A Survey on Person Reidentification

Sree Vrinda G. M, Prasanth R. S

Abstract— In recent years, person reidentification receives an intensive attention in the field of intelligent video surveillance (IVR). Recognizing an instance of a person captured by one camera to another instance of the person captured by different camera is mainly called as Person Reidentification. It's an important task for surveillance applications, either for on-line tracking of a person or off-line retrieval of all videos containing a person of interest. Person reidentification is considered as a challenging problem because the appearance of individuals varies greatly through the scenes, due to different acquisition devices, changes in viewpoints, illumination conditions, shadows, different pose or orientation of person that has to be searched for. This paper focuses on the survey of different techniques that are used for person reidentification and to tackle all the issues and challenging aspects of person reidentification while simultaneously describing previously proposed solutions for the problems.

Index Terms— IVR, Person Reidentification

I. INTRODUCTION

Nowadays, more and more non overlapping camera network have been set up for monitoring pedestrian activities over a large public area such as the airport, metro station, parking lot etc. These are used to acquire individuals complete motion trajectories. Surveillance in public places is used to monitor the locations and behaviour of people in those particular areas. Since events such as terrorist attacks in different public places have occurred frequently in recent years, there is a need for video network systems to guarantee the safety of people has emerged. In public transport systems such as airports, metro station or even inside trains and airplanes, intelligence surveillance will be a useful tool for preventing violent situations. Considering Intelligent Video Surveillance, traditional biometrics such as face, iris, fingerprint and gait are not often available because images are low-quality, variable and may contain motion blur. The growth in computational capabilities of intelligent surveillance systems provided new opportunities in the area of surveillance approaches. When a person stays within a single camera's view, that person's position, background and lighting conditions are known to the system. The problems arise when the person moves out from one camera's view and enters another. So the system must know that the person seen in one camera is the same person seen earlier in another camera and if there is any issue with the system regarding matching of person, that issue is known as re-identification problem. Mainly three aspects are explained in reidentification problem. First, the segmented and comparison parts should be determined.

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Second, invariant signatures should generate for comparing the corresponding parts. Finally, compare the signatures by applying appropriate metric. Appearance –based methods and gait-based methods are the two methods used for reidentification. The appearance-based methods include methods to extract signatures from color, texture and other appearance properties. The gait-based methods extract features from the gait and motion of persons. There are three main steps in reidentification which are depicted in Fig. 1.

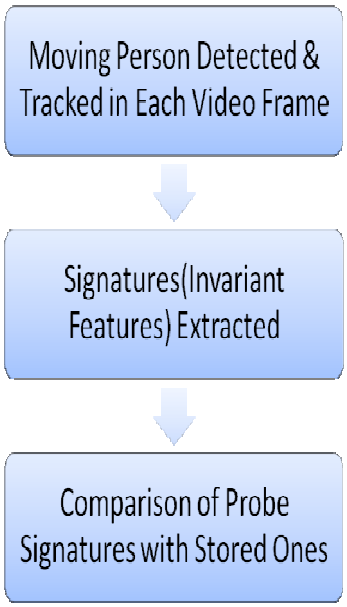

Fig. 1 Steps in reidentification

Inter-camera issues and Intra-camera issues are considered as the main issues under person reidentification. Some of the inter-camera issues are illumination changes for different scenes, disjoint fields of view, different entrance poses in different cameras, rapid changes in person's clothing and blurred images. The intra-camera issues are background illumination changes, low resolution of CCTV cameras and occlusion in frames. This survey describes various techniques and approaches that are proposed by many authors to solve reidentification issues.

II. LITERATURE SURVEY

Annan Li, Luoqi Liu, Kang Wang and Si Liu [1] recommended clothing attributes assisted person reidentification. In the proposed method, first the holistic image of person image is found out through cascade detector. Then the body parts and corresponding features are extracted for alleviating pose-misalignment issues. Here a new approach is proposed called latent SVM based person reidentifiation approach and is used to describe the relations among the low-level part features, clothing attributes in middle level and high level reidentification labels of person pairs. This approach is a part based for representing the appearance of pedestrians. The main advantage of SVM approach is treating clothing attributes as real value variables

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which is more effective than using these attributes as discrete variables. Yanbing Geng, Hai-Miao Hu, Jin Zheng and Bo Li [2] proposed a new algorithm for person reidentification by using region –based feature selection and feature fusion. In feature selection a person's body is divided into upper region and lower region using adaptive body segmentation. Each region is then subdivided into sub regions using mean shift and features are extracted from these sub regions. In feature fusion method, the extracted features are inputted to Principal Component Analysis for dimensionality reduction and noise data remove. During feature fusion, different features for each region are separately identified and represented, which can make full use of the salience of different features. It gave better accuracy and performance than other similar algorithms but there will be a slight increase of computational complexity during fusion methods.

Lianyang Ma, Xiaokang Yang and Dacheng Tao [3] formulate person reidentification as a multitask distance metric learning problem in camera networks. Multiple metrics are created for different camera pairs to cope with multiple transition models in the camera network. The proposed method introduced multiple Mahalanobis distance metric for complicated situations in different camera networks. The extension of proposed method a novel model called Multi-task Maximally Collapsing Metric Learning (MtMCML) is introduced. Here one Mahalanobis distance metric is assigned for each image pairs in a camera network and MtMCML is used to manage multiple Mahalanobis distance metrics by joint regularization. MtMCML model is introduced not only for person reidentification but also for solving pattern recognition problems.

Rui Zhao, Wanli Ouyang and Xiaogang Wang [4] proposed a novel perspective for person reidentification based on unsupervised salience learning. An unsupervised framework is proposed to extract distinctive features for person reidentification. Each human image is segmented into a grid of local patches and features are extracted from each patch. SIFT descriptor is used to handle the viewpoint and illumination change. The final multidimensional vector for each patch is the concatenated form of dense color histograms and dense SIFT features. From this multidimensional vector patch matching is utilized with adjacency constraint for handling the view point and pose variation. The accuracy of person reidentification is improved by patch matching and this improvement is based on its flexibility in handling large viewpoint and illumination change. Finally the human salience is learned in an unsupervised way. The main advantage over here is the human salience is a useful descriptor for pedestrian matching.

Andy J. Ma, Jiawei Li, Pong C. Yuen and Ping Li [5] address a new person reidentification issue without label information of a pedestrian under different cameras. The proposed method is adaptive ranking support vector machines (AdaRSVMs). The main use of AdaRSVM is person reidentification without person labels under target domain cameras. The AdaRSVM not only outperforms non-learning methods but also better in state-of-the-art discriminative learning methods using labelled data from the source domain for training. The target positive mean for domain adaptation learning is estimated and the reidentification performance is improved through this estimation. AdaRSVM only considers single source domain but not for multiple source domains. The main advantage over this method is it achieves better reidentification performance than existing domain adaptation methods.

Wei Li, Yang Wu, Masayuki Mukonuki and Michihiko Minoh [6] present Common-Near-Neighbor Analysis (CNNA) for person reidentification. This technique formulates with three main components. First, Metric Space Construction for each feature space that is extracted from image. Second, common near neighbours of each image pair of samples are represented in a new metric space using relative and direct information. Finally, reranking is performed using Common-Near-Neighbor Modelling. The learned metric space helps to extract new features for matching but the main problem faced over here is after metric learning no one can identify that the nearest neighbour is an intruder or not.

Dapeng Tao, Lianwen Jin, Yongfei Wang and Xuelng Li [7] introduced minimum classification error based KISS metric learning (MCE-KISS). This technique integrates MCE criterion and smoothing technique to improve the performance of KISS metric learning for person reidentification. Here MCE is used for discriminative learning than classical ML (maximum likelihood) estimation. Minimum Classification Error is widely used for machine learning, automatic speech recognition system and also used to build music recommendation tool. In this method smoothing technique is required to improve the eigen values which is obtained by ML estimation. MCE-KISS is superior in performance and accuracy than other metric learning algorithms such as KISS, LMNN, ITML and RS-KISS but the training speed is much slower than KISS metric learning.

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Title	Method	Advantages	Disadvantages
A Person Re-identification Algorithm By Using Region-based Feature Selection And Feature Fusion [2]	Feature selection and fusion method	Good accuracy	Computational cost is high
Person Re-Identification Over Camera Networks Using Multi-Task Distance Metric Learning [3]	MtMCML method for multi-task distance metric learning model	Better performance	Not good to tackle the variations in photographic and weather conditions
Unsupervised Salience Learing for Person Re-identification [4]	Person reidentification is done with salience detection of image pairs	Method is robust to viewpoint change, pose variation and articulation	Distinct feature extraction will take more time
Common-Near-Neighbor Analysis For Person Reidentification [6]	Image pair ranking based on Common Near Neighbor Modelling	Avoids complexity of data	Learned metric is not impeccable, cannot identify nearest neighbor is an intruder
Person Reidentification by Minimum Classification Error-Based KISS Metric Learning [7]	MCE-KISS method which integrates MCE criterion and smoothing technique	Better performance and accuracy than other metric learning algorithms.	Slower training speed

Table.1.Comparison of different person reidentification approaches

III. CONCLUSION

In this paper we have presented the main issues to identify a person, challenging issues and an overview of current techniques that are used in person reidentification. Person reiddentification is a method of matching people across non-overlapping camera networks. The recognition techniques that are used for person reidentification are very specific to real world problems. From this survey it is understandable that the main existing issue in person reidentification is the lower performance and accuracy of matching result. From this inappropriate result it is difficult to find out the matching image pairs of a person. Our aim is to increase the accuracy of person reidentification method with limited computational complexity.

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