Improving Technique for GAIT RECOGNITION & Performing Feature Extraction Using Videos of Different Forms

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Abstract—**Biometric gait recognition is the way with the help of which we can identify the human being from far distance with his any sort of cooperation from his side .human identification using gait now a day's gaining an interest from computer vision community. It is very inconspicuous biometric this is what the feature which really makes it more effective and efficient as compare to another technique to identify the human being .Many highly security needed places such as military, banking sector, parking lots provide them a best way to identify threats. It assured to keep the track of different user groups and on the basis of group they belong to providing different level of accessibility to them.**

Keywords: **Gait recognition, Gait recognition approaches, principal component analysis, multiple discriminant analysis, back propagation neural network, outermost contour, support vector machine.**

I. INTRODUCTION

Gait recognition is the way which is used to detect, track and identify the human as well as identification using gait is efficient way because it is related with individual not with information passing from one place to another place.

During the time of 5th century B.C, to identify the individual movement when he runs or sprinting is defined in the ancient Greek art. Later on Shakespeare noticed that we can recognize on the basis of walk also i.e. is what today world known as gait. [3]

First gait recognition approach developed by Niyogi and Adelson [6]. It provides the new way of research direction in the era of biometric world. Biometric broadly classified in two different characteristics physiological or behavioral to authenticate the identities of people. In physiological includes face, fingerprints, iris, palm print, handwriting, DNA. In case of behavioral characteristics are key stroke-scan, speech pattern and gait. In both the methods have their own advantages and disadvantages. As in face or finger prints we need the human co-operation and as well as it does not work in low resolution so to eliminate these disadvantages gait came into existence in which we can get the better results and as well as we don't need co-operation from user side.

As in today era we can divide the gait into two different categories: model based and model free. In model based it consists of two steps, in first step human model are constructed, second step it use the parameter of the model for recognition because of these things this technique is slow complex in nature. To overcome their disadvantages model free technique is used which don't construct the human model just recognize on the basis of image statistics.

As a lot of work is already done in gait but still it has limitation like changes of clothes, change in mood, carrying objects in the hands or imperfect segmentation can affect the results. There are 24 different components to human gait if all these are considered then the gait is unique. To implement the Gait it has different steps need to consider like Input, background subtraction, feature extraction, recognition and at last testing the result respectively.

II. OVERVIEW OF APPROCHES

A Prime motive is to develop a system which is automatic gait recognition method. For this it needs to be implemented in different steps to complete the whole task. Broadly it is divided into two parts training and testing:-

1. *First step is to load the input video in the database so that while identifying the object we should have inbuilt detail of the object on the basis of which we can match it.*

2. *In second step, I am going to work on frames for which the inputted video or testing video will converted into the frames so that we can match them.*

3. *In third step, one of the important part need to be implemented which is background subtraction because if the threat is moving on a particular place but we need to concentrate only on him rather than complete frame.*

4. *In fourth step, we are going to implement the concept of feature extraction which means on the basis of what different parameters we are going to match the database image with the man who is walking.*

5. *In fifth step, Core part of gait is implemented, recognition which is basically consists of two different parts:-*
   1. Matching the database with the inputted data.
   2. Testing the result.

6. *At last we will check out the how much efficient CCR (correct classification rate).*

All of these steps will take place in two parts training and testing.
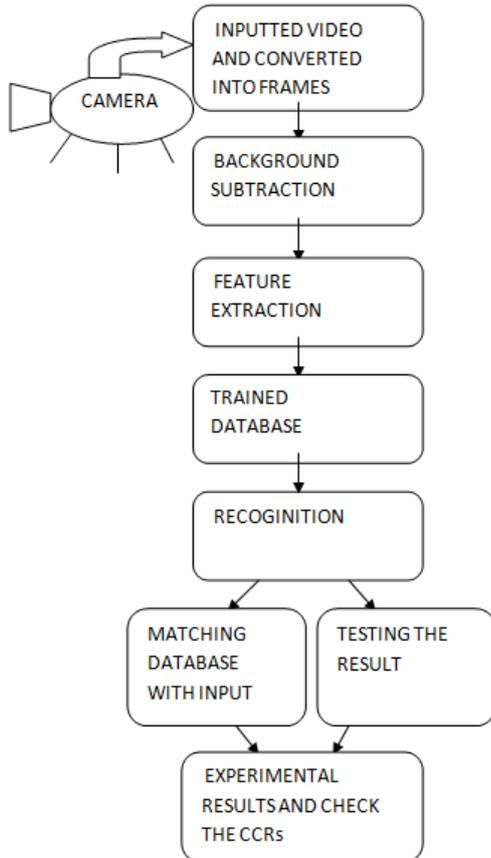
III. GAIT RECOGNITION SYSTEM

Fig. 1 Example of a Process of Gait Recognition

A. Input Video

The foremost step is to load the input video because I am going to do work on live streaming so for this the extension of the video is the most important thing need to be consider the best type of video is which is supported is avi-reader videos which can be recorded from the video cameras as well as videos made by mobiles also supported.

B. Background Subtraction

To implement the background subtraction its main motive is to make the image to become more smoothing as well as useless part will be removed so for this, I am going to use two different things

1. *Equation*
2. *Median filter*

In which, I remove the background component by subtracting their mean and dividing by their standard deviation and smoothing them with a median filter.

C. Feature Extraction

Feature extraction is based upon the silhouette analysis. The main reason to add this part because up to one extent, it captures the motion of the body parts, another reason to implement, it support the night vision capability.

While extracting this feature we have two different options. Those are following:-

1. *Use the entire silhouette*
2. *Use only the outer contour of the silhouette*

The choice of using above mentioned feature depends upon the quality of the binarized silhouettes. If the silhouettes are of good quality, the outer contours preserve all the information of the silhouette. In case of low quality contours, low resolution data, the drawing out of the outer contour from the binarized silhouette may not be certain. In such situations, direct use of the binarized silhouette may be more appropriate.

I choose the OUTERMOST CONTOUR, In order to reduce the computational cost. In outer contour is used to reduce the dimensionality of the image. For which the complete image is divided into the rows as in each row of normalized silhouette image, the most right and left pixel on the contour belong to outermost contour.

As in outermost contour the number of pixels are definite in number so dimensionality cannot be reduced up to that extent for which we are going to use one more feature i.e. HANVAN'S MODEL ALGORITHM. The geometric human body model designed by Hanavan (1964).A total of 41 anthropometric parameters need to be measured in this model. Example of a web page in [9]

Table I

No	Parameter
1	Length, Hand
2	Circumference, Toe
3	Length, Wrist to Knuckle
4	Circumference, Ankle
5	Length, Forearm
6	Circumference, Shank
7	Length, Upper arm
8	Circumference, Knee
9	Length, Elbow to Acromion
10	Circumference, Upper Thigh
11	Length, Foot
12	Circumference, Head
13	Length, Shank
14	Circumference, Chest
15	Length, Thigh
16	Circumference, Xyphion Level
17	Length, Head
18	Circumference, Omphalion Level
19	Length, Upper Trunk
20	Circumference, Buttock
21	Length, Xyphion to Acromion Level
22	Width, Hand
24	Width, Wrist
25	Length, Lower Trunk
26	Width, Foot
27	Circumference, Fist
28	Width, Toe
29	Circumference, Wrist
30	Depth, Hip
31	Circumference, Forearm
32	Width, Chest
33	Circumference, Elbow
34	Width, Xyphion Level
35	Circumference, Axillary Arm
36	Width, Omphalion Level
37	Circumference, Foot
38	Width, Coxae
39	Circumference, Ball of Foot
40	Length, Xyphion Level to Chin/Neck Intersection
41	Length, Hip to Chin/Neck Intersection $= P_{12} + P_{13} + P_{40}$

Out of these parameters some of the parameters will be selected to do the feature extraction with the help of the Hanavan model.

D. Recognition

To implement the recognition, it can be implemented using two different steps

 1. *Matching database with input*
 2. *Testing the result.*

To match the database with the input we use the surf method technique which is the inbuilt method in Matlab which is simplest and one of the best way to match the database image with the input image.

In case of testing the result, I will use the merging of two techniques and test the results. These two techniques are:-

 1. *SVM (Support vector machine)*
 2. *NN (Neural network)*

The Support Vector Machine (SVM) is a state-of-the-art classification method introduced in 1992 by Boser, Guyon, and Vapnik. The SVM classifier is widely used in bioinformatics (and other disciplines) due to its highly accurate, able to calculate and process the high-dimensional data such as gene expression, and exibility in modelling diverse sources of data.

Some of the properties of SVM are given below:-

 1. *Flexibility in choosing a similarity function*
 2. *Sparseness of solution when dealing with large data sets. Only support vectors are used to specify the separating hyper plane.*
 3. *Nice math property: a simple convex optimization problem which is guaranteed to converge to a single global solution*

It has lots of applications also which makes it more suitable to use in case of gait recognition.

- The Neural Network (NN) is the technique which is capable to make the calculation of central nervous system mainly used in machine learning and pattern recognition method. It has mainly three parts input, hidden, output which is shown in following diagram. An artificial neural network is an interconnected group of nodes, akin to the vast network of neurons in a brain [10]. Here, each circular node represents an artificial neuron and an arrow represents a connection from the output of one neuron to the input of another. Example of a web page in [10] It has following advantages:-
 1. *Our enhanced Human Identification Using Gait Recognition algorithm is low cost and more accurate.   Our enhanced Human Identification Using Gait*
 2. *Recognition algorithm assures quality of result. Because of these properties and advantages, I am going to implement the concept of recognition by collaborating two different techniques SVM & NN.*

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