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RESEARCH ARTICLE

CHANGE DETECTION IN CCTV SYSTEM USING HADOOP

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ABSTRACT

Object detection and tracking are two fundamental tasks in multi - camera surveillance. This paper proposes a framework for achieving these tasks in a nonoverlapping multiple camera network. A new object detection algorithm using mean shift (MS) segmentation is introduced, and occluded objects are further separated with the help of depth information derived from stereo vision. The detected objects are then tracked by a new object tracking algorithm using a novel Bayesian Kalman lter with simpli ed Gaussian mixture (BKF-SGM). It employs a Gaussian mixture (GM) representation of the state and noise densities and a novel direct density simplifying algorithm for avoiding the exponential complexity growth of conventional Kalman lters (KFs) using GM. When coupled with an improved MS tracker, a new BKF-SGM with improved MS algorithm with more robust tracking performance is obtained. Furthermore, a monitoring-based object recognition algorithm is employed to support object tracking over non-overlapping network. Experimental results show that: 1) the proposed object detection algorithm yields improved segmentation results over conventional object detection methods and 2) the proposed tracking algorithm can successfully handle complex scenarios with good performance and low arithmetic complexity. Moreover, the performance of both monitoring - and training-based object recognition algorithms can be improved using our detection and tracking results as input.

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INTRODUCTION

Object detection and tracking are two fundamental tasks in multi - camera surveillance. The most important technique of this multi-camera related technique is to track and analyse objects within the images. The core technology of multi - camera analysis is used in detecting, analysing, and tracking the object's motion. In addition, when the light's colour or direction changes, it is difficult to trace the object. Firstly use the block based algorithm for detecting the change scene in video if the scene is change is detected then video is stored on the server for further analysis. Once the video was stored on the server. Stored videos are dived in to chunks and send to different nodes for analysis using map reduce technology of Hadoop. for detecting object we apply the object tracking algorithm using a novel Bayesian Kalman filter with simplified Gaussian mixture (BKF-SGM). Using Hadoop we minimize the analysis time Finally draw the graphs in which show the no of objects to be detected and time to be required for analysis and stored analysis result into database for security purpose. Visual object detection and tracking are important components of video analytics (VA) in multi-camera surveillance. We develop system for achieving these tasks in a multi-camera network. System con guration is different from existing multi-camera surveillance systems in and which utilize common image information extracted from similar eld of views (FOVs) to improve the object detection and tracking performance. However, in practice, such camera setup may not be easily achieved because of economical concern, topology limitation, etc. Therefore, we focus on the non-overlapping multi-camera scenario in this system, and our main objective is to develop reliable and robust object detection and tracking algorithms for such environment. Automatic object detection is usually the rst task in a multi-camera surveillance system and background modelling (BM) is commonly used to extract prede ned information such as object's shape, geometry and etc., for further processing. Pixel-based adaptive Gaussian mixture modelling (AGMM) is one of the most popular algorithms for BM where object detection is formulated as an independent pixel detection problem. It is invariant to gradually light change, slightly moving background and uttering objects. However, it usually yields unsatisfactory foreground information (object mask) for object tracking due to sensor noise and inappropriate GM update rate, which will lead to holes, unclosed shape and inaccurate boundary of the

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extracted object. Furthermore, important information of the object such as edge and shape are not utilized in such method. Therefore, the performance of subsequent operations such as object tracking and recognition will be degraded. In this paper, a mean shift (MS)-based segmentation algorithm is proposed for improving the object mask obtained by AGMM. By using the segmentation information, holes within the mask can be significantly reduced through in painting and better alignment between the object boundary and those of the mask can be obtained. Occlusion of moving objects is a major problem in multi-camera surveillance systems. In existing multi-camera surveillance systems, occlusion problem is addressed by fusing the BM information obtained from the overlapped image information in adjacent cameras. These approaches, however, are not directly applicable to our non-overlapping setup.

problem can be approximately solved by a number of KFs operating in parallel. Unfortunately, the filter number and the component number of the states will increase exponentially with time. To tackle this problem, a new direct density simplification approach is proposed to obtain a BKF with simplified GM (BKF-SGM) for visual object tracking. As the GM is simplified directly without resampling, the proposed BKF-SGM avoids performance degradation due to sampling degeneracy in conventional PF. Furthermore, coupled with an improved MS tracker for extracting measurements from image frame, the original MS is extended under the BKF-SGM framework to a bank of parallel MS trackers, which reduces the possibility of being trapped in local maxima at the background or similar objects.

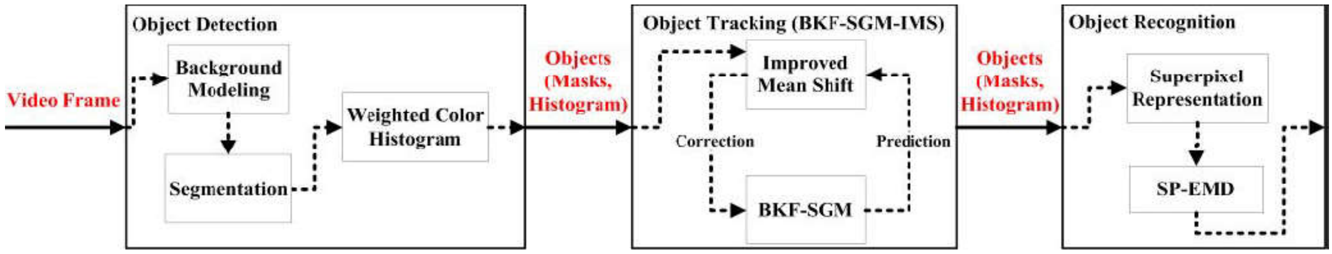

Fig.1. Block diagram of the proposed video surveillance pipeline

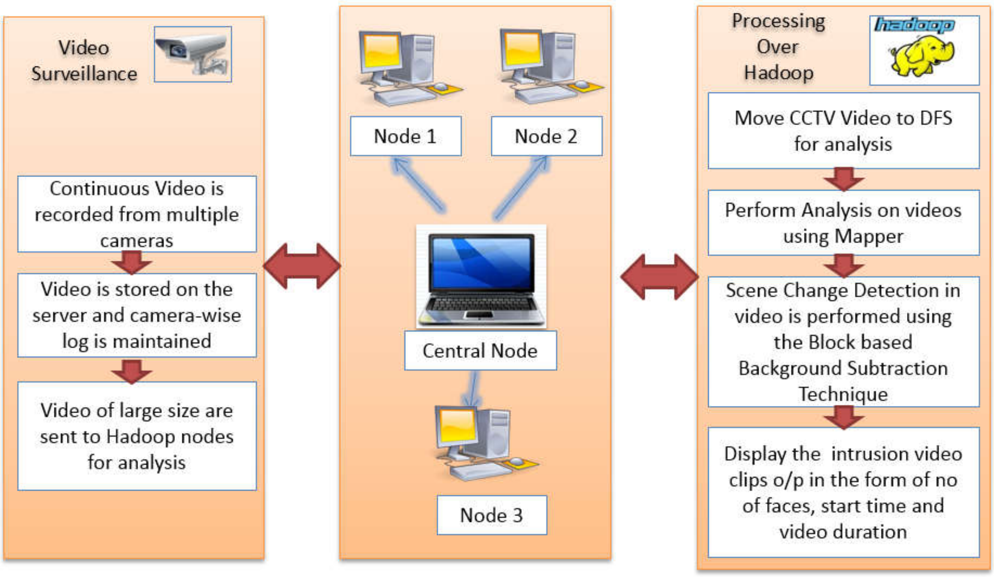

Fig.2. Overall Design

Therefore we propose to use stereo cameras, which offer additional depth information to resolve the occlusion problem.

In this paper, we approximate the non-Gaussian state and noise densities by Gaussian mixtures (GMs) and propose a new Bayesian Kalman filter (BKF)-based intra-camera tracking algorithm. The proposed BKF is based on the classical. Formulation of Ho et al. who showed that the classic Gaussian KF formulation can be extended by means of the Bayesian framework to handle more general pdf. However, for the non-Gaussian and/or non-linear system, the Bayesian recursion cannot be generally computed using closed-form formula due to difficulty in evaluating the multidimensional integral analytically. Therefore, one needs to approximate the state and noise pdfs using various techniques such as particles or GMs. For the former, it gives rise to the PF technique discussed above. For the GMs, the filtering process of the original

Previously Work Done

CCTV is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors. It differs from broadcast television in that the signal is not openly transmitted, though it may employ point to point (P2P), point to multipoint, or mesh wireless links. CCTV is often used for surveillance in areas that may need monitoring such as banks, casinos, airports, military installations, and convenience stores. It is also an important tool for distance education. In industrial plants, CCTV equipment may be used to observe parts of a process from a central control room, for example when the environment is not suitable for humans. CCTV systems may operate continuously or only as required to monitor a particular event. A more advanced form of CCTV, utilizing Digital Video Recorders (DVRs), provides recording for possibly many years, with a variety of quality and performance options and extra features (such as motion-detection and email alerts). More recently, decentralized IP-based CCTV cameras, some equipped with megapixel sensors, support recording directly to network-attached storage devices, or internal flash for completely stand-alone operation. Surveillance of the public using CCTV is particularly common in the UK, where there are reportedly more cameras per person than in any other country in the world. There and elsewhere, its increasing use has triggered a debate about security versus privacy.

The Overall Design

This project makes use of Open CV library to capture camera images and detect intrusion using comparison - block based motion object detection method. Once the comparison is done and an intrusion is found, it saves the streamed video on server. After that video analysis is performed using Hadoop technology. Application consist of following modules.

1.Video Recording

Video recording takes place using Open CV. Image capturing and comparing with template image takes place. Once the difference between template image and current image found then it means that intrusion is detected. Finally the intruded video is stored on the server for analysis. Analysis is performed using Hadoop technology.

2. Historic CCTV Video

We can apply the Hadoop technology on Historic CCTV Videos which is large size. For analysis these video take long time on single machine so overcome this problem we use Hadoop technology.

3.Analysis on videos using Mapper

a) Scene Change Detection: Scene Change Detection is performed using the block based background subtraction image .Compare the current image and template image if the current image and template image difference is found then Scene change is happened.

b) Pedestrian Detection: Pedestrian Detected using novel Bayesian Kalman filter with simplified Gaussian mixture (BKF-SGM).Once the pedestrian is detected in the intruded video is stored on server for analysis of video over Hadoop.

4.Processing Over Hadoop Node

For analysis using Hadoop the map Reduce concept is used. A Map Reduce **job** usually splits the input data-set into independent chunks which are processed by the ***map tasks*** in a completely parallel manner. In our project we analyse the video and slit the video in to number of chunks then it proceed to the different nodes for analysis.

5.Generate output with faces and change timing

Generate a graph and how much time is required for the analysing video.

6.Save the analysis logs into the database

Analysis logs like timing of each node for analysis, number of objects to be tracked, timing etc. is stored into the database for security purpose.

Processing pipeline of the proposed algorithms

To validate the proposed algorithms, a prototype intelligent video surveillance system was constructed. It consists of multiple intelligent stereo video surveillance cameras which are connected to a local PC-based video processing server. To support high-level VA tasks and other processing algorithms, the server is equipped with an INTEL Core i7 3770 CPU with 8GB RAM, GTX 610 GPU and storage.

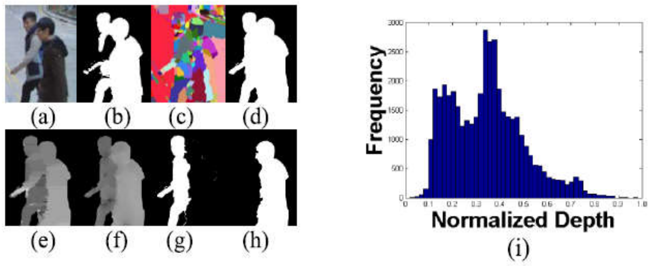

Fig.3. Processing steps of object detection: (a) image frame containing objects A and B, (b) object mask obtained by AGMM, (c) segmentation map, (d) refined object mask, (e) raw depth map, (f) refined depth map,(g) and (h) segmented objects A and B, and (i) 1D normalized histogram of depth values in (f)

Fig. 3 shows the block diagram of the proposed algorithms, which consists of three major blocks. Detection Block: It takes in a new video frame captured by a stereo camera and performs object extraction. The BM is firstly implemented for foreground/background labelling of each captured pixel using the AGMM algorithm. Then the proposed object segmentation is used to obtain the mask of newly identified objects. Finally, the weighted colour histogram of the object can be extracted by the object mask. Tracking Block: It uses the proposed BKF-SGM-IMS algorithm for tracking. The BKF-SGM-IMS employs the GM and MS tracker to model the state and noise densities and estimate the location of the tracked objects. This results in a bank of parallel MS trackers which significantly reduces the possibility of converging to the background with similar colour information as the tracked objects. The weighted colour histogram of newly detected object is used in the improved MS. Moreover, the object mask obtained from the detection block is used to update the bounding box and colour histogram of the tracked objects. Recognition Block: In this block, the colour appearance and shape information of the object are modelled by super pixel representation using the object mask obtained in the previous steps. Then, the SP-EMD distance metric is used to perform matching between the query image and a reference either obtained from a database or adjacent cameras for network-wise tracking. For generality, prior training of the object appearance is assumed to be unavailable, though training-based algorithms can also be used.

Conclusion

The proposed object detection algorithm yields improved segmentation results over conventional object detection methods and tracking algorithm can successfully handle complex scenarios with good performance and low arithmetic complexity. Moreover, the performance of both monitoring - and training-based object recognition algorithms can be improved using our detection and tracking results as input.

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