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Analysis of Gait Recognition Algorithm Models with SURF and SVM- A Review

Chinu Sayal
[1] *Student,*
Department of Electronics & communication, Punjabi University, Patiala, India
chinusayal1990@gmail.com

Dr. Rajbir Kaur
[2]*Asst.Professor,*
Department of Electronics & communication, Punjabi University, Patiala, India
rajbir277@yahoo.co.in

Dr. Charanjit Singh
[3]*Asst.Professor,*
Department of Electronics & communication, Punjabi University, Patiala, India
channjitsingh@yahoo.com

Abstract: ***Gait is a potential behavioral feature and many studies have demonstrated that it has a rich potential as a biometric for recognition. Vision based Posture Recognition has a potential to be a natural and power full tool supporting efficient institutive interface for HCI. In this paper a survey of recent Human Gait Recognition System is presented, its purpose is to introduce a visual interpretation of Gait Recognition as a mechanism of interaction to identify the human in the application of Biometric Authentication. Simple feature selection Hanavan's model reduces the computational cost significantly during training and recognition. These methods have been applied on frames of videos, and these videos are live and some from ADSC-AWD database. In visual observation frameworks, human ID at a separation has as of late picked up more investment. The advancement of workstation vision methods has additionally guaranteed that vision based programmed walk examination might be continuously attained for training and testing purpose.***

Keywords: Gait recognition, Posture recognition, Gait Energy Image (GEI), Shelaton Information, HCI, Biometric Authentication.

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 is 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.

The basic structure and working of gait recognition system are described below. Block diagram of general gait recognition system is shown below in figure1 phases involved and existing methods of all relevant steps are explained below:

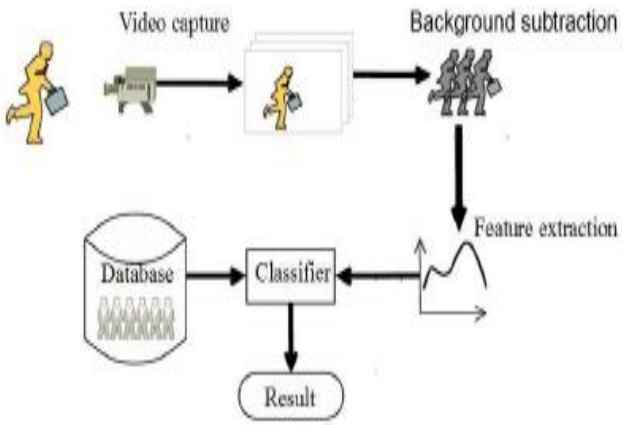

Fig1.Block diagram of gait recognition system

Video capture: It is a method of accurate tracking of the person in indoor surveillance video stream obtained from the static camera. Example: a video camera on the front door or anywhere in multi-complex can store gait sequences of a moving person, so that video can be used for further processing.

Background subtraction: Background subtraction is a computational vision process of extracting foreground objects in a particular scene. A foreground object can be described as an object of attention which helps in reducing the amount of data to be processed as well as provide important information regarding the task under consideration. Often, the foreground object can be thought of as a coherently moving object in a scene. Background subtraction generates binary images containing black and white(moving pixels) also known as binary silhouettes. Background subtraction is a class of techniques for segmenting out objects of interest in a scene for applications such as surveillance. There are many challenges in developing a good background subtraction algorithm. First, it must be robust against changes in illumination. Second, it should avoid detecting non-stationary background objects such as moving leaves, rain, snow, and shadows cast by moving objects. Finally, its internal background model should react quickly to the changes in the background such as starting and stopping of vehicles.

Feature Extractions: Feature selection is an important 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 a person starts from rest, left foot forward, rest, right foot forward, rest. The stances during the gait cycle, Gait cycle is determined by calculating the sum of the foreground pixels. At rest positions this value is low. By calculating a number of frames between two rest positions, gait cycle is estimated.

Matching and Recognition: Matching and Recognition is the final step of gait-based person identification. Here, the input is the test video sequences which is compared with the trained sequence in the database. In general, minimum distance classifier may be used for gait recognition. In the training, after parallel processing of two training processes, spatial and temporal templates are extracted. Test sequences are pre-processed by template extraction and projection. The projected vectors of spatial and temporal templates are concatenated into extended vectors before recognition. Then these extended vectors are matched to the trained data base with the help of Neural Network, Back propagation neural network, linear discriminate analysis and multi linear discriminate analysis.

II. REVIEW OF LITERATURE AND WORK DONE PREVIOUSLY

A literature survey goes further the search for information and involves the identification and articulation of relationships among the literature and our research field. While the form of the literature review may vary with different types of studies, but the basic purposes remain constant. Jiwan Lu in 2013[1] investigate the problem of human identity and gender recognition from gait sequences with arbitrary walking directions. Most datasets assume that people walk along a fixed direction or a predefined path but this is unrealistic because people walk freely and the walking direction may be time varying. To study this new problem a new gait database named ADSC-AWD (Advanced Digital Sciences Center-Arbitrary Walking Directions) is constructed in which people walk freely in the scene, and the walking directions are arbitrary and time-varying.

M. Jeevan in 2013[2] proposed an existing Gait representations which capture both motion and appearance information are sensitive to changes in various conditions such as carrying bag and clothing. Shannon Entropy encodes the randomness in the silhouette. It captures mostly the motion information and is robust to conditions that affect the appearance. To overcome this, Pal and Pal Entropy is proposed. CASIA datasets A, B, C have been carried out to demonstrate the effectiveness of the proposed representation of Gait. They achieved reasonable results on a large database like CASIA dataset B and C, indicate the suitability of this method for large datasets.

Neha Jain 2013[16] suggests the method of Gait using Pal and Pal Entropy (GPPE) was implemented to see its relative performance Shannon entropy. The performance of the proposed feature was tested on CASIA Gait and Treadmill Databases and

was found to fare well over Shannon entropy. The proposed feature was found to withstand under covariate conditions such as subject's walking direction, carrying a bag or wearing a thick coat and subject having different speed.

X.Huang in 2012[3] study the problem in which most gait recognition methods assume that the view is consistent or the walking path is pre-defined but this assumption is unrealistic because people walk freely and walking direction may be time-varying. A gait recognition system is proposed where the walking direction changes during the walking period. Shifted energy image and Structural features extraction are used for gait recognition.

Maodi Hu 2011[6] proposed a modeling approach for gait-based gender classification which includes shape features extraction. Shape appearance of both genders is integrated into a model. Assessing walking patterns can provide valuable information regarding physical conditions of individuals. They use both CASIA dataset B and IRIP gait database for gender recognition. The conditional random field (CRF) is used for features extraction. It is a form of the graphic model, which model arbitrary features. The result shows the superior performance of model free approach.

M.Pushpa Rani 2010[15] analyses human step has earned respectable enthusiasm toward late workstation vision explores, as it has colossal use in reasoning the physical prosperity of individuals. Discovery of unordinary development examples could be performed utilizing Support Vector Machines arrangement. Vector Machine classifiers are effective instruments. Very nearly all late works extensively utilizes SVM technique for walk dissection due to its momentous learning capacity. At the same time when managing time many-sided quality, there exists a confinement with the SVM. The processing expense for the SVM was high.

S.Yu 2009[4], X.Li 2008[5**],** proposed that each gait image is partitioned into several different parts such as head, chest, and legs, and perform classification on each part with SVM. The outputs of different parts were then combined and fused. Gait analysis is difficult because of the wide variety of movements of the different parts of the body. AGI has shown to be effective for both human Identification and gender recognition.

Qiong Cheng 2009[7] proposed gait recognition based on PCA (Principal Component Analysis and Linear Discriminate Analysis (LDA). PCA is mainly used for dimensional reduction technique and LDA is performed to optimize the pattern class. For the experiment, they used their own database and they achieved better recognition rate from PCA compared to LDA.

Jun-Young Jung 2008[13] highlighted on the point when the automated exoskeleton is utilized for step restoration, the robot ought to perceive the proposition of patients before moving. They had considered recognition of propositions for the robot as recognition of a period (when the patient wants to move) and a behaviour (what the patient wants to do). In this paper, the expectation recognition strategy comprising of a walk stage recognizer and a step design generator utilizing neural systems is presented. The viability of the proposed strategy is confirmed quickly utilizing recorded walk designs.

Ai-Hua 2007[8] highlighted on the gait recognition subject that distinguish people by examination of walk example. Here a basic and proficient walk recognition technique focused around situating body joints was displayed. At the outset, the key edge was concentrated focused around cyclic step investigation. For each one key casing picture, foundation subtraction was performed to concentrate moving body profiles from the foundation. At that point, the directions of joints are processed as per the geometrical attributes indicated while strolling. Finally, the closest neighbour classifier was utilized to arrange subjects.

III. TECHNIQUES USED

Following are the main Gait recognition techniques used in different phases of the system.

Background subtraction techniques can be classified into two types:

Non Recursive method: Non-recursive techniques uses a sliding window approach for background estimation. It stores the support of the past L feature casings, and evaluations the foundation picture focused around the secular variety of every pixel inside the cradle. The drawback of this technique is memory stockpiling necessity.

Recursive methods: Background model is recursively updated based on each input frame. Recursive techniques require less storage.

Feature extraction techniques: An important step in gait recognition is the extraction of appropriate feature that will effectively capture the gait characteristics. Transforming the input data into the set of features is called feature extraction. Feature extraction can be done by two ways:

Model based approach: Model-based methodologies utilize models whose parameters are controlled by the handling of paired shapes. These systems are scale, view invariant and oblige great quality feature arrangements. In this methodology, human outline is partitioned into neighborhood areas relating to distinctive human body parts, and ovals are fitted to every area to speak to the human structure.

Model Free approach: In this approach, a binary silhouette is obtained first by background subtraction technique. Some distinct features are then to be extracted from static and dynamic information of moving subject. An initial approach was done by Johnson. This method operates directly on binary silhouettes without assuming any specific model for the walking human.

Hanavan Model

The geometric human body model is designed by Hanavan's.This was originally tried by Miller & Morrison. The trunk was divided into three segments at the navel and upper (elliptical Column), middle (elliptical solid) and lower (elliptical column). The hand was defined as an ellipsoid of revolution. The foot was defined as an elliptical solid with the base being circular. The thigh was defined as an elliptical solid with the top being circular.

TECHNIQUES FOR RECOGNITION

Speeded Up Robust Features (SURF features)
It is a robust local feature detector. This could be utilized within machine vision undertakings like item distinguishment or 3D reproduction. It is partially impelled by the filter descriptor. The standard expression of SURF is a couple time snappier than SIFT and ensured by its inventors to be more capable of differing picture transformations than SIFT. The most valuable property of an interest point detector is its repeatability and it expresses the reliability of a detector. Surf feature is used for matching in their system here we use surf feature to find out the critical points which help us to match the images more accurately. SURF is focused around aggregates of 2D Haar wavelet reactions and makes an effective utilization of vital pictures. It is used as a number of a rough guess to the determinant of Hessian blob finder, which could be figured to a great degree rapidly with a necessary picture. For quirks, it uses the total of the Haar wavelet response around the reason for the venture. Yet again, these could be enrolled with the backing of the fundamental picture.

Support vector machine (SVM) The Support Vector Machine is a state-of-the-art classification method.The SVM classifier is generally utilized as a part of bioinformatics because of its profoundly exact, ready to figure and procedure the high-dimensional information, for example, gene interpretation, and edibility in displaying assorted wellsprings of information. SVM is fit with the general class of piece systems. A piece system is a calculation that relies on the information just through spot items. At the point when this situation occurs, the dab item could be supplanted by a bit capacity which registers a spot item in some conceivable high dimensional peculiarity space [16].

CONCLUSION

Analysis of the comprehensive surveys and articles indicates that the techniques implemented for Gait recognition are often sensitive to poor resolution, frame rate, drastic illumination conditions, and changing weather conditions and among other prevalent problems in the Gait recognition systems. In most of the papers Gait Recognition is performed using silhouette images.Now a skeleton information of the human obtained using kinect sensor was used for Gait Analysis, which is insensitive to the type of clothes, objects carrying by humans, illumination changes and provide a good recognition rate. More research on Gait recognition using skeleton information yet to be done.

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