NEW OBJECT DETECTION, TRACKING, AND RECOGNITION APPROACHES FOR VIDEO SURVEILLANCE USING HADOOP

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ABSTRACT

Object detection and tracking are two fundamental tasks in multicamera surveillance. The most important technique of this multicamera related technique is to track and analyze objects within the images. The core technology of multicamera analysis is used in detecting, analyzing, and tracking the object's motion. In addition, when the light's color or direction changes, it is difficult to trace the object.Firstly use the block based algorith m 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 algorithms like SSIM index, Histogram matching 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 analysisand stored analysis result into database for security purpose.

KEYWORDS: *Video analytics, detection, tracking, recognition, Bayesian Kalman Filter*

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1. INTRODUCTION

Object detection and tracking are two fundamental tasks in multicamera surveillance. The most important technique of this multicamera related technique is to track and analyze objects within the images. The core technology of multicamera analysis is used in detecting, analyzing, and tracking the object's motion [1]. In addition, when the light's color 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 [2] 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 the objects, we apply algorithms like SSIM index, Histogram matching [5]. 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

2. IMPORTANT MODULES AND ALGORITHMS

This system makes use of Opencv 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 [1], it saves the streamed video on server. After that video analysis is performed using Hadoop technology.

2.1 MODULES

1. Video Recording

Video recording takes place using OpenCV. 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 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.

4. Pedestrian Detection

Pedestrian Detected using algorithms like SSIM index, Histogram matching [6]. Once the pedestrian is detected in the intruded video is stored on server for analysis of video over Hadoop.

5. Processing Over Hadoop Node

For analysis using Hadoop the mapReduce concept is used. A MapReduce *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 analyze the video and slit the video in to number of chunks then it proceeds to the different nodes for analysis.

6. Generate output with faces and change timing

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

7. Save the analysis logs into the database

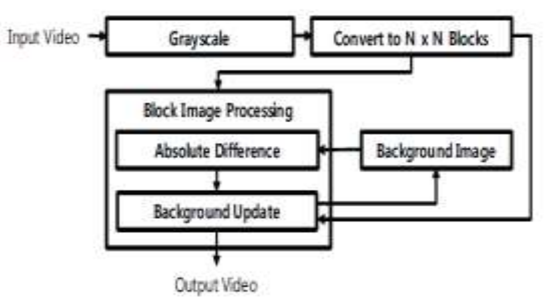
Analysis logs like timing of each node for analysis, number of objects to be tracked, timing etc is stored into the database for security purpose.

2.2 ALGORITHMS

A. Motion detection using block based background subtraction image.

1. Motional Region Detection Structure:

The new motion detection method we proposed uses a technique like BSM [3]. That is, it uses the subtraction between the current frame image and the background image. The background image used at this time is not a background image prepared in advance. However, it creates the background screen in real-time when video shooting. [5] The motion detection method proposed in this study can have divided into three steps:



- blocking the input image and preprocessing the image by block zoning
- obtaining the difference image between the background image and block zoning
- Updating the background image.

In Figure, the initial input image is a TV input [2] method proposed in the NTSC standard. This is the YIQ method [2]. It is converted to grayscale using following formula. Herein, F represents the frame image, and r, g, b indicates Red, Green, Blue value, respectively, to the pixel corresponding to the position of x and y.

$$G(x,y) = 0.299 \times F_r(x,y) + 0.587 \times F_g(x,y) + 0.114 \times F_b(x,y)$$

The images obtained after converting to grayscale are segmented into the square block with the entire number of pixels, N. Subsequently, the [3] absolute difference image of the block is divided in the front using formula.

$$D_n(x,y) = \begin{cases} 1, & |W_n(x,y) - B_n(x,y)| > t_T \\ 0, & otherwise \end{cases}$$

$(x, y=0,1,2,......,N\text{-}1 \quad N\text{: window block size})$

In above formula, n represents the number of blocks, W the block corresponding to the current image, B the block corresponding to the background image, and D the value [4] of the absolute difference between W and B.

2. Background Image Update:

Step 1: One-dimensional array is declared to store each difference image luminance change rate by block R(n), and initialized to 0. This step is performed only once during the first run.
Step 2: Integer variable C to calculate the degree of change for the entire block is declared and initialized into 0. Here in, C represents the number of blocks with a change. For the block difference image (Dn). Steps 3 and 4 are performed repeatedly.
Step 3: The number of pixels that have 1 as a value within the block difference image (Dn) is put together. At this time, the sum of pixels represents the change in the Luminance within the block. If it is equal to or greater than t [4], it is considered to have a change in △ the movement in the block, and the value of R(n) increases by 1. In addition, the value of C increases by 1. Conversely, if the sum of the pixels is less than t we consider there is no change, the value of R(n) reduces by 1, and all the values of Dn are initialized to 0. The image with no change in the [5] luminance value in the block is initialized into0 to eliminate noise. Herein, t uses an arbitrary threshold value i.e. block size N.

$$R(n) = \begin{cases} R(n)+1, & C = C+1, \quad \sum_{k=0}^{N^2} D_n(k) > \Delta t \\ R(n)-1, & D_n = 0,...,0., \quad otherwise \end{cases}$$

Step 4: In above formula, if the value of R(n) is less than '-1', the background image of the block is updated. Otherwise, it is not updated and remains as the previous background image.

B. Object tracking algorithm using a novel BayesianKalman filter with simplified Gaussian mixture (BKF-SGM)

A Kalman filter is used to estimate the state of a linear system where the state is assumed to be distributed by a Gaussian. Kalman filtering is composed of two steps, prediction and correction [5]. The prediction step uses the state model to predict the new state of the variables:

$$\bar{X}^t = DX^{t-1} + W$$

$$\bar{\Sigma}^t = D\Sigma^{t-1}D^T + Q^T$$

Where and are the state and the covariance predictions at time t. D is the state transition matrix which defines the relation between the state variables at time t and t − 1. Q is the covariance of the noise. Similarly, the correction step uses the current observations to update the object's state: M is the measurement matrix; K is the Kalman gain. [5]

$$X^t = \bar{X}^t + K^t[Z^t - M\bar{X}^t]$$

Note that the updated state Is still distributed by a Gaussian. Kalman filter, the extended Kalman filter assumes that the state is distributed by a Gaussian.

1. EXPERIMENTS

We have tested our system over challenging video sequence to generate analyzed output and to test that system is capable to handle Big data from different surveillance areas. Following are some snapshots of analyzed output obtained from our system while processing the database of classroom.

above is screenshot taken from our system which provide analysis on input video with their name algorithm used to analysis change time as in seconds and thresholds value of change which help us to find out that what type of motion it is like motion is due to natural changes like air or something or by human interaction which would affect threshold value

these output provide whole input video with highlighted part as shown in screenshot highlighted part indicates the motion in whole video where there is no motion in other part so we can able to analyzed total video of big size in fastest and easier way

In these analysis we have shown whole output in graphs and pie chart which can be used easily to analyses change duration with their threshold values and pie charts indicates whole time of change from original time so we can find out how many time is saved for analysis. In these screen shot our total video size is 53 min where we have analyzed these video and minimize time in 10 min by finding out only part which have motion or human interaction.

2. CONCLUSION

New approaches for object detection and tracking in camera network has been presented. A novel object detection algorithm using color based MS segmentation and depth information is first proposed for improving background modeling and segmentation of occluded objects. The segmented objects are then tracked by BKF-SGM-IMS. Finally, a no training-based object recognition algorithm based on SP-EMDdistortion metric is presented for identification of similar object extracted in nearby cameras to achieve network-based tracking. The usefulness of the proposed algorithms isillustrated by experimental results and comparison with conventional methods. For minimizing analysis time system is implementing over Hadoop.

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