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Identification and Tracking using Multiple Webcam

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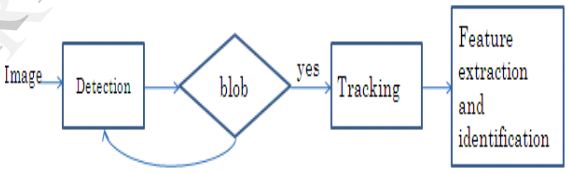
Abstract: An Automated Video Surveillance system is presented in this paper. The system aims at tracking an object in motion and identify an object in multiple webcam which would increase the area of tracking . The system employs a novel combination of an Adaptive Background Modeling Algorithm (based on the Gaussian Mixture Model) and a RGB color model used for identifying an object in multiple webcam.

INTRODUCTION

Detection, tracking and identifying an person in real time video are the task which are widely used in an high security zone. A huge number of studies are already done related to tracking of moving object. [1]Adaptive Gaussian mixtures have been used for modeling nonstationary temporal distributions of pixels in video surveillance applications. Significant improvements are shown on both synthetic and real video data. Incorporating this algorithm into a statistical framework for background subtraction leads to an improved segmentation performance compared to a standard method. In [2] a *method employs a region-based approach by processing two foregrounds resulted from gradientand color-based background subtraction methods.* In [3] system employs a novel combination of an Adaptive Background Modeling Algorithm (based on the Gaussian Mixture Model) and a Human Detection for Surveillance (HDS) System. The HDS system incorporates a Histogram of Oriented Gradients based human detector which is well known for its performance in detecting humans in still images. *[4] uses modeling each pixel as a mixture of Gaussians and using an on-line approximation to update the model. The Gaussian distributions of the adaptive mixture model are then evaluated to determine which are most likelyt o result from a background process. Each pixel is classified based on whether the Gaussian distribution which represents it most effectivelyis considered part of the background model.* In [5] a method for human tracking using a stereo camera system called "Subtraction Stereo" and color information. The tracking system using the subtraction stereo, which focuses its stereo matching algorithm to regions obtained by background subtraction, is realized using Kalman filter. To make the tracking system more robust, the new method also uses color information as another distinctive information of person. In this paper we are implementing an technique which can continuously track and identify multiple person from one place to another using multiple webcam by using adaptive background subtraction with Gaussian mixture model technique, handoff the color as feature to identify the person in other webcam.

System modeling

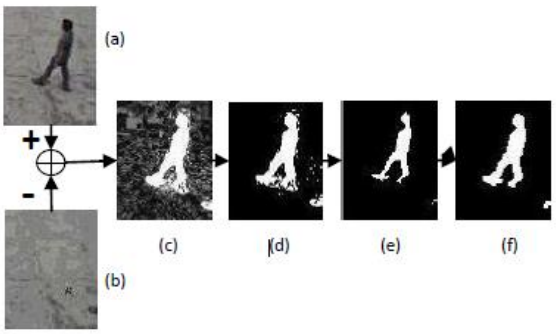
Overview of system:



The flow chart shows how an image taken from live webcam is processed for tracking and identification pupose.the first process is detection of moving object for that Gaussian mixture model is used.second pocess is to track an moving object for that blob analysis is used,third process is identification of moving object in multiple webcam for that color feature is used and hand off of the feature is done between the webcam.

A. FRAME DIFFERINCING

A statistical background image of the video scene is obtained. This background image is subtracted from the current frame image and threshold. The foreground regions of interest are extracted from the threshold image after appropriate morphological operations. The algorithm flow for Static Background Subtraction is depicted in Fig



The Static Background Subtraction system is not resilient to illumination changes or long lasting changes in the scene. Hence an Adaptive Background Modeling scheme should be adopted. In the following discussion, an implementation of the Gaussian Mixture model algorithm is presented, originally formulated by Stauffer et al [4], and subsequently modified by
Harville et al [10].

B. GAUSSIAN MIXTURE MODEL

The following algorithm models each individual pixel as a mixture of K-3D Gaussian distributions in the color space.

Pixel Value: $X_t = \begin{bmatrix} X_{r,t} \\ X_{g,t} \\ X_{b,t} \end{bmatrix}$

Probability: $P(X_t) = \sum_{i=1}^{K} w_{i,t} * \eta(X_t, \mu_{i,t}, \sum_{i,t})$

In each time step t, we try to match the new pixel observation $X_{i,t}$ with the K distributions in the mixture model. If we find a match, the weightings W_k , mean μ_k and variance $\sigma^2_{i,k}$ of the matched distribution $\eta_{i,k}$ are updated according to the equations described by Harville [10].

$(X_t - \mu_{k,t})^2 > \beta\sigma_k^2$

μ_t=(1-α) μ_{t-1} + αX_t

$\sigma_t^2 = (1-\alpha)\,\sigma_{t-1}^2 + \alpha(X_t - \mu_t)^T(X_t - \mu_t)$

where is taken as a learning constant. The distributions are sorted according to the values . The first B distributions are chosen from the sorting to represent the background according to the following criteria:

B = argmin $(\sum_{K=1}^{b} W_k > T)$

The new pixel value is classified as a foreground pixel if no match is found amongst the B distributions. The least weighted distribution is replaced with the distribution corresponding to the new pixel value.

Preprocessing of an image

morphological operations are done by using structuring element square of matrix 5x5 for smoothing the image.

bwareaopen(binary image,P) removes from a binary image all connected components (objects) that have fewer than P pixels, producing another binary image This operation is known as an area opening.

C. IDENTIFICATION

BlobAnalysis :The BlobAnalysis object computes statistics for connected regions in a binary image

BBOX: computes the bounding box BBOX of the blobs found in input binary image.

centroid:gives the co-ordinates of the moving object the co-ordinates are in the form of *M*-by-4 matrix of [x y width height] bounding box coordinates, where *M* represents the number of blobs and [x y] represents the upper left corner of the bounding box.

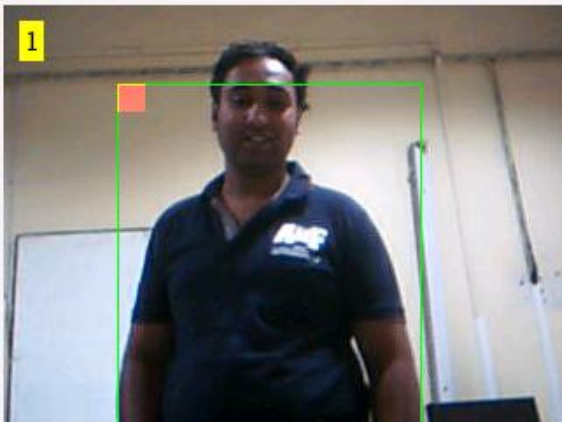


Figure 1: boundingbox as green color,red is the color tag as an identity mark.

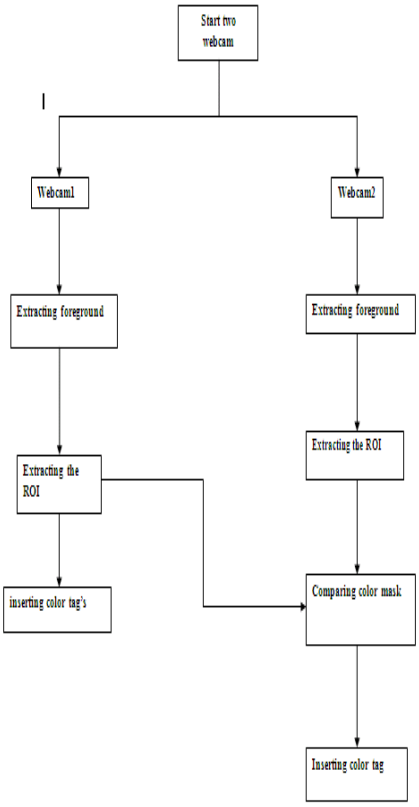
Extraction region of intrest from moving object:in this project an person is being detected by using color information.so our region of intrest is an small mask of moving object extracting its color information the region of intrest in this project is an small mask of centre part.by using centroid information we are able to locate the centre part of moving object extracting an 10x10 matrix color information.

Region of intrest:

Figure 2:an 10x10 color mask from the centre of boundingbox

Inserting color tag:an color tag is inserted to the left upper corner of the bounding box as an identifiying mark to that moving object.

Flow chart:



In this system two webcam are used for identifying and tracking two person.an person is entered first in webacm1,this person is identified by frame differencing and Gaussian mixture model,an boundingbox is made around the foreground object which gives the co-ordinates of the moving person.for extracting the color mask we take an 10x10 matrix from the centre of the boundingbox an extracting the mask assume this person is tag as red color in upper left side as an mark of identity.for second person we may tag an green color as an identity mark.the mask are continuously compared with the foreground object and if the mean of difference of two mask is less then threshold then the same color tag is given as in webcam1.multiple webcam an multiple person can be tracked using this method.

Performance analysis

The figure below shows tracking of one person in webcam 2 where the green color rectangle box is bounding box used to tack the moving object.left upper corner shows the count and the red color tag is inserted at the upper left of the bounding box as an identification mark.

Figure 3: one person tracking in webcam2

Same person is tracked in webcam 1 since both the webcam are placed close to each other and it can be observed that same person are having same color tag that is red color.

Figure 4:tracking of one person in webcam1

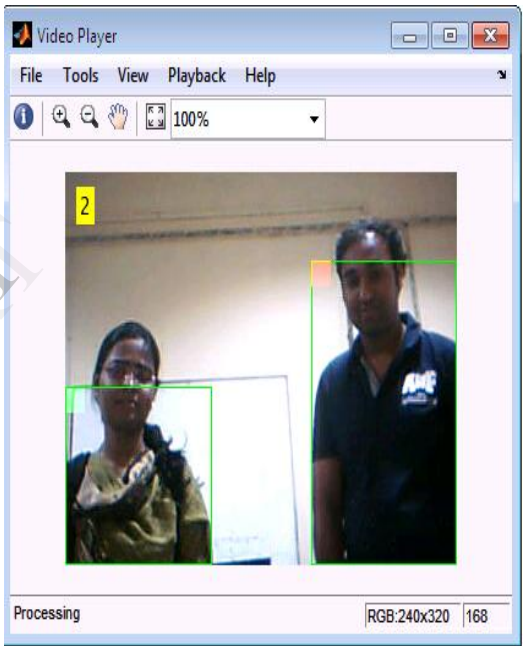


Figure 5:two person tracking in webcam1

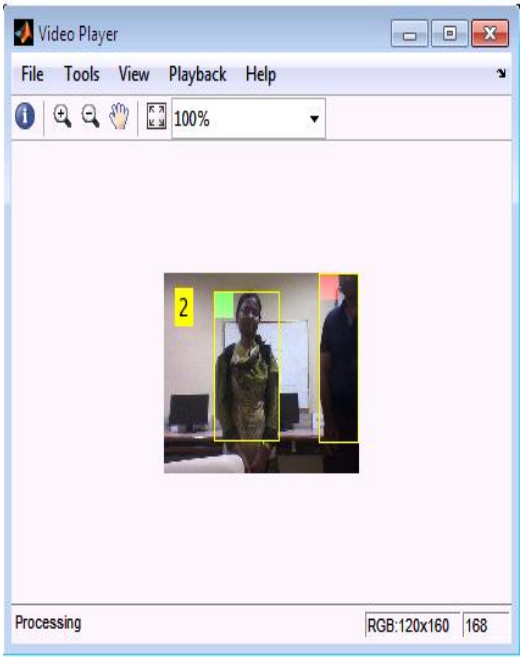


Figure 6:two person tracking in webcam2

The above figure shows two person are been tracked in two webcam contineously.In first webcam the color mask are crop and are compared in second webcam the mean difference between the two mask is less then an threshold then same color tag is inserted as an mark for identification.

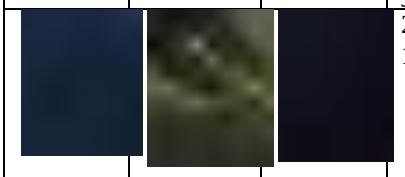
Webcam1	Mask of boy in first fame (x1)	Mask of girl (x2)	Mask of boy (x2)	Mean difference of x1 and x2	Mean difference of x1 and x3
				23.0441	0
Webcam2	Mask of boy in first fame (x1)	Mask of girl (y2)	Mask of boy (y3)	Mean difference of x1 and y2	Mean difference of x1 and y3
				23.9311	0

Table 1:comparison of color mask of moving object in webcam1 and webcam2

The above table shows the comparison of color mask of two person.the mean difference between each mask is calculated.The mean difference between the color mask of same person in webcam 1 & 2 is zero and of different person is greater than 23.which shows that our algorithm works perfectly for tracking of multiple object in multiple webcam.

CONCLUSION

The system presented in this paper for tracking and identifying an person in two are successfully performed in matlab2013. This system successfully track two person and identify them in two webcam continuously by inserting tag's for the respective person. Tracking is done by using Gaussian mixture model and for identification we have used rgb color information as an feature.

REFRENCES

[1] Dar-Shyang Lee, Member, IEEE, Effective Gaussian Mixture Learning for Video Background Subtraction, IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 27, NO. 5, MAY 2005

[2] Mohammad Izadi and Parvaneh Saeedi, Robust Region-Based Background Subtraction and Shadow Removing Using Color and Gradient Information

[3] Prithviraj Banerjee and Somnath Sengupta: Human Motion Detection and Tracking for Video Surveillance

[4] Stauffer, C. and Grimson, W.E.L,Adaptive Background Mixture Models for Real-Time Tracking, Computer Vision and Pattern Recognition, IEEE Computer Society Conference on,Vol. 2 (06 August 1999), pp. 2246-252 Vol. 2

[5] Yuma Hoshikawa, Kenji Terabayashi, Kazunori Umeda, Human Tracking Using Subtraction Stereo and Color Information

[6]. Beymer, D. and Konolige, K., "Real-Time Tracking of Multiple People Using Continuous Detection", *Proc. Of the 7th Int. Conf. on Computer Vision Frame-rate Workshop*, 1999.

[7] Bhattacharyya, A., "On a measure of divergence between two statistical populations defined by probability distributions", Bull. Calcutta Math. Soc., Vol.35, pp.99–109, 1943.

[8] Schiele, B., et al., "Visual People Detection-Different Models, Comparison and Discussion", *Proc. of the IEEE ICRA2009 Workshop on People Detection and Tracking*, pp.1-8, 2009.

[9] Umeda, K., et al., "Subtraction Stereo -A Stereo Camera System That Focuses On Moving Regions -", *Proc. Of SPIE-IS&T Electronic Imaging*, Vol.7239 Three- Dimensional Imaging Metrology, 723908, 2009.

[10] M. Harville, G. Gordon, and J. Woodfill, "Foreground Segmentation using adaptive mixture models in color and depth", In *Proceedings of the IEEE workshop on Detection and Recognition of Events in Video*, 2001.