An Approach of Human Identification based on Gait

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ABSTRACT
Gait is a behavioral biometrics which has gains more attention for research. Advantages of human gait are that it can be captured from a distance without knowledge of the subject. Gait is defined as manner of person's walking. A wide range of research have been done in this filed so far. In our research work, an approach has been proposed for identification of human being based on their gait. We have evaluated result analysis on CASIA Dataset. We have considered right side view of 17 subjects and three features for result evaluation. In this paper two type of analysis have been done and find out which analysis have given better recognition rate.

Keywords
Biometrics, Gait, Classification.

1. INTRODUCTION

Recognition of an individual is an important task to identify people. Identification through biometric is a better way because it associate with individual not with information passing from one place to another. The term Biometrics is derived from Greek word "Bio" means life and "metrics" means measure [2][5]. In short, biometrics is the science and technology of measuring and analyzing biological data. Figure 1 shows basic diagram of biometric surveillance.

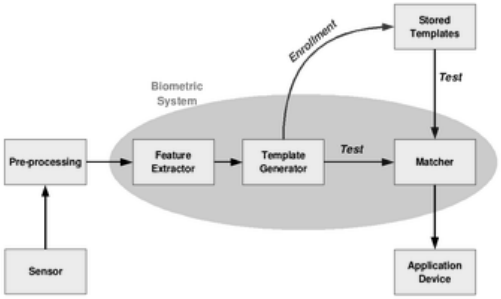


Figure 1. Basic block diagram of biometric surveillance [6].

In this paper, we present a biometrics recognition system based on Gait. Vision based human identification at a distance in surveillance applications have recently gained more importance. Gait recognition as a new behavioral biometrics aims at recognizing individuals by the way they walk rather than the worn clothes or changing backgrounds.

In comparison with other first generation biometrics such as finger prints and iris, gait has the advantage of being non-invasive and noncontact and it is also the only perceivable biometrics for personal identification [5][2]. In the previous work many method has been proposed for solving gait analysis. Which include analysis of subject trajectory, velocity movements, and discrete symmetric operator, continuous HMM [3] and some other approach based on kinematics and dynamics model. In [9] Gait is a spatio-temporal phenomenon that specifies the motion characteristics of an individual. They propose a view based approach to recognize humans through gait. The width of the outer contour of the diarized silhouette of a walking person is chosen as the image feature. A set of stances or key frames that occur during the walk cycle of an individual is chosen. In [8] a motion-based, correspondence-free technique for human gait recognition in monocular video is presented. They contend that the planar dynamics of a walking person are encoded in a 2D plot consisting of the pair wise image similarities of the sequence of images of the person, and that gait recognition can be achieved via standard pattern classification of these plots. The method is tested on outdoor sequences of 44 people with 4 sequences of each taken on two different days, and achieves a classification rate of 77%. Paper [7] proposed a system which is evaluated using side view videos of NLPR Database and experimental results indicate that classification ability of SVM with Radial Basis Function (RBF) is better than other Kernel function.

2. PROPOSED METHODOLOGY

In this paper we have given an approach for human recognition based on Gait illustrated in Figure 2.

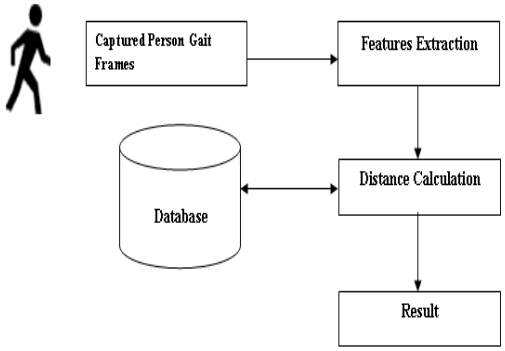


Figure 2. Proposed Block diagram

In the proposed approach shown in figure2, gait frames are captured from each individual person. Then these frames are inputted into proposed model for feature extraction. The proposed model is designed in Matlab 7.5. Features include

left hand, left and right feet. A single triangle is formed between these features. After triangle formation distance between all three sides has been computed [11] from the given equation.

$$a = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$$

$$b = \sqrt{(x3 - x2)^2 + (y3 - y2)^2}$$

$$c = \sqrt{(x3 - x1)^2 + (y3 - y1)^2}$$

Figure 3 show how distance for three sides has been computed for multiple frames of each individual subjects [6].

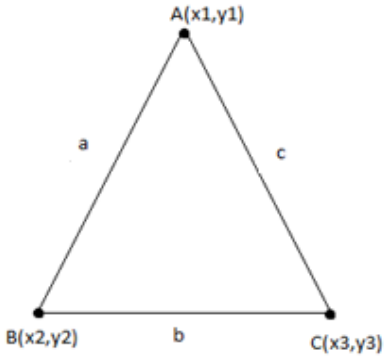


Figure 3. Example of single triangle formation and calculation of three sides distances.

Table I shows an example of a particular person triangle sides length with multiple frames.

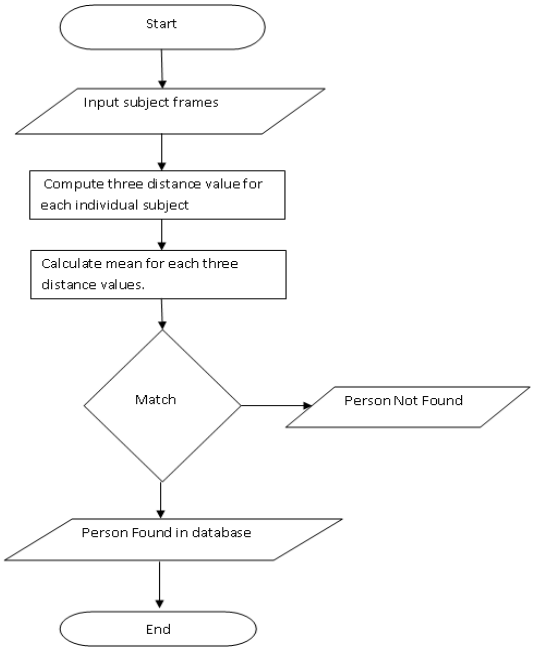
Frames	Distance 1	Distance 2	Distance 3
1	52.2015	44.1022	79.3095
2	51.6624	44.4072	79.9062
3	49.8197	44.9110	78.5684
4	48.3735	44.1475	75.9276
5	41.4367	39.3954	70.8025
6	42.2019	26.9258	64.1405
7	44.6430	16.5529	50.0899
8	50.2892	28.0713	51.6624
9	49.9800	42.2966	57.6975
10	51.5461	51.2445	64.3506
11	55.7315	54.0093	71.8401
12	75.743	57.1402	60.2993
13	79.9312	53.1507	62.0322
14	77.0779	46.8722	63.6396
15	68.6222	40.2616	60.5310
16	58.8218	28.1603	56.4358
17	50.1597	17.0294	55.1543
18	65.4370	32.0156	52.7731
19	76.4199	46.0109	53.9351
20	81.5659	54.0370	55.5788

Table 2 shows 17 subjects Mean distances of three sides

Subjects	Mean Distance A	Mean Distance B	Mean Distance C
A	55	39	65
B	58	48	66
C	58	49	64
D	75	50	79
E	81	72	93
F	61	52	66
G	61	40	64
H	56	52	62
I	57	45	63
J	63	53	68
K	58	40	63
L	81	65	91
M	61	55	70
N	65	49	76
O	56	48	68
P	71	56	81
Q	63	56	70

Table1 shows three distances of an individual subject frames. As we get multiple frames of person gait, so we calculate the overall mean for all three distances of an individual subject for recognition [5]. This process is repeated for each individual subject and their individual mean distances are stored for recognition. Table 2 shows 17 subjects mean value for each individual subject**.**

3. PROPOSED FLOWCHART



4. EXPERIMENT AND RESULT ANALYSIS:

CASIA gait database setA [10] has been used for evaluation of our proposed work. The dataset includes 17 subjects and frames in each individual subjects are of size 352*290. Figure 4 shows the three mean distance variations

of 17 subjects. All 17 subjects mean distance numeric value is shown in table 2

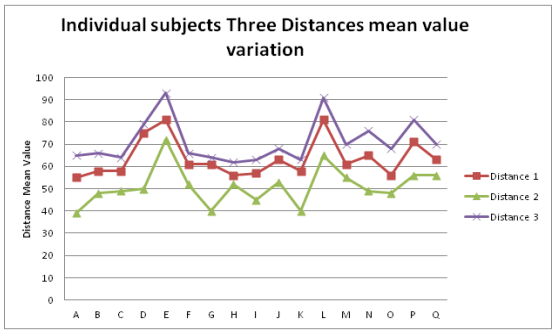


Figure 4. Represents the mean variation of three distances of 17 subjects. X-axis represents subjects and y –axis represents distances mean value.

Objective of our approach is to find the correct classification rate. We perform analysis on mean values of 17 subjects to find correct classification rate (CCR). We perform two type of analysis.

4.1. First Analysis:

The first analysis compute CCR [1] of distance1, distance2 and distance3 of each 17 subjects to find which distance value gives better recognition rate. Figure 5 shows the first analysis results.

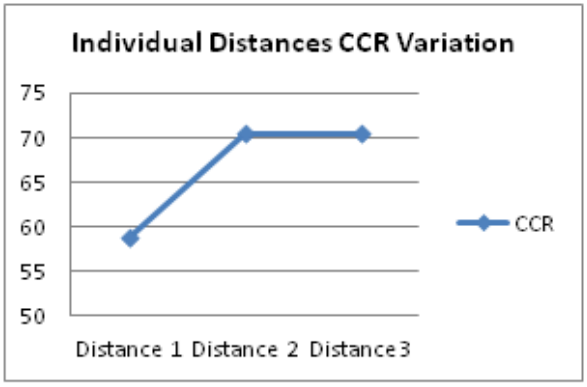


Figure 5. First result analysis of individual distances with their correct classification rate.

4.2. Second Analysis:

In second analysis we create three pair of distances: Pair1(A): Distance 1 and Distance2, Pair2(B): Distance 2 and Distance 3 and Pair3(C): Distance 1 and Distance 3 and find their correct classification rate as shown in figure 6.

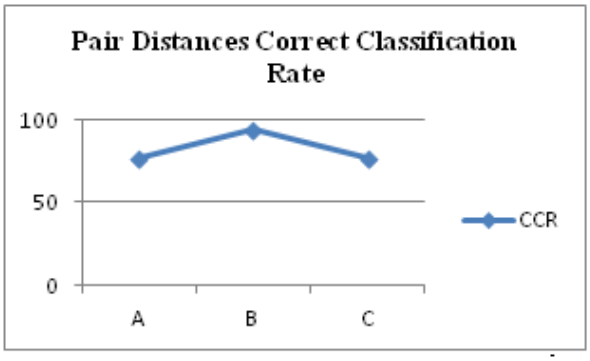


Figure 6. Shows CCR of three Pair distances, A represents (Distance1 &Distance2), B represents (Distance2 & Distance3) and C represents (Distance 1& Distance 3)

From these two analysis it is found that second analysis which is based on pair distances achieve better recognition rate as compare to first analysis. Maximum recognition rate in second analysis is obtained from second pair that is distance2 and distance3 is 94.11% and minimum recognition rate achieved is 76.47%. The average recognition rate of second analysis is 82.35% which is higher than first analysis average recognition rate 66.6%. It is concluded that if we consider all three distances we get best recognition rate as compared to these two analysis. Table 5 shows the result of two analysis done on 17 subjects.

Table 5 shows two analysis Correct Classification Rate

Analysis Parameters	
First Analysis	**CCR**
Distance 1	58.80%
Distance 2	70.50%
Distance 3	70.50%
Second Analysis	**CCR**
Pair 1(A)	76.47%
Pair 2(B)	94.11%
Pair 3(C)	76.47%

5. CONCLUSION AND FUTURE WORK

In this paper gait based human recognition is proposed where two analysis has been done to find best recognition rate. Table5 shows the correct classification rate of both analysis. Our experiments demonstrated that a feature selected of a subject proves to be better gait recognition. It is clear from the experiments that the assumptions we made on dynamic features of human body (i.e hand and feet) improves greatly human gait recognition. In our proposed work , where two analysis has been done to find best recognition rate. Table5 shows the correct classification

rate of both analysis. It is concluded that second analysis give better recognition rate where pair2 (B) give higher CCR. We have computed the average CCR that is 66.66% for first analysis and 82.35% for second analysis. It has been concluded that second analysis have given better classification rate.

6. REFERENCES

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