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Real Time Object Tracking in Surveillance System Using MATLAB

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Abstract

In video surveillance, detection of moving objects from a video is important for object detection, target tracking, and behavior understanding. Detection of moving objects in video streams is the first relevant step of information and background subtraction is a very popular approach for foreground segmentation.. Nowadays CCTVs are installed at many places like banks safe. But the CCTV cameras continuously record the situations. Hence there is an unnecessary memory wastage if there is nothing happening in front of the camera. Also the CCTV system does not provide alerts of burglary happening at particular time. So there is a need of a system which will record the situation only if there is some movement happening in front of the camera.. By implementing the system in real time and testing the system on large number of long sequences, authenticated person can stop alert for fix time to enter into secured. Human motion Detection System is developed from the security point of view. The objective of Real Time Security System using Human Motion Detection is to develop a system that monitors the area in which it is being deployed. In Human motion detection System, web camera is applicable in the area where no one is permissible to enter, also where we need to detect if any motion has been done. We can use web camera for Human Motion Detection. The Camera is used to catch the live images of the area in which it is being implemented, if any object is moving. The captured images are stored for further work. The captured images are stored for further work. If motion is found in this video, the computer will start recording, buzz an alarm.

Keywords: Object detection, Background subtraction, Gaussian Mixture model, Real Time Video, Surveillance Camera.

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INTRODUCTION

Surveillance cameras can be an effective technique to protect public safety and detect or deter criminal activity. Surveillance cameras are increasingly being installed inside and outside of public buildings (in elevators, hallways, entrances, etc.), on streets, home, highways, in parks and public transportation vehicles. Carlos and Fernando gives an automatic visual object detection and tracking framework is proposed to reliably introduce video surveillance and counting-based applications in the consumer electronics environment. It is based on off-the shelf equipment, such as IP, web cameras, and PCs, and does not need especial installation and configuration requirements [1]. The video surveillance system requires fast, reliable and robust algorithms for moving object detection and tracking. The system can process both colour and gray images from a stationary camera. It can handle object detection in indoor or outdoor environment and under changing illumination conditions [2] Habib Hussien presented a live feed frames sequences from a fixed camera, detecting all the foreground objects and estimate the trajectory of the object of interest moving in the scene. There are many challenges in developing a good object detection algorithm [4]. The video captured by the camera is being processed by the MATLAB program that helps in motion detection. [2] Frame difference used in this paper, which calculates the differences between 2 frames at every pixel position and store the absolute difference. It is used to visualize the moving objects in a sequence of frames.

Generalized system

Existing system was simply based on frames or we can say objects. Simple approach was used in existing system like capturing photos or frames with CCTV camera. After capturing frame it will calculate the difference between captured frames[8].Then it will calculate the threshold value by applying some algorithmic standards and it will detect the objects based on the motion of that object

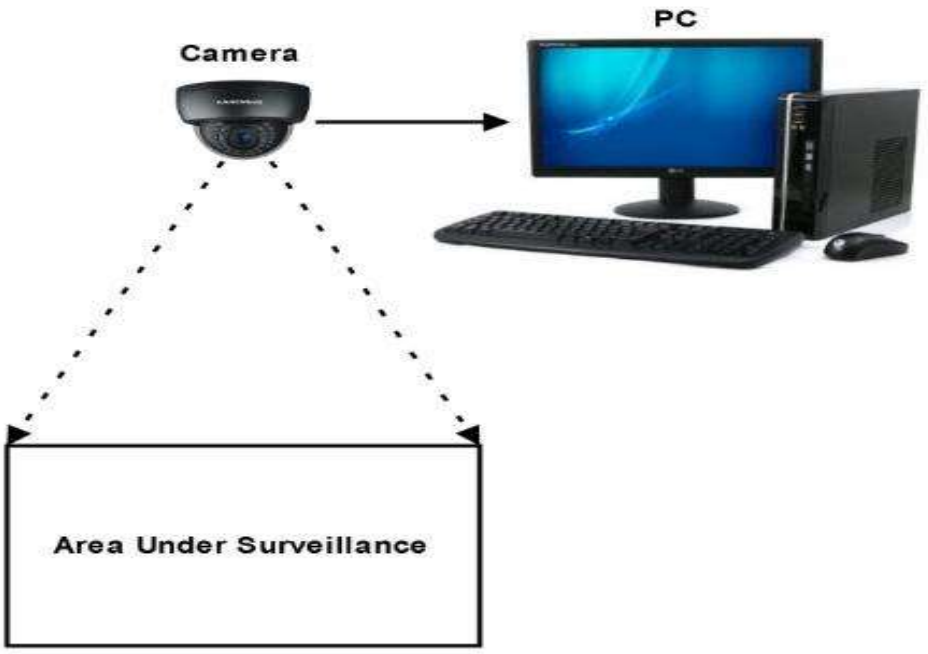

Fig -1: Block Diagram

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a-Moving Object Detection

Moving object detection is always the first step of a typical surveillance system. Moving object detection aims at extracting moving objects that are interesting out of a background which can be static or dynamic. Since subsequent processes are greatly dependent on the performance of this stage, it is important that the classified foreground pixels accurately correspond to the moving objects of interests. The three most popular approaches to moving object detection are background subtraction, frame differencing, and optical flow.

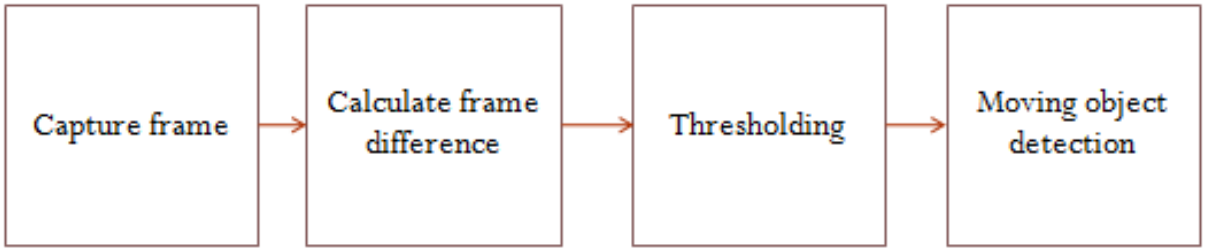

Fig -2: Traditional object detection

b-Object Tracking

Object tracking is to establish a correspondence between objects or object parts in consecutive frames and to extract temporal information about objects such as trajectory, posture, speed and direction. Tracking detected objects frame by frame in video is a significant and difficult task. It is a crucial part of smart surveillance systems since without object tracking, the system could not extract cohesive temporal information about objects and higher level behavior analysis steps would not be possible. On the other hand, inaccurate foreground object segmentation due to shadows, reflectance and occlusions makes tracking a difficult research problem. Object Tracking in real-time objects is done on the basis of the environment properties of the object such as Bounding Area, Centroid etc.

c-Moving a Object Tracking Based On Region

This method identifies and tracks a blob token or a bounding box, which are calculated for connected components of moving objects in 2D space. The method relies on properties of these blobs such as size, color, shape, velocity, or Centroid. A benefit of this method is that it time efficient, and it works well for small numbers of moving objects. Partial overlapping and occlusion is corrected by defining a pedestrian model. From the above Object tracking system flow chart, we can see that we apply morphological filters based on combinations of dilation and erosion to reduce the influence of noise, followed by a connected component analysis for labeling each moving object region.

PROPOSED METHODOLOGY

a- Foreground Detection

A combination of a background model and low-level image post-processing methods to create a foreground pixel map and extract object features at every video frame. Background models generally have two distinct stages in their process: initialization and update.

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b- Gaussian mixture Model

A Gaussian Mixture Model (GMM) is a parametric probability density function represented as a weighted sum of Gaussian component densities. GMMs are commonly used as a parametric model of the probability distribution of continuous measurements or features in a biometric system, such as vocal-tract related spectral features in a speaker recognition system. GMM parameters are estimated from training data using the iterative Expectation-Maximization (EM) algorithm or Maximum A Posteriori (MAP) estimation from a well-trained prior model.

Main Body Text :A novel adaptive online background mixture model that can robustly deal with lighting changes, repetitive motions, clutter, introducing or removing objects from the scene and slowly moving objects. Their motivation was that a unimodal background model could not handle image acquisition noise, light change and multiple surfaces for a particular pixel at the same time. Thus, they used a mixture of Gaussian distributions to represent each pixel in the model.

To implement an 8 mixture of Gaussians. But the pixel values that don't fit the background distributions are considered as foreground. Nowak 2003 showed how the parameters of a mixture of Gaussians for which each node of a sensor network had different mixing coefficients could be estimated using a distributed version of the well-known expectation-maximization (EM) algorithm. This message-passing algorithm involves the transmission of sufficient statistics between neighboring nodes in a specific order, and was experimentally shown to converge to the same results as centralized EM. Kowalczyk and Vlas-sis Kowalczyk and Vlassis, 2004 proposed a related gossip-based distributed algorithm called Newscast EM for estimating the parameters of a Gaussian mixture. Random pairs of nodes repeatedly exchange their parameter estimates and combine them by weighted averaging.

In this section, another technique that is commonly used for performing background segmentation. Stauffer and Grimson et al. have proposed; suggest a probabilistic approach using a mixture of Gaussian for identifying the background and foreground objects. The probability of observing a given pixel value Ptat time t is given by

$$P(p_t) = \sum_{i=1}^{k} \omega_{i,t}\eta(p_t, \mu_i, \sum i,t)$$

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Where k is the number of Gaussian Mixture and that is used. The number of k varies depending on the memory allocated for simulations. Then the normalized Gaussian η is a function of ωi,tμi,t ∑i, t which represents weight, mean and co-variance matrix of the ith Gaussian at time Where k is the number of Gaussian Mixture and that is used. The number of k varies depending on the memory allocated for simulations. Then the normalized Gaussian η is a function of ωi, tμi, t ∑i, t which represents weight, mean and co-variance matrix of the ith Gaussian at time

$$\rho = \alpha\eta(\ p_t \mid \mu_{i,t-1}, \sigma_{i,t-1}\ )$$

$$\omega_{i,t} = (1-\alpha)\omega_{i,t-1} + \alpha$$

$$\mu_{i,t} = (1-\rho)\mu_{t-1} + p_t\rho$$

$$\sigma_{i,t}^2 = (1-\rho)\mu_{t-1} + p_t\rho$$

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The values for weight and variance vary based on the significance that is given toa pixel which is least likely to occur in a particular way. All the Gaussian weights are normalized after the update is performed. The-Gaussians are then reordered based on their likelihood of existence.

C - Background Subtraction Detection

Background subtraction method initializes a reference background with the first few frames of video input. Then it subtracts the intensity value of each pixel in the current image from the corresponding value in the reference background image. The difference is filtered with an adaptive threshold per pixel to account for frequently changing noisy pixels. The reference background image and the threshold values are updated with an IIR filter to adapt to dynamic scene changes. Background subtraction (aka background differencing) is probably the most fundamental image processing operation for video security applications. Frame differencing is a pixel-wise differencing between two or three consecutive frames in an image sequence to detect regions corresponding to moving object such as human and vehicles. The threshold functions determine change and it depends on the speed of object motion. It's hard to maintain the quality of segmentation, if the speed of the object changes significantly. Frame differencing is very adaptive to dynamic environments, but very often holes are developed inside moving entities. Videos are actually consists of sequences of images, each of which called as a frame. For detecting moving objects in video surveillance system, use of frame difference technique from the difference between the current frame and a reference frame called as 'background image' is shown.

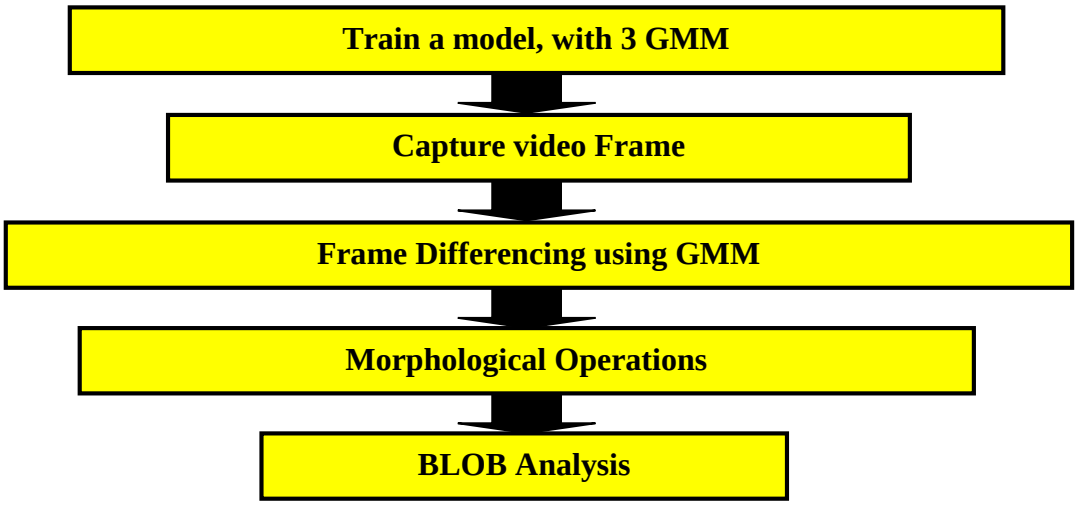

Fig -3: Flowchart for Background Subtraction

Algorithm for person alert
Step 1: Capture frame from camera in real time.
Step2: Convert the RGB image to Gray scale.
Step3: Get the current and the last frames.
Step4: Find the difference between these two frames.
Step5: Threshold this image.
Step6: Check if the difference value between the two frames (i.e. rate of movement) is greater than the value set by the user.

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Step7: If yes buzz the alarm.

Detection Algorithm

Input: Frame f captured at time t and Frame f captured at time t+1, Th as Threshold

Output: Alarm

Process:

1. Convert frames into grayscale
2. Calculate difference of Frames.

$$D(x,y,t+1)=\begin{cases}1 & |f(x,y,t)-f(x,y,t+1)>Th| \\ 0 & otherwise\end{cases}$$

3. Th for decision to set foreground and background pixel
4. Get binarized image
5. Get moving object
6. If moving object motion>threshold2 then send Alert Alarm

APPLICATIONS

The name of this topic itself is one of the applications of the system. The term surveillance is a most applicable to security system because in the security system, to watch on every suspicious movement in the specific organisation. The advances in the development of these algorithms would lead to breakthroughs in applications that use visual surveillance. Monitoring of Banks, Departmental Stores, Airports, Museums, stations, private properties and parking lots for crime prevention and detection patrolling of highways and railways for accident detection, Measuring traffic flow. In such organisation this system is most not only applicable but also more reliable. The demand for remote monitoring for safety and security purposes has received particular attention, especially in the following areas: Transport applications such as airports, auditorium environments, railways, and motorways to survey traffic.

Public places such as banks, supermarkets, homes, department stores and parking lots.

Remote surveillance of human activities such as attendance at football matches or other activities.

Surveillance to obtain certain quality control in many industrial processes, surveillance in forensic applications and remote surveillance in military applications.

CONCLUSIONS AND RESULTS

A video monitoring detecting system was thus developed successfully in this project. This system mainly provides an efficient method for surveillance purposes and is aimed to be highly beneficial for any person or organization. Thus motion based change detection in.avi video format was completed and successfully implemented. We propose an instance based method for human detection in real time, which is motivated by a range of applications. An implementation and system design of a prototype system developed for testing purposes is reviewed in this report as well. In this report, a human body detection algorithm based on the combination of temporal information and shape information is designed. Firstly, the area are selected which are surveillance. Where the need of object are detected. When the moving object is entering in the surveillance area it will be detected. Moving objects are detected using the proposed Background Elimination Technique and Gaussian mixture Model. Secondly, the moving a object are track under the surveillance area and the

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outside rectangle of moving object is computed using the max width and height value of the moving regions.

Fig -4: Area under Surveillance

Fig -5: Track Object Image

Fig -6: Object Detected

Fig-7: Background Eliminated Frame

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