. The examples of these types of measures

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include Keystroke-scan, Speech pattern and Gait. The main advantage of gait as biometric is its ability to recognize a threat from a distance.

Gait recognition system classified into three categories depending on the sensor used.

1. Motion vision(MV): In Motion vision(MV) based approach; gait is captured at far distance using a video-camera. Video and image processing techniques are used to extract gait features. For instance, body parameters, cadence, stride etc. Most of the MV-based gait recognition algorithms are based on the human silhouette.
2. Wearable Sensor (WS): Wearable sensor based approach requires carryingbody worn motion recording (MR) sensors that can be worn at different locations on the human body. The MR sensors can be set on legs, hip, arms, or any other part of the human body to collect gait data.
3. Floor sensor (FS): In Floor sensor based approach, a set of floor sensors or force plates are put into the floor that enable to detect gait related features, when a person walks on them. For instance maximum time value of heel strike, maximum amplitude value of the heel strike, etc.

In the proposed method, we are focus on motion vision based approach.

However, many gait recognition approaches are available already but still it has many challenges such as poor Correct Classification Rate (CCR),changes in result based on different types of gait. The proposed system implements the Gait in five different steps including load video, background subtraction, gait feature extraction and recognition.

STEPS OF GAIT RECOGNITION

A. Input Video.

The initial step is to convert the input video into frames that can be further use for gait recognition process.

B. Background Subtraction

Background subtraction is the method of the gait recognition which is used to detect the moving objects that differ from background model and to remove the unwanted part from the background to obtain binary images containing black and white moving pixels also known as binary silhouette.

C. Feature Extraction

In feature extraction process input data will be converted into reduced representation set of features.Acquiring the human silhouette, boundary box is

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generated that covers the complete silhouette and this boundary box width is indicated as step size length. Each gait sequence is divided into cycles that are determined by calculating number of frames between two rest positions (as person starts from rest, left foot forward, rest, right foot forward, rest which is known as gait cycle). The silhouette is then aligned centrally with the help of its centroid.

D. Recognition and matching

After obtaining gait features, recognition is the final step of person identification based on gait that can be implemented in two different steps:

1. Matching trained sequence with the tested sequence
2. Testing the result

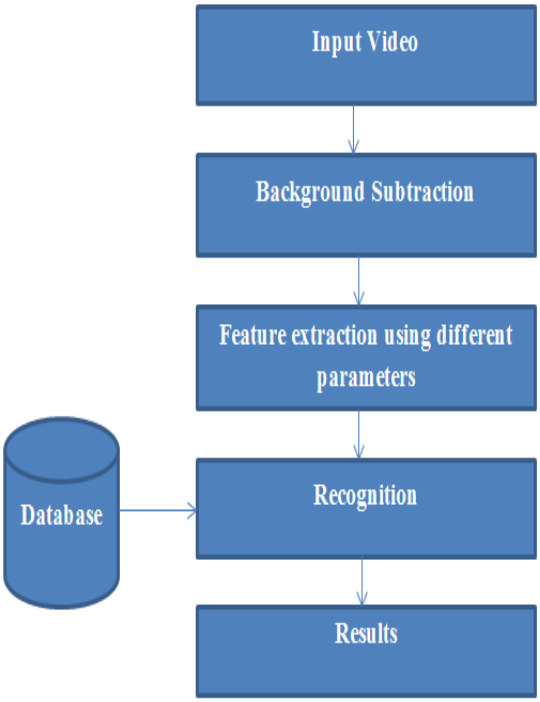

Figure 1: Steps of Gait Recognition

II. OVERVIEW OF THE PROPOSED SYSTEM

The gait recognition system is divided into following parts:

- Training
- Testing

The proposed gait recognition method contains two parts known as testing part and training part. In training part we first input the video and human gait extract features. Then LDA is performed for dimensionality reduction of the extracted features. At last, three classification approaches LDA, SVM and NNare used for training. In testing part again we extract the gait features and then matching the database based on model established in the training stage.

PROPOSED METHODOLOGY

Stages in gait recognition system:

- Input
- Background Subtraction
- Feature Extraction
- Matching
- Classification
- Results

Firstly collect the gait database using camera. Then perform the background subtraction and extract the features usingframe differenceequation and Hanvan's model algorithm with Gait pal and pal entropy in which an additional step

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of filtering by median filter is incorporated to remove noises.Then the input test image and the database image sequence will be matched by using SURF method technique for better accuracy. We introduce the combination of SVM, NN, and LDA for classification to get good accuracy results which is far better in comparison to previous research paper. The results obtain using the mean square error, peak signal to noise ratio, correct classification rate, matchingtime.

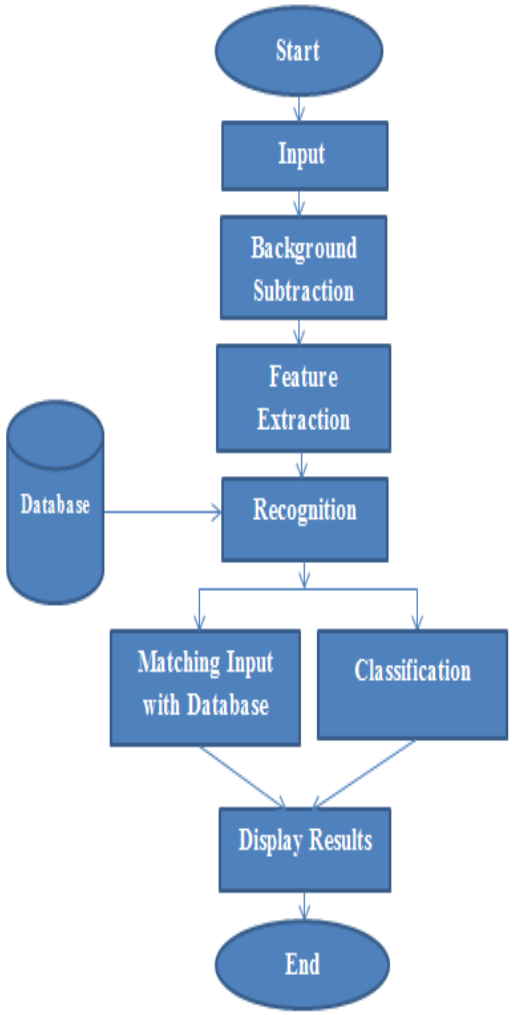

Figure 2:Implementation steps of Proposed Methodology

Classification

Support Vector Machine (SVM)

The Support Vector Machine (SVM) is a state-of-the-art classification method introduced in 1992 by Boser, Guyon, and Vapnik. SVM main goal is to pick the best separating hyperplane according to maximize margin between two classes. The decision boundary or hyperplane should be as far away from the data of both classes as possible. SVM can find the optimal hyperplane by using the dot product functions in original space known as kernels. The SVM classifier is widely used in bioinformatics, pattern recognition, and regression estimation etc. due to its highly accurate.

Neural Network (NN)

Neural network is set of interconnected neurons. The artificial neural networks are composed of interconnecting artificial neurons. A neural network (NN has been used among image processing and signal processing for solving data classification problems with significant success rate. Many researchers have successfully applied neural networks to face/gait recognition because of their highly flexible, inductive, and non-linear modelling ability. Neural network has three types of layers: input layer, output layers and hidden layers. A layer of

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"**input**" units is connected to a layer of "**hidden**" units, which is connected to a layer of **"output"** units.

Linear Discriminant Analysis (LDA)

Linear discriminate analysis (LDA) is a tool used for data classification and to reduce dimension of feature vectors. The Objective of LDA seeks to reduce dimensionality while preserving as much of the class discriminatory information as possible. Algorithms based on LDA are superior to those based on PCA in the lower dimensional subspace. In this technique discriminate analysis, the two scatter matrices, called within-class (Sw) and between-class (Sb) matrices are defined to quantify the quality.

LITERATURE SURVEY

The gait recognition is one most challenging area of biometric recognition. Gait includes both the body mechanics and activity of muscles of human walking motion. A number of such researchers and preceding work are summarized below:

Nancy, Tejinderpal Singh [1] introduces Improved Gait Recognition using DifferentClassifiers. In this paper they present the review of gait recognition system and different approaches are used. CCR (Correct Classification Rate) is obtained using MDA (Multi-linear Discriminant Analysis) and LDA (Linear Discriminant Analysis) technique. M.Jeevan, Nehajain, M.Hanmandlu, GirijaChetty [3] introduce the Gait Recoginition Based on Gait Pal and Pal Entropy Image using Principal component analysis and Support Vector Machine (SVM). The CCR achieved for normal-normal, normal-slow, left-right is 93.36%,56.95%, 26.31% respectively.Robindeepkaur, NamitaKakkar [2] This paper present the review of gait recognition system, different approaches and classification categories of Gait recognition like model free and model based approach, MDA, ENN, NN.Alese, B. K., Mogaji, S. A., Adewale, O. S. and Daramola [5] In this paper they Design and Implement Gait Recognition System to identify the presence of human in video streams for the extraction of important features. The main two techniques used are mixture of gaussian model (MoG) and medial axis transformation techniques. Variations in different parts of the limbs, hands and body posture are extracted as the gait signature. Lili Liu , Yilong Yin ,Wei Qin , Ying Li," [6] introduces simple but effective Gait Recognition method Based on Outermost Contour Principal Component Analysis (PCA) is adopted to reduce the dimensionality and three classification methods – MDA with ENN, BPNN, and SVM are used for recognition. The accuracy achieved is 97.67%. Sanjeev

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Sharma, RituTiwari, Anupamshukla and Vikas Singh [7] introduces Identification of People Using Gait Biometrics approach based on specific features, like center of mass, step size length and cycle length. Here neural network is being used for recognizing people. Obtain the accuracy of 96.32%. Hayder Ali, Jamal Dargham, Chekima Ali, Ervin GobinMoung [10] proposed Gait Recognition using principle Component Analysis. Mainly, PCA is used to reduce dimension of the images without much loss of information. Three walking styles slow, fast, and with ball were tested. The correct classification rate is 97% and95.61 for slow, fast walk respectively. M.K. Bhuyan and AragalaJagan [11] proposed Person Identification using Gait by Combined Features of Width and Shape of the BinarySilhouette. Gaussian Mixture Model is used for estimating background information by a Gaussian Mixture Model and median filtering operation is performed for removing noises in the background subtracted image. PCA is used to reduce data dimensionality. The proposed system is evaluated using some gait sequences.Qiong Cheng, Bo Fu, and Hui Chen [12] introduces Gait Recognition Based on Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA). Normalized Euclidean Distance (NED) isused to measure the two different sequences and K nearest neighbour classification (KNN) are finally performed for recognition. The experimental results show the PCA and LDA based gait recognition algorithm is better than that based on PCA.

III. CONCLUSION

A problem of individual identification is an actively growing area of research.

The methods are based on different physiological and behavioral characteristics of biometric system; fingerprints, face recognition, hand scans, voice pattern, gait are the most commonly used authentication methods. However, many gait recognition approaches are available already but still it has many challenges such as poor Correct Classification Rate (CCR) and was not accurate enough so the task was not fulfilled. Gait Recognition using GPPE with Support Vector Machine(SVM) alone could not provide better results. We use Gait Recognition using GPPE with, SVM,NN,LDAfor classification and SURF technique for matching. Finally SVM, NN and LDA with GPPE results are calculated which is far better in comparison to previous research paper.

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Ms.JatinderKaur is doing her Mtech thesis under the supervision of Ms.Varsha. Her research interests include Digital Image Processing.

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