Human Identification by Gait Using Model Base Approach

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Abstract
Recognition of any individual is a task to identify people. Human identification using Gait is method to identify an individual by the way he walk or manner of moving on foot. Gait recognition is a type of biometric recognition and related to the behavioural characteristics of biometric recognition. Gait offers ability of distance recognition or at low resolution. In this paper we present the review of gait recognition system, different approaches and classification categories of Gait recognition like model free and model based approach, MDA, PCA, BPNN, SVM.

Keywords
Feature Extraction, Gait Recognition, BPNN, SVM, PCA, MDA, Silhouette Representation, Outermost Contour

I. Introduction
Traditionally password were set as a string which included integer or special characters and were used for authentication and these password can easily cracked but now Biometric authentications are used. Biometric is a field of technology that uses automated methods for identifying and verifying a person based on physiological and behavioural traits [1]. In real time applications like in banks, airports authentications and verifications are always required. In such type of applications biometric identification methods are used.

Every individual has different features therefore biometric means unique feature of a person. Biometric characterstics are of two types physiological and behavioural. Physiological characteristics are face, fingerprints, iris, palm print, DNA etc. And behavioral characteristics are voice and gait. As these physiological characterstics does not provide good results in low resolution and need user cooperation therefore recognition using Gait is more attractive. Recognition using gait means to identify a person by the way he move or walk. Gait recognition can also used for low resolution images.

II. Gait Recognition System
System will identify unauthorized individual and compare his gait with stored sequences and recognize him. Background subtraction is the common approach of gait recognition. Background subtraction method [2] is used to subtract moving objects and to obtain binary silhouette. Using background subtraction, preprocessing is done to reduce noise. Background subtraction techniques are also classified into two types: non- recursive methods and recursive methods. Non recursive technique uses sliding window approach for background subtraction. Recursive methods use single Gaussian method and Gaussian mixture model. Gait recognition method contains two parts
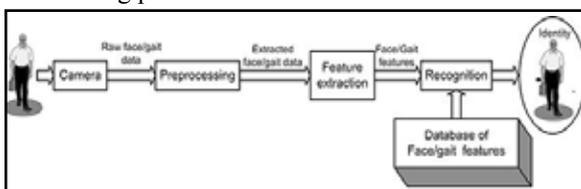• Training part
• Testing part.

Fig. 1:

III. Feature Extraction
Feature extraction is an important step in gait recognition. Features are the best function to differentitate 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 and holistic method [3].

IV. Model Based Approach
Model based approaches are 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]. Features used in this approach are insensitive to background cluttering and noise [2]. Model based gait recognition system includes motion of thigh and lower leg rotation that describes both walking and running [5]. Lee and Grimson [6] used seven ellipses to model human body. Yamet.al [7] used double pendulum to describe the tigh and lower leg movement. Model based method construct human model to recover features describing gait dynamics such as stride and kinematics of joint angle[4]. Parameters used in this approach are height, distance between head and pelvis.

V. Model Free Approach
Model free approach is easy to follow and has less computational complexity and this approach is best suited for real time systems. [8] They used model free approach for gait recognition based on outermost contour.

VI. PCA (Principal Component Analysis)
This mathematical procedure is used to reduce the dimensionality of data.PCA allows us to compute linear transformation that maps data from high dimensional space to lower dimensional space [2]. 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 components [9]. To obtain gait feature [10] they adopt PCA for dimensionality reduction. PCA is a classical linear approach to reduce data dimensionality and has been effectively used in face recognition.
[8] They use different types of classifiers to verify the effectiveness and robustness of feature extraction algo.

A. Backpropagation Neural Network (BPNN)
Neural networks give effective results for solving multiple class classification problems. Chau [11] notes that neural network facilitate gate recognition because of their highly flexible and non linear modeling ability. Neural network has three types of layers: input layer, output layers and hidden layers. Hidden layer does intermediate computation before directing the input to output layer. Back propagation can also be considered as a generalization of delta rule. When back propagation network is cycled, an input pattern is propagated forward to the output units through the intervening input to hidden and hidden to output weights. Neural network have been widely used in image and signal processing [12].
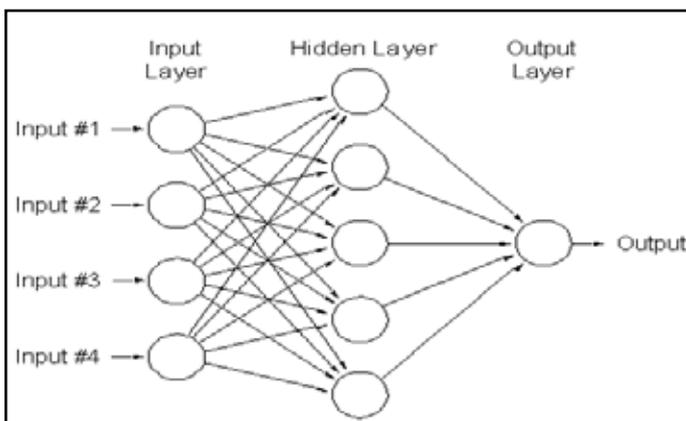
Fig. 2:

B. Support Vector Machine (SVM)

SVM is classified into two classes. First class maps the training smaples into a high dimensions space and then finds a separating hyperplane that maximizes the margin between two classes in this high dimension space [8]. They give result using model free approach. CCR (correct classification rates) for BPNN is 94.33% and for SVM 94.67%.

C. MDA (Multiple Discriminant Analysis)

MDA [13] is used to solve multiple class classification problem. MDA has ability to optimize the class seprability. Main objective of MDA is to maximize distance between different classes and minimize difference between each class. [8] They proposed that after MDA training process, gait features are transformed to new space where it becomes easier to classify gait features from different classes.

V. Conclusion

In this we conclude that there are different types of approaches used for gait recognition with each has its advantages and disadvantages. We cannot say that one approach provide best result upon other but we will use model based approach and achieve better accuracy result of CCR for BPNN.

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