HUMAN IDENTIFICATION USING GAIT RECOGNITION: A STUDY

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ABSTRACT

Human identification by gait has become a key area of interest in cyber world due to its advantage of inconspicuous recognition at a relatively far distance. Biometric systems are becoming increasingly important, since they provide more reliable and efficient means of identity verification. Biometric authentication as well as verification has been widely used for access management, law enforcement, security system and entertainment over the past few years. Gait analysis is one of the behavioral biometric technologies that is becoming an attractive topic in biometric research. In Gait biometric research there are various gait recognition approaches available. In this paper, I am discussing about the gait recognition system.

Keywords: Gait Recognition System, Diagrammatic, Segmentation.

I. INTRODUCTION

The first and foremost important step towards preventing unauthorized access is user authentication. User authentication is the process of verifying identity [1, 2]. Biometric authentication is based on someone's physiological and behavioral characteristics. A person can be identified or verified on the basis of different physiological and behavioral attributes like fingerprints, live scans, faces, iris, hand geometry, gait, ear pattern, voice recognition, keystroke pattern and thermal signature etc. Among them, gait recognition, as a relatively new biometric technique, aims to recognize individuals by the way they walk. The advantage of identification using gait recognition is that features can be extracted from the image without the co-operation of the person [3]. The paper is organized as follows. The Silhouette Extraction is discussed in section II. In section III, Gait Recognition is summarized. Approaches for Gait Recognition and Steps of Gait Recognition System are presented in section IV and V. The paper is concluded in section VI.

II. SILHOUETTE EXTRACTION

After importing the image through optical scanner or digital photography, the next step is creation of a silhouette or feature extraction. The most important step of gait recognition is the extraction of silhouette. Silhouette is important because it gives an exact and clear image of the person. They are mostly used in those fields where speedy verification is necessary. But firstly, we need to be clear about the definition of a silhouette. Silhouette is the dark shape and outline of someone or something visible in restricted light against a brighter background [4]. In gait recognition, silhouette is defined as a region of black and white pixels of the walking person. Silhouette is basically obtained through background subtraction. Background Subtraction is a collection

of techniques for segmenting the objects of interest [1]. For obtaining a clear silhouette best of the background subtraction algorithms is to be used. Silhouette extraction is basically a two-tier process.

1. Detection
2. Segmentation

Silhouette extraction mainly focuses on segmenting the human body. The silhouette extraction process is shown in Fig. 1 [1]. Each of the frames in the image sequence is subtracted from a background model of the respective image sequence. If the pixel value of each frame is not the same with the pixel value of the background, the pixel is marked as region of silhouette. To remove shadow from the difference image, a threshold value is applied to the difference images. The difference image map is first analyzed by generating the intensity histogram of the image so that the pixels distribution along the image can be represented clearly and in an effective way according to an applied threshold value. The threshold must be suitable so that the foreground image is neither under segmented nor over-segmented [1].

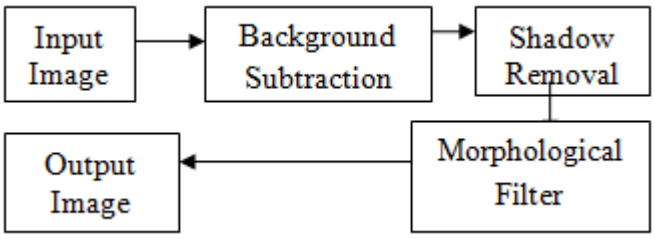

Figure 1: Silhouette Extraction

Under-segmentation and Over-segmentation purpose is to produce first and second reliable silhouette respectively. Basically, the silhouette video is calculated frame by frame. From each frame human being is extracted.

To conclude, silhouette determination is a process that includes detection and segmentation of walking persons from the background by using motion detection and segmentation methods. In segmentation, the foreground subject is extracted from the video-sequence, and is now ready for extraction of gait features.

III. GAIT RECOGNITION

Once we obtain gait features, the next step is gait recognition. Gait recognition is an emerging biometric technology which involves people being identified purely on the basis of the way they walk [5,6]. Basically gait recognition can be done through Gait analysis.

3.1 Gait Analysis

It is the systematic study of locomotion, more specifically the study of human motion, using the eye and the brain of observers, multiplied by instrumentation for measuring body movements, body structure, and the activity of the muscles [1]. Gait analysis is used to assess, plan, and treat individuals through the conditions affecting their ability to walk. It is also commonly used in sports biomechanics to help athletes run more efficiently and to identify posture-related or movement-related problems in people with injuries. The study includes quantification, (i.e., introduction and analysis of measurable parameters of gaits), as well as

interpretation, i.e., drawing various conclusions about the animal (health, age, size, weight, speed etc.) from its gait pattern.

3.2 Factors and Parameters for Gait Analysis

3.2.1 Factors

The gait analysis is manipulated or modified by many factors, and changes in the normal gait pattern can be temporary or permanent [7]. The factors can be of various types:

- Extrinsic: such as terrain, footwear, clothing, cargo
- Intrinsic: sex (male or female), weight, height, age, etc.
- Physical: such as weight, height, physique
- Psychological: personality type, emotions
- Physiological: anthropometric characteristics, i.e., measurement and proportions of body
- Pathological: for example trauma, neurological diseases, musculoskeletal anomalies, psychiatric disorders

3.2.2 Parameters

The parameters taken into account for the gait analysis are as follows [4]:

- Step length
- Stride length
- Cadence
- Speed
- Dynamic Base
- Progression Line
- Foot Angle
- Hip Angle

IV. APPROACHES FOR GAIT RECOGNITION

Some basic methods or approaches for gait recognition are [1]:

4.1 Moving Video Based Gait Recognition

In this category, gait is captured using a video-camera from distance. Video and image processing techniques are employed to extract gait features for recognition purposes. Most of the M-V based gait recognition algorithms are based on the human silhouette. For example stride, cadence, static body parameters, etc.

4.2 Floor Sensor Based Gait Recognition

In this approach, a set of sensors or force plates are installed on the floor and such sensors enable to measure gait related features, when a person walks on them, e.g. maximum time value of heel strike, maximum amplitude value of the heel strike, etc.

4.3 Wearable Sensor Based Gait Recognition

In this approach, gait is collected using body worn motion recording (MR) Sensors. The MR sensors can be worn at different locations on the human body. The acceleration of gait, which is recorded by the MR sensor, is utilized for authentication.

V. STEPS OF GAIT RECOGNITION SYSTEM

In gait recognition, following steps are to be executed for serving the purpose of verification [8]. The steps are explained through block diagram shown in Fig. 2.

1. Firstly, camera captures the video data.
2. Detection and segmentation are the two main steps of silhouette representation which calculates walking persons from the background by using motion detection and segmentation methods. In segmentation, the foreground subject is extracted from the video-sequence, and is now ready for extraction of gait features.
3. After calculating the foreground and background image from segmentation and detection respectively, the relevant gait features can now be extracted from the segmented images, which will be used in fulfilling the classification purpose, i.e. gait features can be easily extracted after segmentation of silhouettes is done from the background.
4. The similarity between the extracted gait feature and the feature present in the gait database or the difference between output image and actual image is measured for person identification which gives the final result.

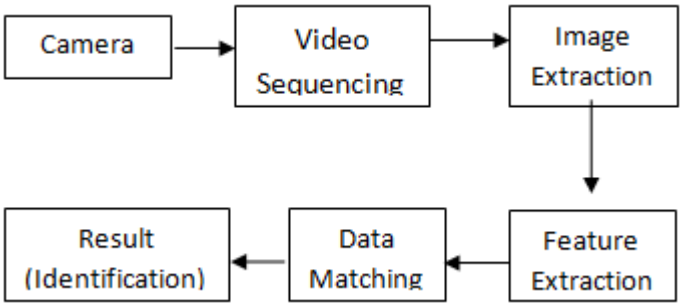

Figure 2: Block Diagram of Gait Recognition System

VI. CONCLUSION

Human Motion Analysis is receiving a wide attention from the computer vision scholars. This wide interest is motivated by wide spectrum of applications such as in closed-circuit television (CCTV) surveillance, because of its high potential in unconstructive individual recognition and too from a distance. Commercial visual surveillance has also many applications in a number of areas mainly in security systems, namely banks, airports, military-based areas, public transportation like railway- stations and bus- stations, shops and malls, and car-parking monitoring systems. The major reason for human motion analysis is increasing number of piracy, theft and unauthorized access. Thus, it is paving a great achievement in technology field for the upcoming computer vision researchers.

REFERENCES

[1] Pritpal Kaur And Gagandeep Singh Aujla, "Human identification using Gait Recognition Technique with PAL and PAL Entropy and NN", International Journal Of Computer Science And Information Technologies, Vol. 5, Issue 3, 3281-3285, 2014.

[2] M. Pushparani and D. Sasikala, "A Survey of Gait Recognition Approaches Using PCA & ICA", Double Blind Peer Reviewed International Research Journal Vol. 12, Issue 10, Version 1, May, 2012.

[3] Navneet Kaur And Samandeep Singh "Gait Recognition For Human Identification Using NN", International Journal Of Computer Science And Information Technologies, Vol. 5, Issue 3 , 3991-3993, 2014.

[4] Jyoti Bharti, M. K. Gupta, "Gait Recognition with Geometric Characteristic and Fuzzy Logic", Journal on Image Processing and Computer Vision, Canada Vol. 3, Issue 1, 1 March, 2012.

[5] Mark S. Nixon, John N. Carter "Automatic Gait Recognition", Sixth IEEE International Conference on Automatic Face and Gesture Recognition, 2004.

[6] Jasvinder Pal Singh, Sanjeev Jain, "Person Identification Based On Gait Using Dynamic body Parameters", Trendz in Information Sciences & Computing (TISC), Vol. 53, Issue 4, 248-252, 17-19 December, 2010.

[7] S. Niyogi and E. Adelson, "Analyzing and Recognizing Walking Figures in XYT", Proc. IEEE CS Conf. Computer Vision and Pattern Recognition, 469-474, 1994.

[8] Yi-Bo Li, Tian-Xiao "General Methods And Development Actuality Of Gait Recognition", International Conference on Wavelet Analysis and Pattern Recognition, Beijing, China, 2-4 November, 2007.

[9] Jorge Fazenda, "Using Gait to Recognize People", presented in Serbia & Montenegro, Belgrade, 22-24, November, 2005.

[10] Jasvinder Pal Singh, Sanjeev Jain, "Person Identification Based On Gait Using Dynamic body Parameters", Trendz in Information Sciences & Computing (TISC), Vol. 53, Issue 4, 248-252, 17-19 December, 2010.

[11] A. Kale "Gait Analysis For Human Identification", IEEE Transactions on Image Processing, Vol.13, Issue 9, September, 2004.