

# Review on Enhancement of Gait Recognition Using SURF and K-NN

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## ABSTRACT

Biometric technologies are the best computerized techniques for person's affirmation. The elite advantage of biometric technologies is, they are impossible to replicate. They are subcategorized into physiological and behavioral techniques. Physiological techniques include physical characteristics like facial contours, fingerprints, hand palm geometrics, DNA and irises. Behavioral techniques include behavioral traits like voice pattern, gait and typing cadence. Gait Recognition is one of the best behavioral techniques to recognize people by the manner they walk. Gait recognition is reckoned for its characteristics: security and reliability. This paper demonstrates the novel approach to intensify the performance metrics of Gait Recognition Systems examined in the previous work. We propose a system in which we have combined SURF and KNN technique for better accuracy and CCR.

Keywords- Enhancement, Gait, SURF, KNN.

## 1. INTRODUCTION

Recognition of an individual is an important task to identify persons. Now a days, biometric authentication has become vital because biometrics associate with individual and difficult to replicate, forge etc.. Biometrics are divided into two types of characteristics: physiological or behavioral, which can be used to check authorization of an individual. Various biometric methods are used to help derive person's individuality. Physiological characteristics includes fingerprints, face recognition, iris-scans and hand scans and behavioral includes keystroke-scan, gait, voice pattern and typing cadence. Here, comes, Gait recognition, that is relatively new biometric identification technology in which a person is identified by its walking style. Identification Systems are referred as best in the following situations:

- (I) Identifying employees at a military base
- (II) Watching for shoplifters in a store
- (III) Watching for terrorists outside a nuclear power plant

(IV) Maintaining security at an airport

Advantages of Gait Recognition that make it one of the best methods for authentication:

- Unobtrusive
- Difficult to replicate
- Effective from a distance
- Non-Invasive: Gait Recognition is an emerging biometric technology which involves people being identified purely through the analysis of the way they walk. It has attracted interest as a method of identification because it is non-invasive and does not require the subject's cooperation.
  - Human recognition based on gait is relatively recent compared to other biometric approaches such as fingerprint, iris, face etc. The most important advantage is that person walking image can be captured from long distance and the image with low resolutions is then processed. We have merged two techniques: SURF (Speeded Up Robust feature) and K-NN (Classifier). SURF will

detect critical points and K-NN will find nearest neighbour. Both are combined to get enhanced results.

## 2. LITERATURE SURVEY

Ashish Bhangale et al. proposed a technique which extracts automatically and describes a moving articulated shape, the human leg and its potential in Gait.CCR is calculated and performance was enhanced.

Arun Joshi et al. used BPNN and SVM technique for recognition and matching purpose. He used center of mass, step size length and cycle length as key features. In this paper he concluded that GAIT has rich potential as a biometric for recognition.

Neha Jain et al. proposed a novel approach GPPE( GAIT using Pal and Pal Entropy for each cycle of the silhouettes. After that, She applied Principal component analysis to create feature Matrix. CASIA Gait and Treadmill Databases were used to evaluate the recognition performance .

Omaima N. Ahmad AL-Allaf et al. proposed the following Algorithms : Linear Discriminant Analysis(LDA); Discrete Fourier Transform (DFT); and Discrete Cosine Transform (DCT) and after comparing the time required for executing the LDA was lowest than DFT and DCT. The recognition rate of proposed system came out with 97 % and MSE with 0.0027.

Ashutosh Batta et al. merged two techniques i.e. SVM (Support Vector Machine) and NN(Neural Networks).SVM is used to calculate and process the high -dimensional data and Neural Networks is used to match the extracted features, which further calculates the recognition performance.

## 3. DESCRIPTION OF THE GAIT RECOGNITION SYSTEM

Gait Recognition System involves the following steps as shown in the figure. Different authentication systems use different strategies.

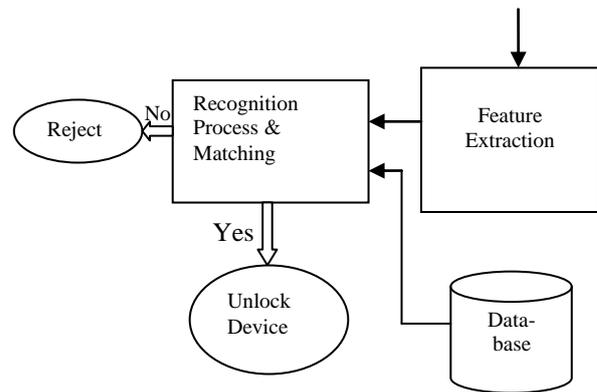
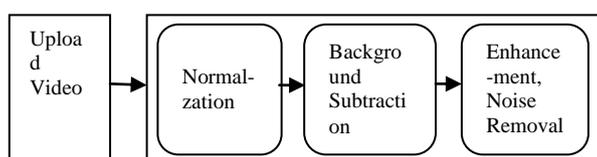


Figure 1 Proposed System for Gait Recognition using SURF and KNN technique.

As shown in figure 1, we will upload the video first and it will be converted into video frames. Pre-processing is done before Feature Extraction. Then our combined technique is applied which includes: SURF and KNN and how our proposed system works, is described as under:

### 3.1 Upload Video:

First Step in this proposed system includes Uploading the video, which includes the code that will automatically convert it into video frames.

As shown in figure 1, after inputting the video, further process takes place which involves: normalization, background subtraction and enhancement. This is called as Pre-processing.

### 3.2 Pre-processing

The acquired video frames contain much noise, so amplification is required. Therefore, enhancement functions such as normalization, background subtraction and enhancement is done to reduce noise and dullness.

#### 3.2.1 Normalization:

Normalization is a process that changes the range of pixel intensity values. Normalization is subjected to binarization. Binarization is a method of transforming greyscale pixels into either black or white moving pixels, which is known as binary silhouette.

#### 3.2.2 Background Subtraction:

After attaining the frames from normalization, unwanted regions/parts needs to be removed from background, which is done in this phase.

#### 3.2.3 Enhancement:

Enhancement operation improves the quality, its contrast, brightness and reduces its noise content.

### 3.3 Feature Extraction

Feature Extraction means converting the input data into group of features. In this phase, we will extract different features of video frames like height, length of hand, length of leg, distance between left hand and right leg and distance between right hand and left leg.

### 3.4 Recognition Process and Matching:

After extracting the features, the final phase will start which is Recognition and Matching. In recognition process the feature from the live database video and the live input video is matched. Matching is done after extracting feature , so

(I) Firstly, extraction is done ,

(II) then matching takes place

The features extracted from video frames are already stored in the database. If it gets matched, the device will be unlocked and if not, then it will show a reject message.

Now, comes the main part regarding recognition performance, which is tested using SURF and K-NN Technique. This is how Gait Recognition system works and it verifies the whether the person's identity matches or not.

### 3.5 Testing:

The performance of a biometric system depends upon the different measures such as CCR (Correct classification rate), false rejection rate, false acceptance rate, genuine acceptance rate. Error rates are measured to determine the accuracy of the biometric system. Brief description of these parameters or measures is:

#### 3.5.1 False Rejection Rate (FRR):

FRR also commonly referred to as type I error, measures the percentage of times an individual who should be positively accepted is rejected- in other words how many times the person cannot gain access [6].

#### 3.5.2 False Acceptance Rate (FAR):

FAR also commonly referred to as type II error, measures the percentage of times an individual who should be rejected is positively matched by the biometric system- how many times the person beat the system [6].

#### 3.5.3 Genuine Acceptance Rate (GAR):

GAR is an accuracy measurement of a biometric system. It is calculated by the formula:

$$\text{GAR} = 1 - \text{FRR}$$

GAR is considered as the chief measurement of precision. Higher the GAR rate, more accurate is the system.

**3.5.4 Correct Classification rate (CCR):** is defined as data set equals the number of correctly classified claims divided by total number of claims in data set.

## 4. CONCLUSION

In this paper, we proposed a system in which we have combined the two techniques, i.e. SURF and K-NN, which provide the better results than SVM and also our proposed system improves the recognition performance.

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