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Analysis of Gait Recognition Algorithm Models using SURF and SVM – A Comparison

Chinu Sayal[1], Dr Rajbir Kaur[2], Dr Charanjit Singh[3]

M. Tech Student, Dept. of ECE, Punjabi University, Patiala, India[1]

Asst Professor, Dept. of ECE, Punjabi University, Patiala, India[2,3]

Abstract: Now-a-days, biometric recognition is a common and reliable way to authenticate any human being based on his physiological or behavioural biometrics [1]. A physiological biometric traits is stable in their biometric like fingerprint, iris pattern, facial feature, hand geometry, gait pattern etc. whereas behavioral biometric traits is related to the behaviour of person such as signature, speech pattern, keystroke pattern. Facial recognition system is a computer application for automatically identifying or verifying a person from a digital image or a video frame from a video source. A specific way or style of proceeding onward foot is characterized as Gait. Gait acknowledgment could be used from a detachment that makes it proper to perceive the offenders doing incorrectly work. In this paper we utilize Hananava's model which is a geometric human body model and an aggregate of 41 Anthropometric parameters should have been measured. The systems being utilized for acknowledgment are SURF and SVM. SURF is a vigorous neighbourhood highlight finder though SVM is a cutting edge characterization strategy. The yield result is being acquired from the blend of these two calculations. Yield is through coordinating the video information outlines with recordings yield outlines.

Keywords: Gait Recognition, Speeded up Robust Features (SURF), Support Vector Machine (SVM).

I. INTRODUCTION

The gait as a biometric is a generally used a new research of study in which the domains of workstation vision. This has been getting the developing enthusiasm inside the workstation vision group and various stride measurements have been taken care. Gait recognition is a rising biometric innovation which includes individuals being recognized absolutely through the investigation while they walk. It has been pulled in enthusiasm as a technique for ID on the grounds that it is not obtrusive and does not force the subject's participation. Gait recognition could be utilized from a separation that making it appropriate to recognizing the culprits at a wrong doing scene [13]. We utilize the term Gait recognition to imply the ID of a single person from a feature succession of the subject strolling. This does not imply that walk is constrained to strolling; it can additionally be connected to running or by walking. Walk as a biometric has numerous favourable circumstances which make it an appealing suggestion as a technique for distinguishing proof. The step has a principle advantage, unpretentious recognizable proof at a separation, makes it an extremely appealing biometric.

The capability to distinguish a conceivable danger from a separation, gives the client a time span in which to respond before the suspect turns into a conceivable risk. An alternate inspiration is that feature footage of suspects that are promptly accessible, as reconnaissance. Polaroid are generally minimal effort and introduced in many structures or areas obliging a security vicinity, the feature simply needs to be checked against that of the suspect and also the inborn points of interest of step, [5] the build in processor power, alongside the fall in cost of rapid memory and information stockpiling gadgets have all helped the expanded accessibility and relevance of machine vision and feature preparing strategies. Ongoing feature transforming in which it is needed for step recognition is a possible probability on present home PC engineering, making the innovation a feasible security application [14]. Human step recognition works from the perception that a singular's strolling style is one of a kind and could be utilized for human distinguishing proof.

II. GAIT RECOGINITION SYSTEM

The stride acknowledgment system [3] is a framework which is utilized to distinguish the stride of a person, by looking at the walk of an individual with the succession of information put away in the database. The proposed stride acknowledgment framework is appeared in the figure1. In this framework we firstly, change over the caught video into picture outlines, besides the foundation subtraction is performed on the picture outlines to dispense with the non-usable data. After that highlight extraction is performed to extricate different parameters such as separation between the right hand and the left leg, separation between the head and the feet(the stature of the person), separation between both the

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hands, separation between the right leg furthermore, the left hand, length of the one leg and the length of the one hand can be execute on the premise of hanavan's model.
Stage 1: Select a Live Video for database and build up a code so that live video is naturally changed into video casings and mat document as database. We are going to chip away at casings for which the input video or testing video will changed over into the edges with the goal that we can coordinate them.
Stage 2: We will execute the idea of foundation subtraction so that unneeded part will be erased and afterward we can focus on significant part in light of the fact that if the danger is proceeding onward a specific place however we have to focus just on item instead of complete edge.
Stage 3: We are going to actualize the idea of highlight extraction which implies on the premise of what diverse parameters we are going to coordinate the database picture with the man who is strolling.
Stage 4: Lastly we build up a code to test acknowledgment execution of our proposed strategy utilizing SVM and for coordinating testing and preparing information we are going to utilize SURF which will demonstrate preferable results over beforehand acquired utilizing other distinctive techniques.

2.1. Capuring the Input Video

At first an information video is caught for the stride distinguishing proof, assist then that info video is changed over into the casings which are generally known as video arrangements and after that these edges are further utilized for the acknowledgment procedure.
The initial step to be completed is to catch the recordings having the individual's strolling. The accompanying are the suspicions amid the procedure of video catching:

a. The gadget for catching video must be stationary at the season of video catch.
b. The main moving article in the casing of perspective is the subject, while the video is being recorded.
c. The line of perspective of the gadget is at right points to the course of strolling of the subject.

The devices which are being used for the capturing of videos should have a sufficient clarity of resolution. It is preferable that within a single database all videos are to be recorded from the same distance and this is requirement for the uniformity of feature parameters.

2.2. Background Subtraction

The second step in the wake of changing over video into casings, is of background subtraction. The fundamental utilization of the background subtraction is to expel or preclude all the undesirable data i.e. just to hold the helpful information. For the most part the essential and the basic assignment for some PC based applications is to perceive the moving articles from a video arrangement. Background subtraction is a typical methodology, which distinguishes the moving items from a segment of a video casing, that essentially contrasts from a foundation model. By Background subtraction[4], the required data can be held and it is performed, in which the moving articles is perceive from the area of the video outline that varies from the foundation model. It produces twofold pictures which contains white and dark moving pixels know as paired outlines. Background Subtraction is done on the video edges, to lessen the nearness of commotion. The premise basic strategy for movement identification is Background Subtraction. The following condition demonstrates the count for the background subtraction is basic and simple to implement.

$$D_K(x,y) = \begin{cases} 1, \text{if } |F_k(x,y) - B_{k-1}(x,y)| > T \\ 0, \quad \text{otherwise} \end{cases} \quad \text{---1}$$

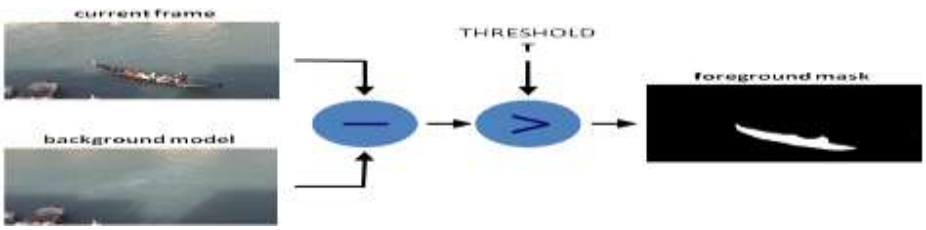

Figure 1: Calculation of Background Subtraction.

Where $D_k(x,y)$ is the resultant difference, $F_k(x,y)$ is the current frame of the system and $B_{k-1}(x,y)$ is the background initial frame and T is threshold which holds back the shadow depending on the value assign.

The result of the background subtraction is a picture that maps the contrast between background picture and the first info picture. What's more, to concentrate the outline, the distinction picture must be changed over into a twofold picture by executing reasonable edge esteem into the pixels diverse picture, which further results into a double picture that mirrors a whole diverse picture, and the required picture can be separated with no loss of data.

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Figure2. (a)The input image (b) Foreground image by subtraction

2.3. Detection and Tracking

Detection and Tracking are computer vision frameworks based errands utilized for finding and taking after individual in a video arrangement. Human location and following are thought to be the initial two procedures for the video observation and further bolster into more elevated amount thinking modules, for example, acknowledgment and static/dynamic scene investigation.

The following is utilized as a part of the closer view picture to decide the position and the other applicable data of the moving articles in the successions and to outline the item outline by casing. The principle thought process is to acquire the paired picture of the silhouette[6],[7] that is about coordinating the real outline of the strolling individual. The principle point of following is to subtract the two consequent edges, in which the piece of pictures which doesn't change can get subtracted to give the zero power i.e. the foundation picture gets subtracted and after subtraction, it gives the dark pixels. Then again, just the moving article don't get lessens to zero in light of the fact that the power of the moving object of the two resulting edges are distinctive.

To create the outline taking after strides must be completed.

1. Firstly, foundation subtraction is to be done, on the info video, outline by edge along these lines the resultant picture is to be doubles into the foreground (white) and the background (black) pixels.
2. A limit box is set around the moving picture that contains the moving individual, as that part of the picture as appeared in the figure 2(b) along these lines, in this the span of the container is suited all the data in the database.
3. The left and the right limits of the body are followed. Along these lines the stature of the outline is gotten as far as numbers and spared in the database.

By this, the tallness of the outline can be computed and this will assist help in figuring the different parameters. The parameters computed can assist utilized as a part of for the acknowledgment purposes.

2.4 Feature Extraction

Hanavan's model is being used for feature extraction and some of its important features or parameters which was not used till date has been used in this system. For Feature Extraction Hanavan's model is the latest and fastest model based approach. Feature selection is the most important essential venture in gait recognition. The peculiarity must be powerful to working conditions and ought to yield great separate capability crosswise over people. Every gait arrangement is being separated into cycles. The geometric human body model designed by Hanavan's (1964) was modified Distance between hands Hanavan's model is an inbuilt model in mat lab it has 41 inbuilt features we have used. Feature selection is a critical step in gait recognition. The feature must be robust to operating conditions and should yield good discriminability across individuals. Each gait sequence is divided into cycles. Gait cycle is defined as person starts from rest, left foot forward, rest, right foot forward, rest. Gait cycle is determined by calculating sum of the foreground pixels. At rest positions this value is low. By calculating number of frames between two rest positions, gait cycle (period) is estimated. In this further various parameters can be calculated.

Table 1.1 Hanavan's Table

Segment	Prediction Equation
Length of Hand	m = 0.038 + 0.080- 0.660
Length of Forearm	m = 0.081+ 0.052 - 1.650

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Length of Upperarm	m = 0.007 + 0.092+ 0.050 -3.101
Length of Foot	m = 0.003 + 0.048 + 0.027 - 0.869
Length of Shank	m = 0.135 - 1.318
Length of Thigh	m = 0.074+ 0.138 - 4.641
Length of Head	m = 0.104 + 0.015- 2.189
Length of Trunk	m = 0.349+ 0.423 + 0.229 - 35.460

In the above table prediction equations are given using these equations features of each frames have been extracted. The masses of the segments were obtained from the prediction equations while the densities of the segments were calculated from the masses and the volumes of the segments in this method. Each segment or section was defined as a simple geometric shape and the density throughout the segment was assumed to be constant. The trunk was catagorized into three segments at the omphalion (navel) and xyphion level: higher (elliptical column), middle (elliptical solid) and decreased (elliptical column).The hand was defined as an ellipsoid of revolution. The foot was defined as an elliptical solid with the base (proximal end) being circular.

2.5. Recognition

Recognition is the most important and the critical step for the gait-based human identification. In this, the input test video sequences are compared with the trained sequence in the database and after this background subtraction takes place. After background subtraction feature extraction and finally recognition using SURF and SVM techniques. The results of this are as follows:

Figure 3. Steps used in recognition:a) Load video b) Background subtraction c)Feature Extraction

The results of Recoginion using the SURF and SVM techniques as a parameter of accuracy are as follows:

Figure 4. Result of Accuracy with a) SVM and SURF b) SVM only c) SURF only.

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2.6. Comparision

The comparison of the given data shows that the hybrid of SVM and SURF technique has more accuracy as compared with only SVM or SURF technique. The tabular as well as graph form of comparison is as follows:

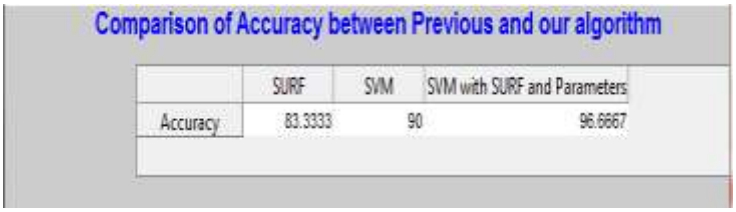

Figure 5. Comparison of Accuracy between Previous and SVM+SURF algorithm

The Bar graph form of comparison is shown below:

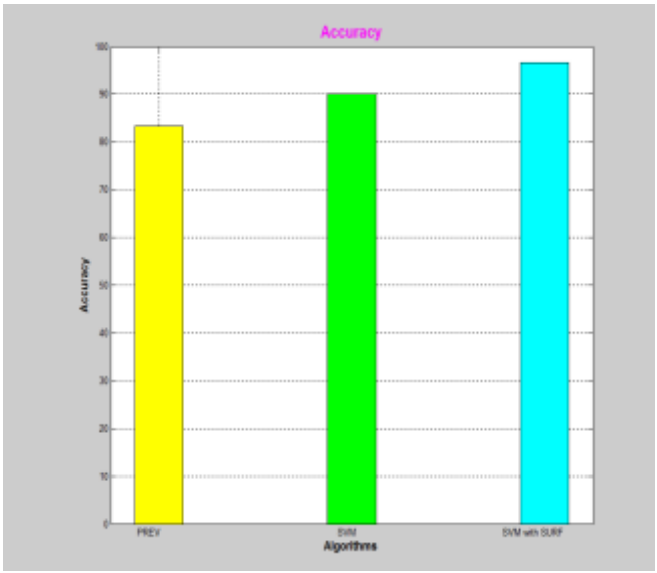

Figure 6. Bar graph comparison.

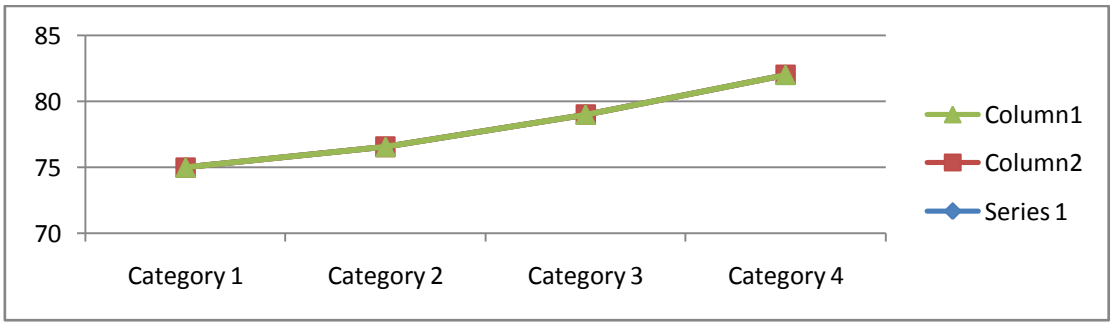

Figure 7: Silhouette the previous model

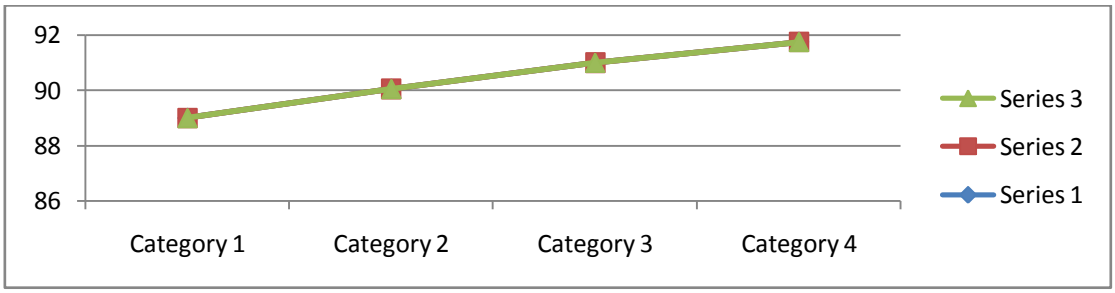

Figure 8: SVM Algorithm Graph

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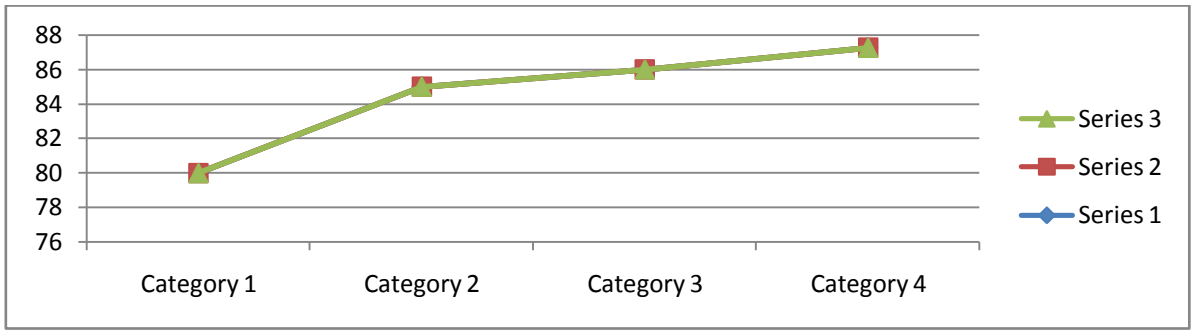

Figure 9: SURF Algorithm Graph

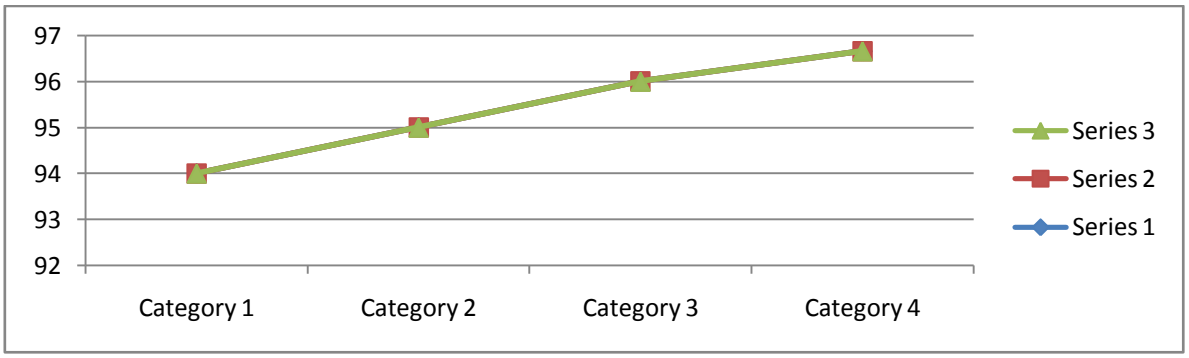

Figure 10: SVM And SURF Algorithm Graph

Table 1.2 : Comparison of Algorithm Values

Algorithm name	Category 1	Category 2	Category 3	Category 4
Silhouette	75	76.56	79	82
SVM	89	90.05	91	91.75
SURF	80	85	86	87.25
SVM+ SURF	94	95	96	96.66

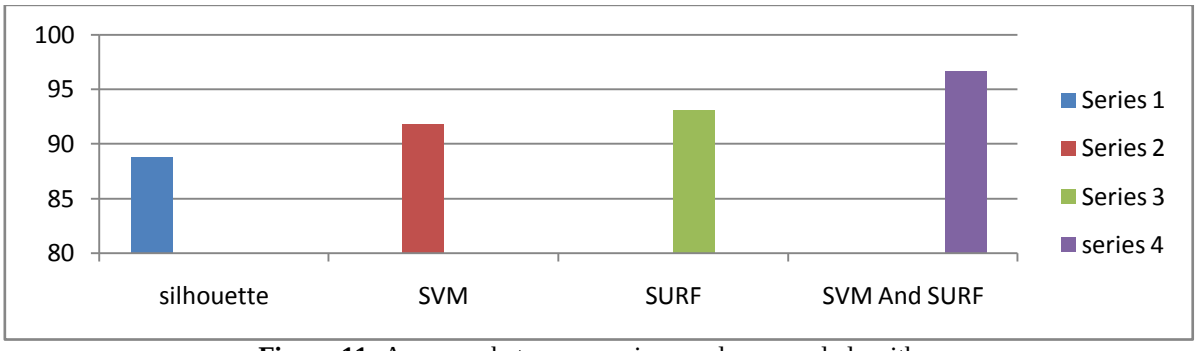

Figure 11: Accuracy between previous and proposed algorithm

III. CONCLUSION

The computer vision systems make guaranteed that vision based methods can be procured. Paper portrayed here gives disentangled system to the human identification. Background subtraction technique used to follow and section the outline of the person under observation. Numerous other Gait examination strategies talked about here in subject too, yet the blend of the SVM and SURF for the acknowledgment produces the better results. Test Results is broadly seen in the high exactness rate which shows the hearty peripheral shape highlight and highlight extraction model utilized is additionally compelling. The best precision 96.677% accomplished and the examinations with the previous work to step acknowledgment techniques demonstrates that the proposed strategy is an extremely encouraging stride acknowledgment strategy in walk acknowledgment group.

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IV. FUTURE SCOPE

1. Acquiring step attributes from single camera based set-up have a few restrictions. However various camera based setup having huge points of interest.
2. Execution rate must be enhanced by impediment, apparel style conditions and diverse strolling contemplations.

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