International Journal of Future Generation Communication and Networking
Vol. 13, No. 2s, (2020), pp. 537–542

Human Identification Using Gait Technology

S. K. Patil[1], M. D. Katole[2], Swapnil Singh[3], Simran Santre[4], Nuttan Gharge[5]

[1,2,3,4,5] *Dept. of E & TC Engg., Smt. Kashibai Navale College of Engineering, Savitribai Phule Pune University, Pune*

[1]skpatil_skncoe@sinhgad.edu [2]katole.mukesh@gmail.com [3]snghswapnil@gmail.com
[4]simransantre1998@gmail.com [5]nuttangharge37@gmail.com

Abstract

Person Identification using Gait Recognition has created a curiosity in the computer domain due to its high recognition even at a far distance. The objective is to implement an automatic biometric system to identify a person based on his/her Gait. A gait recognition algorithm using a gait energy image is proposed. Every image sequence, background subtraction is done, and a simple operation is used to segment and track the silhouettes of a walking figure.

Keywords-*Gait Recognition, Gait Energy Image, Feature Extraction, Background Subtraction, Anaconda.*

I. INTRODUCTION

The world security has always been at risk places like airports, stations, malls, country borders, parks, national monuments and other public are always at risk despite having several security measures. These places use several years old identification method which cannot be used now when the security level requires high technology which is unobtrusive. If considering the case of tube station which is very busy, use of old and identification method for verification is obviously infeasible. Therefore, for such issues the development of biometric methods have to attract the attention of the government and leading development companies. Gait recognition system does not require permission of the targets; it works on video processing technology that detects person by human gait gesture if a person is a threat to security or if he is behaving suspicious.

Human gait refers to the behaviour of walking of a person achieved through limbs. Gait recognition offers several advantages over the other methods. The most important advantage is that the person's cooperation or attention is not required and the gait can be perceivable at a distance. Moreover, other biometric methods require high-resolution images/videos for recognition; Gait offers a greater accuracy for even low-resolution videos. There are several biometric identifications but if those are compared to human gait/gesture identification/authentication, it has some exclusive characteristics. Gait is unobtrusive i.e. it works in such a way that it does not require the permission of the observing subject and can work from a distance, whereas other biometric needs a physical response about the subject such as fingers, eyes, face, and voice, etc. Gait has several disadvantages as well at this platform of being an undeveloped field till now; there is a limitation to gait technology when it comes to the human body for identification. Gait technology works on the basis of a video captured in busy or customized places but even after this its result cannot be accurate enough to take decisions. Therefore, by several types of research done on gait, it is concluded that human gait identification depends on clothes, the place of walking, stress and can change with different emotional feelings. Thus, it is hard to deploy such an identification approach and this is what that discriminates gait from other biometric identification methods. Gait, when combined with another biometric identification approach, can be of great use in several identification applications due to its uniqueness.

Therefore, gait is not used as the only identification method but some field which is unique and full potential in multi-biometric applications.

ISSN: 2233-7857 IJFGCN
Copyright ⓒ2020 SERSC

II. DEFINITION OF HUMAN GAIT RECOGNITION AND BACKGROUND SUBTRACTION

Human Gait Recognition is a type of bio-metric identification system that identifies subjects dependent on their body posture known as 'Human Gaits'. The human gait is unique to every individual and therefore, a person can be detected by their gait. Gait recognition system is a modern technology which does not require permission of the targets; it works on unobtrusive technology that detects by human gait gesture if a person is a thread to security or if he is behaving suspicious.

For Human Gait recognition process, background subtraction is very important step. If the system can't separate the human from the main background then, the whole system will fail to match or might fall into the false match category. To decrease the false acceptance rate (FAR), we need to use the proper background subtraction method with noise filtering.

After segmenting the Human from the original background, we need to create the database of normalized feature from Silhouette images. Below is one of our Silhouette image after background subtraction process. Our process removed background very perfectly for tracking Human.

III. RELATED WORKS

By many researchers, it has been studied the idea of an individual's gait is unique; particularly material that provides several different approaches to achieve a successful working gait recognition system. We systematically analyzed the stages involved in a human gait recognition system and the components required in the process.Model-based approaches have a model in which the gait sequence is recorded under favourable specification. The advantage of the model approach over the holistic approach is that the model approach is view and scale-invariant as it is very difficult to capture the image every time from the same viewpoint as stored in the database for reference. There are specific parameters that are fed in the database, therefore in this approach, only high quality selected gaits are chosen from the gait sequence. There is a lot of noise and another disturbance such as self- blockage is noticed which can destroy or disturb the specification needed for gait sequence. Therefore, a different technique can be used in which a multi-camera gait learning system should be used to obtain a better gait sequence. A similar process was used in using a multi-view human gait learning method which depends on the retrieved static gait criterion that are the dimensions acquired from static gait sequence. Gait dynamics are not involved. The static specifications taken in are the maximum inequality between the abdomen and feet, the length (height), the difference between the head and abdomen and the difference between the feet. The static framework is not affected by the view i.e. its view-invariant, which makes it most preferable for recognition feature.

Another approach was a motion-based method. It is used to detect the optical flow of moving objects and extract gait sequences. The table shows a summary of the most common approaches for Human Gait Recognition.

ISSN: 2233-7857 IJFGCN
Copyright ⓒ2020 SERSC

Table I Table for Literature Survey

Author(s), Year(s)	Approach	Limitations
Nikolaos V. Boulgouris, Dimitrios Hatzinakos , Konstantinos N. Plataniotis (2005)	Gait Recognition: A challenging signal processing technology for biometric identification",	Recognition rate 58%, Motion of hip is fixed.
L. Wang , M.S. Nixon (2003)	Using modified ICA	Walking only in 0º, 45º, 90º to the fixed camera.
P. Huang. C. Harris, M. Nixon (1999)	Using Temporal Templates	Low quality camera, Interlacing in the video
Faustini Libent Ishabailu, Dr. Pei Zhijun, Abdalla Mohamed Hambal (2014)	Recognition System Based On Principal Component Analysis (PCA)	Walking only in 0º,45º,90º to the fixed camera on a tri-stand

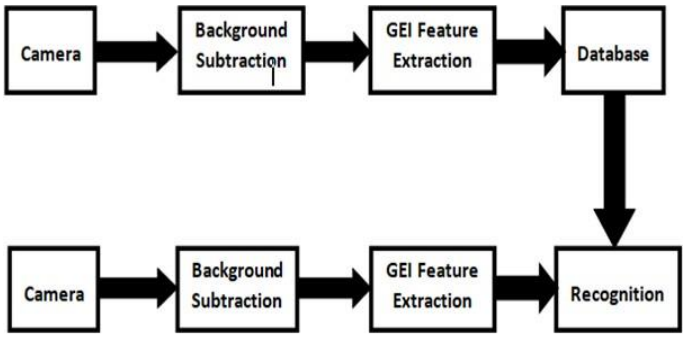
IV. METHODOLOGY

Video Recording: - First the video is recorded using a video recording device. Extraction: - Gait Energy Image Extraction

The gait energy image is used to get the gait sequence of a cycle in a simple energy image using the weighted average method. The gait sequences in a gait cycle are prepared to align the binary silhouette. If the gait cycle image sequence is B(x, y, t), gait energy image can be calculated by the following formula:

$$B(x,y) = \frac{1}{N}\sum_{t=1}^{N} \mathrm{B}\,(x,y,t)$$

Where B(x, y, and t) is the gait cycle image sequence, N is the number of frames in a gait sequence of a cycle



and is the number of gait frames. The figure shows the gait images of a cycle and the Figure shows the corresponding GEI.

Fig. 1 Block diagram of Gait Recognition System

ISSN: 2233-7857 IJFGCN
Copyright ⓒ2020 SERSC

Gait energy image (GEI) preserves dynamic and static information of a gait arrangement. The common static information includes the representation and shape of the human body and the dynamic information includes the modification of frequency and phase. However, there is no consideration of the time that assigns each silhouette within the GEI. As regards this issue, this paper planned the accumulated frame difference energy image, which can reflect the time characteristics. The fusion of the moment invariants extracted from was selected as the gait feature. Then, gait recognition was proficient using the closest neighbor classifier based on the Euclidean distance.

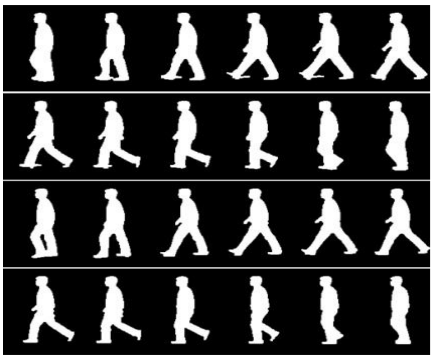


Fig. 2 Shillhote of a moving person

The gait energy image is used to mirror the gait sequence of a cycle in a simple energy image using the weighted average method. The gait arrangements in a gait cycle are prepared to adjust the binary silhouette. If the gait cycle image arrangement is, gait energy image can be determined by the following formula: where is the gait cycle image sequence, is the number of frames in a gait arrangement of a cycle, and is the total number of gait frames.

The color or luminance of the pixels in the figure can point out the size of the body's parts when the person is walking. The white pixel points indicate the parts that move slightly, such as head and trunk. Gray pixel points indicate the parts that move significantly, such as the legs and arms. So, the gait energy image maintains the static and dynamic attribute of human walking, and it greatly minimizes the amount of computation in image processing.

Database Creation: - A new gait database, is established for our experiments. A digital camera fixed on a tripod is used to capture gait sequences on two different days in an outdoor environment. All subjects walk along a straight-line path at free cadences in three different views with respect to the image plane, namely, laterally (0), obliquely (45) and frontally (90).

Background Subtraction

Background subtraction (BS) is a general and universally used technique for generating a foreground mask (namely, a binary image accommodates the pixels belonging to moving objects in the scene) by using static cameras.

As the name suggests, BS determines the foreground mask operating a subtraction between the present frame and a background model, consist of the static part of the scene or, more in common, everything that can be considered as background given the attribute of the detected scene.

ISSN: 2233-7857 IJFGCN
Copyright ⓒ2020 SERSC

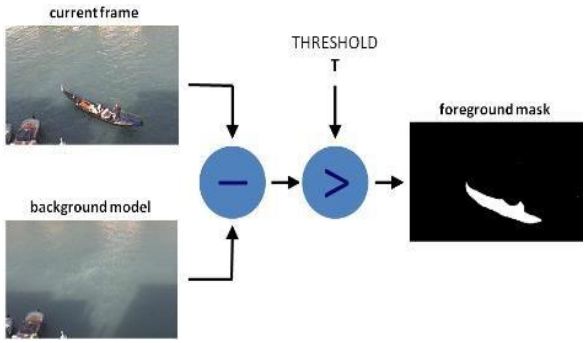


Fig.3 Background Subtraction

Background modeling consists of two main steps:

1. Background Initialization;
2. Background Update.

In the first step, a basic model of the background is computed, while in the next step that model is revised in order to adapt to probable changes in the scene.

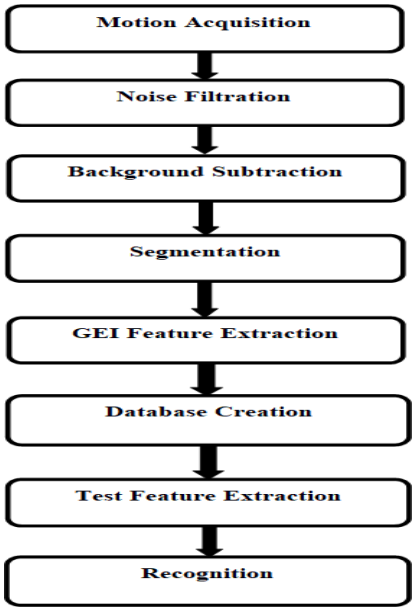


Fig.4 Flowchart for Recognition System

V. SOFTWARE USE

Anaconda (Python distribution)

It is a complimentary and open-source division of the Python and R programming for scientific computing that objective to clear up packet administration and distribution. Package versions are hadled by the package management system conda. The Anaconda distribution involves data-science packages good enough for Windows, Linux, and MacOS.

ISSN: 2233-7857 IJFGCN
Copyright ⓒ2020 SERSC

OpenCV

It is a library of programming operation mainly aimed at real-time computer perception. Basically advanced by Intel, it was afterward backed by Willow Garage then Its eez. The library is cross-platform and complimentary for use under the open-source BSD authorization.OpenCV supports the deep learning frameworks Tensor Flow, Torch/PyTorch, and Caffe.

VI. CONCLUSION

We have presented a simple method for human identification from body shape and gait. The approach is based on identical 2D silhouettes that withdraw from key frames across a gait cycle arrangement. These key frames are compared to dataset frames using basic correlation and subject classification are implemented by closest-neighbor identical among interrelationship scores. The approach essentially captures biometric shapes like body height, width, and part proportions, also as gait like stride length and amount of arm swing. We have find out the technique on four databases with varying viewing angles, background conditions (indoors and outdoors), walk styles and pixels on track. Overall, the method performs well when used within a single viewpoint, even identifying people when the testing gait type (fast walk, walking with ball) differs from the training gait (slow walk). Even with subjects who are unaware that they are being watched, cameras can be placed at “chokepoints” where the walking direction is limited, or multiple cameras can be used to ensure that a range of viewing directions is available. The obvious way to generalize the algorithm itself is to store the training pattern taken from multiple viewpoints, and organize both the subject and the viewpoint.

REFERENCES

[1] Robert T. Collins, Ralph Gross “Silhouette-based Human Identification from Body Shape and Gait." Fifth IEEE International Conference on Automatic Face and Gesture Recognition, pp. 1-5. IEEE, 2002.
[2] Zhiyong Liu “Gait Recognition Using Active Energy Image and Gabor Wavelet." In 9th International Congress on Image and Signal Processing, Biomedical Engineering and Informatics, pp. 1-. IEEE, 2016.
[3] Gowtham Bhargavas M, Harshavardhan K, Mohan G C, Nikhil Sharma A and Prathap C " Human Identification using Gait Recognition" In International Conference on Communication and Signal Processing, April 6-8, 2017, India, pp. 1-4.
[4] Bilal Jawed, Othman O. Khalifa, and Sharif Shah Newaj Bhuiyan “Human Gait Recognition System" In 7th International Conference on Computer and Communication Engineering (ICCCE), pp. 1- 4, ICCCE, 2018.
[5] Hakan Ozen1, Nikolaos V. Boulgouris, and Rafiq Swash “Gait Recognition Based On 3d Holoscopic Gait Energy Image”.
[6] Seokeon Choi, Jonghee Kim, Wonjun Kim, Changick Kim “Skeleton-Based Gait Recognition via Robust Frame-Level Matching” IEEE Transactions on Information Forensics and Security, Vol. 14, No. 10, October 2019.pp-2591
[7] Maryam Babaee, Linwei Li, Gerhard Rigoll “Person Identification from partial gait cycle using fully convolutional neural networks” pp- 125
[8] Parul Arora, Smriti Srivastava, Kunal Arora, Shreya Bareja “Improved Gait Recognition using Gradient Histogram Gaussian Image”
Second International Symposium on Computer Vision and the Internet (VisionNet’15)pp-412
[9] https://en.wikipedia.org/wiki/Anaconda_(Python_distribution)
[10] https://en.wikipedia.org/wiki/OpenCV

ISSN: 2233-7857 IJFGCN
Copyright ⓒ2020 SERSC