

# A Novel Technique Used for Gait Recognition MDA, LDA and BPNN- A Review

Ira Gaba, Paramjit Kaur

**Abstract**— Gait is the manner of the limb movement or the manner a foot of an individual and recognition of an individual is the task of identify a people. Gait Recognition is the biometric process by which an individual can be identify by the manner of walk. The advantage of gait over other biometric traits such as face, iris and fingerprint etc is that it is non-invasive and less unobtrusive biometric, which offers to identify people at the distance, without any interaction from the subject or at low resolution. In this paper we present the review of gait recognition system and different approaches MDA, LDA, PCA and BPNN.

**Index Terms**— BPNN, Feature Extraction, Gait Recognition, LDA, MDA, PCA, Silhouette Extraction.

## I. INTRODUCTION

Biometric system is mainly used to prevent the unauthorized access. Gait recognition is an effective biometric for human identification, by the manner of walking by this a registered/authorized person can be verified. There are three different systems which are knowledge based, object based and biometric based.[1]. Knowledge based system uses password which were set as a string that included integers or special characters and were used for authentication and these passwords can easily be cracked. Object based system is the combination of knowledge based and object based such as ATM card, Credit card with a given pin code. But both the knowledge based and object based system can be steal or lost or forgotten. Therefore to curb this problem biometric based system can be used. Biometric is a field of technology that uses automated methods for identifying and verifying a person based on physiological and behavioral traits[2].

Today, in banks, metropolitan public transport stations, and other real time applications, authentication and verification are always required. In such applications, biometric identification are more attractive. Biometric Recognition refers to an automatic recognition of individual based on feature vectors derived from their physiological and behavioral is related to the behavior of the person such as voice and gait. As these physiological characteristics does not provide good results in low resolution and need user cooperation therefore gait recognition is more attractive.

## II. GAIT RECOGNITION SYSTEM

The Gait Recognition System (as shown in figure 1.) is which that identify the gait of the authorized individual by comparing it with the stored sequence in the database. Gait Recognition can be further categorized as the Model Based Approach and Model Free Approach. Model Based Approach consist of the human model and it uses the parameters of the model for recognition[3]. Model Based Approach is difficult to follow in low resolution images also, they have high computational complexity. Advantage of this approach is the ability to derive gait signature from model parameter and free from the effect of different clothing[4]. Model based gait recognition system includes motion of thigh and lower leg rotation that describes both walking and running[5]. Model based method construct human model to recover features describing gait dynamics such as stride and kinematics of joint[4]. Model based approaches are view-invariant and scale-independent. Model Free Approach are simple and free. The model-free approaches do not model the structure of human motion, but deal directly with image statistics[3]. Model free approach has less computational complexity and this approach is best suited for real time system.

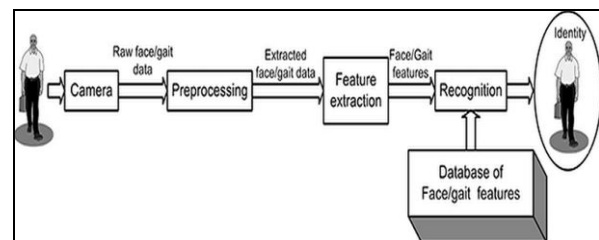


Figure1. Gait Recognition System

### A. Background Subtraction

Background Subtraction is the approach of the gait recognition. It is done on the video frame to reduce the presence of the noise. Background Subtraction is used to subtract the moving objects and to obtain the silhouette[6]. Background modeling is the heart of the background subtraction algorithm. It can be classified into two main categories non-recursive and recursive techniques.

A non-recursive technique uses a sliding window approach for background estimation. This technique is highly adaptive as they do not depend on the history beyond those frame stored in the buffer. On the other hand recursive technique do not maintains buffer for background estimation, they recursively update a single background model based on each input frame. It uses Gaussian Model.

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Gait Recognition method contains two parts

- Training Part.
- Testing Part.

Median Filtering- After background subtraction, some noises may present due to bad background subtraction. Median filter is used to remove such type of noises.

### B. Silhouette Extraction

Silhouette is defined as a region of pixels of walking person[7]. Background Subtraction is the relatively simple and new approach to find the silhouette from an image. Moving object is extracted by background subtraction. Silhouette Extraction mainly focuses on 'segmenting the human body'. The goal is to obtain the binary image of the silhouette that is nearly match the actual silhouette of the walking person. As shown in the figure2.

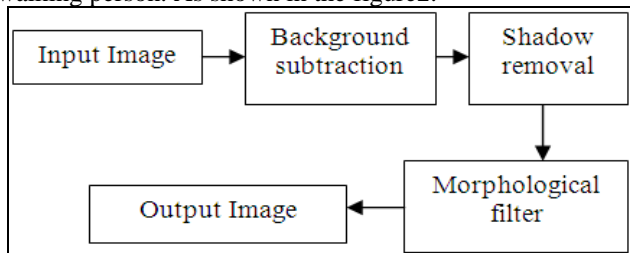


Figure2. Silhouette Extraction

### C. Feature Extraction

Feature Extraction plays important role in gait recognition. Before training and recognition, each image sequence including a walking figure is converted into an associated temporal sequence of distance signals at the preprocessing stage[8]. Features are the best function to differentiate between objects from each other. Feature vector is one method to represent feature of image or a part of an image by carrying out measurements on set of features[4]. As a silhouette image captures almost the motion of entire body so they are the best features. Two basic feature extraction techniques are classified as feature based method and holistic method[3].

## III. PRINCIPAL COMPONENT ANALYSIS(PCA)

PCA is used to simplify the data structure and still account for as much of the total variation in the original data as possible[9]. It is also a statistical analysis of data for finding the principal components on which the data is most likely to vary. PCA is used in identifying patterns in data and expressing the data in such a way as to highlight their similarities and differences. PCA uses orthogonal transformation to convert a set of observation of possibly correlated variables in to set of values of linearly uncorrelated variables called principal component[10]. PCA is used in image compression, but had also applied in the pattern recognition algorithm. PCA is the classical linear approach to reduce data dimensionality and has been effectively used in the face recognition.

## IV. LINEAR DISCRIMINANT ANALYSIS(LDA)

LDA is a technique which is used for the feature extraction and dimension reduction. It has been used in many applications involving high-dimensional data such as image retrieval and recognition[11]. The LDA method is employs to perform training and projecting on original gait feature. It

reduces dimensionality of high dimensional feature with PCA, and then performs optimal classification on low dimensional space with the LDA algorithm[12]. The objective of LDA is to perform dimensionality reduction while preserving as much of the class discriminatory information as possible.

## V. MULTIPLE DISCRIMINANT ANALYSIS (MDA)

MDA is a technique, where three or more class classifications are identified. The objective of this technique is to maximize distance between different classes and minimize difference between each class[13]. MDA process allows the generation of better features and also reduces the curse of dimensionality.

## VI. BACK PROPAGATION NEURAL NETWORK (BPNN)

A neural network can be seen as machine that is designed to model the way in which the brain perform a particular task or a function. Chau[14] notes that the neural network facilitate gate recognition because of their highly flexible and non linear modeling ability. Neural network have been used among other to identify system as well as data classification techniques. Neural network composes of the three layers: Input layer, Hidden layer and Output layer. Design of the neural involves the architecture, algorithm model and the activation function. Back propagation neural network used for the gait recognition problem, which can be used with one or more hidden layer. Hidden layer is used to reduce complexity and increase computational efficiency[4]. Back propagation network can also be considered as a generalization of delta rule.

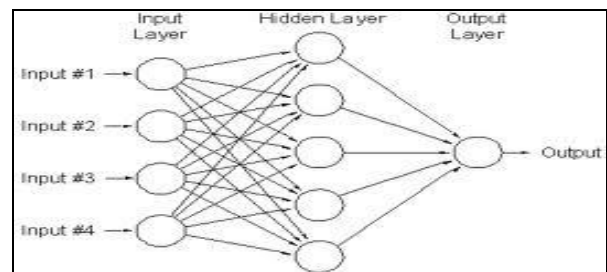


Figure3: Basic Layout of Neural Network

## VII. CONCLUSION

In this paper, we have proposed various techniques for gait recognition. The different techniques used have their own advantages and disadvantages. To get the better result for accuracy we will combine the various techniques such as MDA+BPNN and LDA+BPNN.

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