International Journal of Engineering Research and General Science Volume 3, Issue 1, January-February, 2015
ISSN 2091-2730

Real Time Moving Object Tracking In Video Processing

Payal Ranipa, Kapildev Naina

M.Tech Computer Engineering ,RK University,ranipa.payal8761@gmail.com

Assistant Professor Department of CE,RK University,kapildevnaina@@rku.ac.in

Abstract— Real time moving object detection and tracking is one of the important research fields that have gained a lot of attention in the last few years. Cameras installed around us but there are no means to monitor all of them continuously. It is necessary to develop technologies that automatically process those images in order to detect problematic situations or unusual behavior of human. Design computer vision base automated video surveillance system addresses real-time observation of people within a busy environment leading to the description of their actions and interactions. Tracking is required for security, safety and site management. Object detection by background subtraction technique. Using single camera detect track human behavior. Background subtraction is the process of separating out the foreground objects from the background in a sequence of video frames. If human entity is cross the line design security in mall or public area the object is tracked. It is laborious to track and trace people over multiple cameras. In this paper, we present a system for real-time tracking and fast interactive retrieval of persons in video streams from multiple static surveillance cameras. The system when realizes the human entry, it is processed in a second and the alert is produced for the security purpose.

Keywords—: Human detection and tracing, background subtraction, video streams.

INTRODUCTION

Identifying moving objects from a video sequence is a fundamental and critical task in many computer vision applications.Here are various algorithms are used to detect moving object for video surveillance system. In order to detect moving objects in high speed, the complexity of algorithm mustbe simplified. Moving object detection algorithms based onframe difference has considerable processing speed than thealgorithms of optical flow, statistical learning algorithm.

In [5], author proposed a moving object detection algorithm based on frames difference and edge detection. In [6], the background subtraction and three frame differencing method is proposed for target extraction. In [7], author proposed a very similar method to [6], and it uses HSV color model to remove shadow and illuminated pixels from the subtracted image. The algorithm in [9] proposed a multimodal adaptive background subtraction method for object detection, which takes care of the usual affection such as changing illumination, occlusion, clutter and irrelevant extraneous movements, but it has such a heavy load of parameters since the background model change adaptively over time.

CCTV cameras are important for surveillance applications at bus, train station airports and shopping centers. For the camera operators, however, it is laborious to track and trace People over multiple cameras. In this paper, we present a semi-autonomous system for real-time tracking and fast interactive retrieval of persons in video streams from multiple surveillance cameras. The primary focus of this paper is to discuss an innovative technique for detection of human behavior in different public places like bus, railway station, super mall for security and safety.

Tracking require the location and/or shape of the object in every frame. There are three key steps in video analysis, first detection of moving objects, second is tracking of objects from frame to frame and third analyzing the object tracks to recognize their behavior. For detection and tracing the object use canny edge detector. For more accurate tracking we subtract the background from the frame using the Nearest Neighbor (NN) algorithm. The Nearest Neighbor algorithm uses the distance between the object and the background to subtract it. For identify skin color use blob detector. For the identified object a bounding box is built. By DML algorithm we can track the object. This paper deals with enumerating the steps involved in the process of to detect problematic situations or unusual behavior of human.

METHODS BASED ON OBJECT TRACKING

The human object is captured; a data base about the pixel values are trained to the system.Video Camera is fixed at a required place where security is needed. Whenever human movement is captured by the camera it is immediately detected and the object is tracked by background subtraction method.In the area of moving object detection and tracking, a technique robust to background dynamics using background subtraction with adaptive pixel-wise background model update is described.Two type of technique are used for moving object detection. Background subtraction,Decolor Technique. DECOLOR performs object detection and background estimation simultaneously with a training sequences.

A. Background Subtraction Technique

Background subtraction is a widely-used concept utilized to detect moving objects in videos taken from a static camera. In the last two decades, several algorithms have been developed for background subtraction and were used in various important applications such as visual surveillance, sports video analysis, motion capture, etc. Various statistical approaches have been proposed to model scene backgrounds. We consider a background the pixels of image without motion and a foreground of pixels with motion. Then the simplest background model assumes each background pixel his brightness varies independently with normal distribution. Then we can determine our statistical model of background by accumulating several dozens of frames and there squares.[4]
Background subtraction is a widely used for detecting moving objects. The ultimate goal is to "subtract" the background pixels in a scene leaving only the foreground objects of interest. If one has a model of how the background pixels behave the "subtraction" process is very simple Background subtraction usually consists of three attributes besides the basic structure of the background model, background initialization background maintenance (updating the background model to account) and foreground/background pixel classification.[4]

I. *Background Subtraction Algorithm*
The four major steps in a background subtraction algorithm are,
1. Pre-processing, 2. Background modelling, 3. Foreground detection and 4. Data validation.

II. *Frame Differencing*
Frame differencing involves the following steps:
1. Estimate the background for time t. 2. Subtract the estimated background from the input frame. 3. Apply the threshold (Th), to the absolute difference to get the foreground mask.

B.Edge detector technique:

I.Canny edge detector:
The canny edge detector is used to identify the edges of the object and their traces to detect the object. It is the most common and frequent method used for the object detection for its curve let transforms property. It determines the edges of the object more accurately than other operators.Because of the canny edge detector is susceptible to noise in raw unprocessed image data, it uses a filter based on a Gaussian, where the image is convolved with a Gaussian filter. The result will be a blurred version of the original which is not affected by a single noisy pixel to any significant degree. An edge in an image may point in various directions, so the canny edge algorithm uses four filters to detect vertical, horizontal,and diagonal edges in the image.[4]

The Canny operator works in a multi-stage process. First of all the image is smoothed by Gaussian convolution. Then a simple 2-D first derivative operator (somewhat like theRoberts Cross) is applied to the smoothed image to highlight regions of the image with high first spatial derivatives. Edges give rise to ridges in the gradient magnitude image. The algorithm then tracks along the top of these ridges and sets to zero all pixels that are not actually on the ridge top so as to give a thin line in the output, a process known as *nonmaximalsuppression*. The tracking process exhibits hysteresis controlled by two thresholds: *T1* and *T2* with *T1* > *T2*. Tracking can only begin at a point on a ridge higher than *T1*. Tracking then continues in both directions out from that point until the height of the ridge falls below *T2*. This hysteresis helps to ensure that noisy edges are not broken up into multiple edge fragments.

Advantages of canny edge detection algorithm.

Less Sensitive to noise: Its uses Gaussian filter which removes noise ata great extent as compared to above filters.

Remove streaking problem: The classical operators' like Robert uses single thresholding technique but it results into streaking. Streaking means, if the edge gradient just above and just below the set threshold limit it removes the useful part

of connected edge, and leave the disconnected final edge. To overcome from this drawback canny detector uses 'hysteresis' technique which uses two threshold values t_lowand t-high as discussed above in cannyalgorithm.

Good localization: LoG operators cannot find edge orientation while canny operator provides edge gradient orientation which results into good localization.

II.Roberts Edge Detector

The Roberts operator performs a simple, quick to compute, 2-D spatial gradient measurement on an image. It thus highlights regions of high spatial gradient which often correspond to edges. In its most common usage, the input to the operator is a greyscale image, as is the output. Pixel values at each point in the output represent the estimated absolute magnitude of the spatial gradient of the input image at that point.

According to Roberts, an edge detector should have the following properties: the produced edges should be well-defined, the background should contribute as little noise as possible, and the intensity of edges should correspond as close as possible to what a human would perceive. With these criteria in mind and based on then prevailing psychophysical theory Roberts proposed the following equations:

$$\text{Yi,j} = \sqrt{xi,j}$$

$$\text{Zi,j} = \sqrt{(yi,j - yi+j,j+1)2 + (yi+1,j - yi,j+1)2}$$

where x is the initial intensity value in the image, z is the computed derivative and i,j represent the location in the image.The results of this operation will highlight changes in intensity in a diagonal direction. One of the most appealing aspects of this operation is its simplicity; the kernel is small and contains only integers. However with the speed of computers today this advantage is negligible and the Roberts cross suffers greatly from sensitivity to noise.

III.Sobel Edge Detector

The Sobel operator performs a 2-D spatial gradient measurement on an image and so emphasizes regions of high spatial gradient that correspond to edges. Typically it is used to find the approximate absolute gradient magnitude at each point in an input greyscale image.Sobel operator is a discrete differentiation operator used to compute an approximation of the gradient of image intensity function for edge detection.

At each pixel of an image, sobel operator gives either the corresponding gradient vector or normal to the vector. It convolves the input image with kernel and computes the gradient magnitude and direction.

As compared to Robert operator have slow computation ability but as it has large kernel so it is less sensitive to noise as compared to Robert operator. As having larger mask, errors due to effects of noise are reduced by local averaging within the neighborhood of the mask.

C.FILTERS

I. Particle Filter

Particle Filter is used to realize the particularly selected object tracking.particle filters methods are asset of on-line posterior density estimation algorithms that estimate the posterior density of the state space by directly implementing the Bayesian recursion equations.Particle filtering is a Monte Carlo approximation to the optimal Bayesian filter, which monitors the posterior probability of a first-order Markov process through the following formula:

$$\int f(x_k)p(x_k|y_{0,\dots}y_k\ )dx_k \approx \sum_{l=1}^{N} F(X_K^{(L)})\frac{1}{N}$$

ii.Kalman Filter

The Kalman filter possesses many applications in technology. It is an essential part of both military technology and the development of space technology.[**10**] The main function of Kalman Filter is to utilize measurements recorded over time which contain random variations and inaccuracies to generate values that tend closer to the measurement's true values and connected values that resulted from calculations. For

estimating the position of object is performed using the Kalman filter as an estimator. It has been used successfully in different prediction applications or state determination of a system. Kalman filter as a probabilistic prediction method for object tracking. Main problems that can be solved by usingkalman filter in tracking is

- The object can be track if it move beyond the searched region
- Variation factors such as lighting and occlusion which effect the appearance of target.

III.Temporal filtering

Temporal filtering further filters out the erroneous blocks and tracks the object in consecutive frames. Which includes two steps, first is to project the motion vector on the previous frame and filter out the true motion vector and by projecting true motion vector on previous frame the object can be tracked. Second step includes correlating the DCT of two matched object and further reducing the false alarm.[15].Followed by last step of frequency analysis which distinguish real object from false alarm.

1) Motion vector projection and estimating motion vector reliability
Since motion estimation is performed from a coding point of view, MVs do not always capture actual motion, but can contain a lot of noise. To reduce the effect of noisy MVs, we propose to estimate the reliability of MVs based onthe temporally co-located MVs in surrounding frames.

2) Correlation between DCT values of object detected in previous and current frame

Table 1 - Comparison Table:

Author	Date	Method /Algo	Conclusion
Won-Ho Kim, NuwanSanjeewaRajasooriya	International Journal of Computer, Information, Systems and Control Engineering Vol:7 No:9, 2013	Human object detection algo (difference image generation,binary image generation,moving human object segmentation)	Only can detect the human
B.S.M.MADHAVI, M.V.GANESWARA RAO	May-June 2012, IOSRJECE	1)Background subtraction method (background image initialization ,background update,occlusion detection) 2)Moving object detection(moving object extraction,reprocessing, extraction of moving human body	Only can detect the human
Shashank Prasad, Shubhra Sinha	2011 IEEE	Object detection,objectrecognization,object tracking	Only can detect the object
RishabhRai	April, 2013,ijird	Face Detection, YCbCr Model, Skin Segmentation	Only can detect the face

Ridhi Jindal, Anuj Gupta	November 2013,ijarcsse	Skin Filter , Face Detection from Skin Regions	Only can detect the face
S. Mahendran, D. Vaithiyanathan and R. Seshasayanan,	International conference on Communication and Signal Processing, April 3-5, 2013	Distance Metric Learning (DML), Nearest Neighbor (NN) classifier, Blob Detector, Bounding Box, Region Props feature extraction.	Only can detect the human
Amedome Min-DianeyKodjo, Yang Jinhua	2012 International Conference on Optoelectronics and Microelectronics	motion detection, motion tracking, image acquisition	Only can detect the moving object

V CONCLUSION

In this paper, human motion detection and tracking for real time security system was formulated.. The object is detected from the live video and tracked using background subtraction, this system is proposed for real-time security purpose. It is mainly applicable in banks, jewellery shops, military etc. Object detection is made efficiently using the background subtraction technique and DML Bysian Algorithm try to reduce frame rate and this system works on skin color the black and white video can be used but when the background is similar then we try to detect the object. This system increases the efficiency and reduces the cost and total time consumed. Thus the real-time security system is built efficiently in many applications

REFERENCES:

[1] Shashank Prasad, Shubhra SinhaComputer Science, Electronics and Telecommunication, Mumbai UniversityThakur College of Engineering and Technology,Mumbai, India.'' Real-time Object Detection and Tracking in an Unknown Environment'', 978-1-4673-0126-8/11/$26.00_c 2011 IEEE

[2] Hyung-Bok Kim1 and Kwee-Bo Sim2,'A Particular object tracking in an environment of Multiple Moving objects; International Conference on Control, automation and System 2010

[3] Amedome Min-DianeyKodjo,YangJinhua, 'Real-time Moving Object Tracking in Video', 978-1-4673-2639-1/12/$31.00 ©2012 IEEE.

[4] S. Mahendran, D. Vaithiyanathan and R. Seshasayanan, Member, IEEE,' Object Tracking System Based on Invariant Features', 978-1-4673-4866-9/13/$31.00 ©2013 IEEE.

[5] Zhan Chaohui, DuanXiaohui, XuShuoyu, Song Zheng, Luo Min, "An Improved Moving Object Detection Algorithm Based on Frame Difference and Edge Detection", Fourth International Conference on Image and Graphics, 2007, 519-523.

[6] Lian Xiao feng, Zhang Tao, Liu Zaiwen, "A Novel Method onMoving-Object Detection Based on Background Subtraction and ThreeFrame Differencing", International Conference on MeasuringTechnology and Mechatronics Automation, 2010, Volume 1, 252-256.

[7] Yong quan Xia, Weili Li, ShaohuiNing, "Moving Object DetectionAlgorithm Based on Variance Analysis", Second International Workshopon Computer Science and Engineering, 2009, Volume1, 347-350.

.

[8] Gustavo Moreira1, Bruno Feijo1, H´elio Lopes1, Raul Queiroz Feitosa2,' Real-time Object Tracking in High-Definition Video Using Frame Segmentation and Background Integral Images',' 1530-1834/13 $26.00 © 2013 IEEEDOI 10.1109/SIBGRAPI.2013.20'.

[9] Abhik Banerjee1, Abhirup Ghosh2, Koustuvmoni Bharadwaj3, Hemanta Saikia4,' Mouse Control using a Web Camera based on Colour Detection', IJCTT – volume 9 number 1– Mar 2014

[10] Sherin Cherian1, C.Senthil Singh2,' REAL TIME IMPLEMENTATION OF OBJECT TRACKING THROUGH WEBCAM',Volume:03 special Issue: 01,Mar-2014.

[11] Henri bauma ,janbaan,' Real time tracking and fast retrieval of persons in multiple surveillance cameras of a shopping mall', SPIE, 2013

[12] R.shaalini&C.Shanmugam,R.NiranjanKumar,G.Myilsamy,N.Manikandaprabu,'Human Motion Detection and Tracking for Real Time Security System',December 2013,IJARCSSE.

[13] A.SaiSuneel.'Person Or Object Tracking And Velocity Estimation In Real Time Video',vol 04,special Issue01;2013.

[14] B.S.M.MADHAVI1, M.V.GANESWARA RAO, ' A Fast and reliable motion human detection and tracking Based on background subtraction,'IOSR', *(May-June 2012).*

[15]**Mansi Patel "** Real Time Moving Object Detection and Tracking in H264 Compressed Domain for Video Surveillance",***2014, IJARCSSE.***