A Survey And Analysis Study On Remote Based Video Surveillance By Background Substraction

[1] J. Vasavi [2] SANJEEVA RAO SANKU

Abstract.

The increasing need for intelligent video surveillance in public commercial and family applications makes automated video surveillance systems one of the main current application domains in computer vision. It proposes a low-cost intelligent mobile phone-based video surveillance solution using moving object recognition technology. Intelligent video surveillance systems deal with the real-time monitoring of persistent and transient objects within a specific environment. This can be applied not only to various security systems, but also to environmental surveillance. Firstly, the basic principle of moving object detecting is given by the Background Subtraction algorithm. Then, a self-adaptive background model that can update automatically and timely to adapt to the slow and slight changes of natural environment is detailed. When the subtraction of the current captured image and the background reaches a certain threshold, a moving object is considered to be in the current view, and the mobile phone will automatically notify the central control unit or the user through phone call, SMS (Short Message System) or other means. Proposed solution can be used in constructing mobile security monitoring system with low-cost hardware and equipments.

Index Terms— Background Subtraction, self-adaptive background model, Moving Object Recognition, Video Surveillance

1. INTRODUCTION

Video Surveillance has been used in many applications including elderly care and home nursing etc. intelligent video surveillance system to enable remote monitoring of real time scenarios. This system introduces intelligent analysis of single person activity to enhance the security system in home and also enriches the current video surveillance systems through an automatic identification of abnormal behavior of the person. Video Surveillance started with analogue CCTV systems to gather information and to monitor people, events and activities. Existing digital video surveillance systems provide the infrastructure only to capture, store and distribute video, while leaving the task of threat detection exclusively to human operator

Video surveillance takes place normally by using CCTV cameras (Closed Circuit Television) for monitoring or surveillance for intruder detection in case of emergencies in hospitals, shopping malls, banking sectors, personal purpose automation and so on. Later Video fusion approach also used for monitoring such systems. These systems are designed in such a way that monitoring images are stored and there is a need for human to interact for knowing about the changes in the current surveillance systems and than they will intimate to the concerned organization. Hence this is not a fast secured monitored due to the time delay taken for human interaction. Due to time delay, we cannot get the update information for every minute or second and so it is not possible to detect the intruder in an appropriate time. These system uses the moving average algorithm to store the monitored images. Also this system lack the computation capability for surveillance meant for security . Background modeling is an important component of many vision systems. Existing work in the area has mostly addressed scenes that consist of static or quasi-static structures.

The number of cameras available worldwide has increased dramatically over the last decade. But this growth has resulted in a huge augmentation of data, meaning that the data are impossible either to store or to handle manually. In order to detect, segment, and track objects automatically in videos, several approaches are possible. Simple motion detection algorithms compare a static background frame with the current frame of a video scene, pixel by pixel. This is the basic principle of background subtraction, which can be formulated as a technique that builds a model of a background and compares this model with the current frame in order to detect zones where a significant difference occurs. The purpose of a background subtraction algorithm is therefore to distinguish moving objects (hereafter referred to as the foreground) from static, or slow moving, parts of the scene (called background). Note that when a static object starts moving, a background subtraction algorithm detects the object in motion as well as a hole

left behind in the background. Clearly a ghost is irrelevant for motion interpretation and has to be discarded. An alternative definition for the background is that it corresponds to a reference frame with values visible most of the time that is with the highest appearance probability but this kind of framework is not straightforward to use in practice.

While a static background model might be appropriate for analyzing short video sequences in a constrained indoor environment, the model is ineffective for most practical situations; a more sophisticated model is therefore required. Moreover, the detection of motion is often only a first step in the process of understanding the scene. For example, zones where motion is detected might be filtered and characterized for the detection of unattended bags, gait recognition, face detection, people counting, traffic surveillance, etc. The diversity of scene backgrounds and applications explains why countless papers discuss issues related to background subtraction.

We present a universal method for background subtraction. We extensively review the literature of background subtraction algorithms. This review presents the major frameworks developed for background subtraction and highlights their respective advantages. We have implemented some of these algorithms in order to compare them with our method.

Here we describe our technique and details our major innovations: the background model, the initialization process, and the update mechanism. The experimental results including comparisons with other state-of-the-art algorithms and computational performance. We also present a simplified version of our algorithm which requires only one comparison and one byte of memory per pixel; this is the absolute minimum in terms of comparisons and memory for any background subtraction technique. We show that, even in its simplified form, our algorithm performs better than more sophisticated techniques. A pixel wise generative background model is obtained for each feature efficiently and effectively by Kernel Density Approximation. Background subtraction is performed in a discriminative manner using a Support Vector Machine over background likelihood vectors for a set of features. We compare the performance of the algorithm with other density-based methods using several different feature combinations and modeling techniques, both quantitatively and qualitatively.

2. Problem Identification & Proposed Solution

According to the previous paper there is a drawback for while capturing the images for the moving objects. There is no guarantee that the captured images which have been captured when object is moving are belongs to the authorized person or not.

Background subtraction Algorithm is widely used approach for detecting moving objects in videos from static cameras. Background template construction is used to built the template before the images has been captured. Moving object recognition technology is used to recognize the moving objects. Although there are different methods by which we can capture images for moving objects. A technique referred here is moving object recognition technology and background template construction, which will help us to find how exactly whether that person is authorized or not

A remote based video surveillance system provides a low-cost intelligent mobile phone-based video surveillance solution using moving object recognition technology. The basic principle of moving object detecting is given by the Background Subtraction algorithm. Then, a self-adaptive background model that can update automatically and timely to adapt to the slow and slight changes of natural environment is detailed.

When the subtraction of the current captured image and the background reaches a certain threshold, a moving object is considered to be in the current view and the mobile phone will automatically notify the central control unit or the user through phone call, SMS or other means. This is the more efficient way to get the security compare to the oldest security methodologies like live streaming and keeping buzzers. For advanced way we are going to use hardware module called gsm module and webcam etc.

The major concepts used in a remote based video surveillance system are:
1) Background Subtraction Algorithm
2) Background Template Construction
3) Moving Object Recognition Technology

This system started to capture the images when the web camera is started to capture the images and store the corresponding images it in the server as image path links in MS-Access database. This Background image will be compared with the currently captured image now and then. Whenever there is a difference between two images, a moving object is considered to be in view and through the mobile phone, a notification is sent to the user along

with image links which is already stored in database. If there is no difference between these two images, then the image that was captured later will be used to compare with the images that are going to be captured. Here the SABM is used to update the slight changes in the environment automatically

3. Background subtraction:

Background subtraction is a widely used approach for detecting moving objects from static cameras. Many different methods have been proposed over the recent years and both the novice and the expert can be confused about their benefits and limitations Processing a video stream to segment foreground objects from the background is a critical first step in many computer vision applications. Background subtraction (BGS) is a commonly used technique for achieving this segmentation. Widely Used in 1) Traffic monitoring (counting vehicles, detecting & tracking vehicles),
2) Human action recognition (run, walk, jump, squat,),
3) Human-computer interaction (\human interface"),
4) Object tracking (watched tennis lately)
5) And in many other cool applications of computer vision such as digital forensics.

The popularity of BGS largely comes from its computational efficiency, which allows applications such as human-computer interaction, video surveillance, and traffic monitoring to meet their real-time goals. Numerous BGS algorithms and a number of post-processing techniques that aim to improve the results of these algorithms have been proposed. In this project, I evaluated several popular, state-of-the-art BGS algorithms and examine how post-processing techniques affect their performance. The experimental results demonstrate that post-processing techniques can significantly improve the foreground segmentation masks produced by a BGS algorithm.

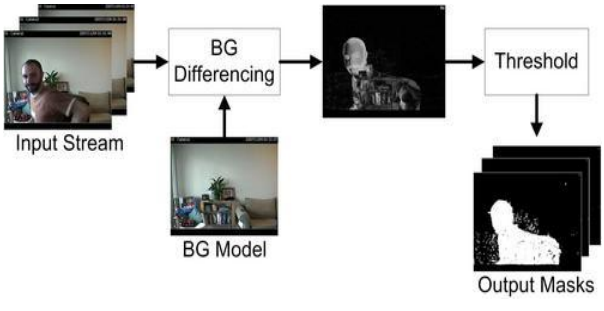

Fig: 3.1 back ground subtraction process

Object detection and tracking in video is a challenging problem involves locating object in the frames of a video sequence, while the latter represents the process of monitoring the object's spatial and temporal changes in each frame. Background subtraction is a computational vision process of extracting foreground objects in a particular scene. A foreground object can be described as an object of attention which helps in reducing the amount of data to be processed as well as provide important information to the task under consideration. In some cases, distance of the moving object also forms a basis for it to be considered a background, e.g if in a scene one person is close to the camera while there is a person far away in background, in this case the nearby person is considered as foreground while the person far away is ignored due to its small size and the lack of information that it provides. Identifying moving objects from a video sequence is a fundamental and critical task in many computer-vision applications.

Object detection can be performed through various approaches, such as region-based segmentation, background subtraction, temporal differencing, active contour models, and generalized Hough transforms. In surveillance system video sequences are generally obtained through static cameras and fixed background. A popular approach called background subtraction is used in this scenario, where moving objects in a scene can be obtained by comparing each frame of the video with a background. In the background model, for each pixel location a range of values are defined. For object detection in surveillance system, background modeling plays a vital role. In ViBe, each pixel in the background can take values from its preceding frames in same location or its neighbor. Then it compares this set to the current pixel value in order to determine whether that pixel belongs to the background, and adapts the model by choosing randomly which value to substitute from the background model. Background subtraction is a class of techniques for segmenting out objects of interest in a scene for applications such as surveillance. There are many challenges in developing a good background subtraction algorithm. First, it must be robust against changes in illumination. Second, it should avoid detecting non-stationary background objects and shadows cast by moving objects. A good background model should also react quickly to changes in background and adapt itself to accommodate changes occurring in the background such as moving of a stationary chair from one place to another. It shossuld also have a good foreground detection rate and the

processing time for background subtraction should be real-time.

The background model is built in two parts, the color model and the gradient model. The color model is built for each color channel. It is composed of two images representing the mean and standard deviation for that color component. Subtracting the incoming image from the mean image will identify the pixels that have changed intensity. Visual features are commonly modeled with probability density functions in computer vision problems In video surveillance, detection of moving objects from an image sequence is very important for target tracking, activity recognition, and behavior understanding. Background subtraction is a very popular approach for foreground segmentation in a still scene image. Locating moving objects in a video sequence is the first step of many computer vision applications

According to M. Van Droogenbroeck and O. Paquot, ViBe is a technique that collects background samples to build background models. Background models are made of 20 background samples for each pixel. Background samples are selected randomly to update the model; other samples are discarded. There is a spatial propagation mechanism that inserts background values in the models of neighboring pixels. Once the random policy decides to substitute a value of the model, it also inserts that value in the model of one of the neighboring pixels. Only a very few background subtraction techniques use of spatial mechanism. There is no notion of time in ViBe. Old and recent values are considered equally when there are replaced. And there is a simple decision process to determine if a pixel belongs to the background

4. Procedure

This paper is integrated with the following modules:

1. User Authorizer
2. Capturing Image
3. Motion Detection
4. Comparing each Frames
5. GSM Modem Implementation

4.1User Authorizer

To avoid unwanted access and to restrict unauthorized users we have to set a sequence of user authorization on the basics of user name and password verification. The user name and the password has been sent to the server side for verification. After verification the user can login to access the image from the image server. We may set any number users depending upon the need. If there is action change with the stored image the alert message is given to the particular person .The option available in the form used to view the exact action detected in the web cam .The Java Media Framework enables the user interaction in the action detected.

4.2 Capturing Image

Capture the video feed is the first step in video surveillance. Video sequence is composed of series of video images At first, by means of image processing for monitored data, it is illustrated whether remarkable changes between continuous sampled images happen or not. Secondly, through comparison of a series of monitored image from network camera, detection of dynamic changes from the previous image to now one is performed so that the signal for homing of camera's platform can be computed and sent to camera for controlling its platform.

And it is used to read data from an output Data Source of a Processor. It creates a processor and hook up the output. Instantiate and set the frame access codec to the data flow path. Get the output Data Source from the processor and hook it up to the Data Source Handler. It reads from camera and display information of each frame of data received. It uses the Java Media Framework to detect image capturing device. In this module we are capturing the video from webcam using Java Media Framework (JMF) API. JMF is a framework for handling streaming media in Java programs. JMF is an optional package of Java 2 standard platform. JMF provides a unified architecture and messaging protocol for managing the acquisition, processing and delivery of time-based media. Java Media Framework (JMF) is an exciting and versatile API that allows Java developers to process media in many different ways. JMF supports many popular media formats such as JPEG, MPEG-1, MPEG-2, QuickTime, AVI, WAV, MP3, GSM and MIDI. JMF supports popular media access protocols such as file, HTTP, HTTPS, FTP, RTP, and RTSP. JMF enables Java programs to (i) Present (playback) multimedia contents, (ii) Capture audio through microphone and video through Camera, (iii) Do real-time streaming of media over the Internet, (iv) Process media (such as changing media format, adding special effects). compressed video is sent to the mobile phone of the user. The mobile phone can decode them and play the surveillance video. (v) store media into a file

4.3 Motion Detection

In this Analyzing images, we can classify the target and extract relevant information to analyze the motion of targets. we are finding the moving object by comparing the each frame with background template using background subtraction algorithm. Analysis of

Motion detection is an important step. In this step, we have to extract the foreground object from the background. Then classify the object whether it is human or non-human. Once the object classification is done, object tracking is next step. The tracking is done based on region and contours .Before the moving objects can be identified, a background template must be built. Generally, background and foreground (moving objects) are mixed together such as waving leaves in the garden and running automobiles on high way. Background subtraction is a popular method for human detection in static background. The motion analysis processing can in the simplest case be to detect motion, i.e., find the points in the image where something is moving. More complex types of processing can be to track a specific object in the image and over time, to group points that belong to the same rigid object that is moving in the scene, or to determine the magnitude and direction of the motion of every point in the image. The information that is produced is often related to a specific image in the sequence, corresponding to a specific time-point, but then depends also on the neighboring images. This means that motion analysis can produce time time-dependent information about motion. Detection and tracking of moving objects can be viewed as lower level vision tasks to achieve higher level event understanding. Identifying moving objects is a critical task for video segmentation, which is used in many computer vision applications such as remote sensing, video surveillance and traffic monitoring

Detecting the foreground objects as the difference between the current frame and an image of the scene's static background

framei–background| > Th

It evidently works only in particular conditions of objects' speed and frame rate. Very sensitive to the threshold The Given an image (mostly likely to be a video frame), we wantto identify the foreground objects in that image.

In most cases, objects are of interest, not the scene.

Fig: 4.3 background subtraction for moving cars frame

The foreground cannot be removed so the ideal background image cannot be retrieved. But the moving objects do not exist in the same location in each frame of a real-time video sequence. An "average" frame of the video sequence can be retrieved to approach the ideal background image. Moving regions were obtained automatically by frame difference with an adaptive threshold. Then region combination was done according to the nearest distance

4.4Comparing each Frames

Systems first segments video objects (VO) from surveillance videos, and the fundamental semantic information is then extracted and indexed into the database

Image processing has been done with two target images extracted from database are divided into fourth or ninth pieces of sub image. Corresponding two pieces of sub image are compared with pixel-wise operations, and detection of dynamic changes can be performed based on the result whether compared two sub images are different or not. Background subtraction is a commonly used class of techniques for segmenting out moving objects of interest in a scene for applications such as surveillance. It involves comparing an observed image with an estimate of the image if it contained no objects of interest. The areas of the image plane where there is a significant difference between the observed and estimated images indicate the location of the objects of interest. The term "background subtraction" comes from the simple technique of subtracting the timely updated background template from the observed image and then threshold the result to generate the objects of interest.

4.5 GSM Modem Implementation

GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile), is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones. The compressed video is sent to the mobile phone of the user. The mobile phone can decode them and play the surveillance video. GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. Importing the COMM Driver and connecting the Modem to the PC with serial port.

Description of a Universal Background Subtraction Technique

Background subtraction techniques have to deal with at least three considerations in order to be successful in real applications

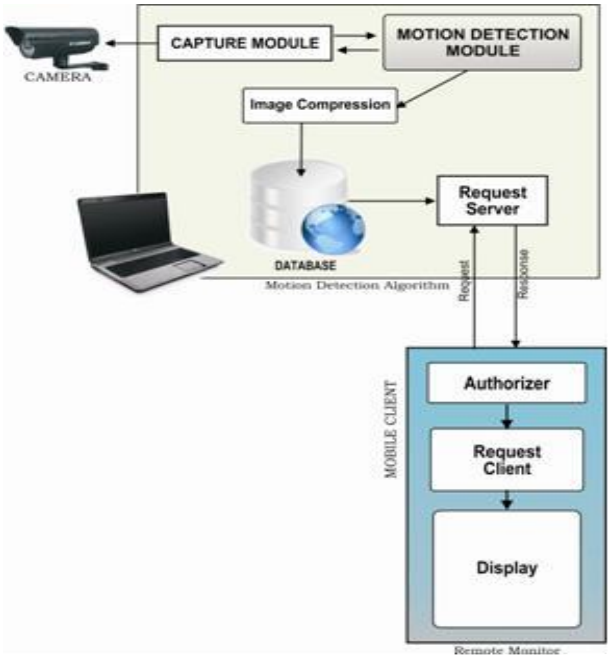

Fig: Proposed system architecture of the background subtraction for images

5. Related work:

For object detection in surveillance system, background modeling plays a vital role.Wren et al. have proposed to model the background independently at each pixel location which is based on computation of Gaussian probability density function (pdf) on the previous pixel values. According to Bohyung Hans Background modeling and subtraction is a natural technique for object detection in videos captured by a static camera, and also a critical preprocessing step in various high-level computer vision applications. propose a pixel wise background modeling and subtraction technique using multiple features, where generative and discriminative techniques are combined for classification. A pixel wise generative background model is obtained for each feature efficiently and effectively by Kernel Density Approximation (KDA).Background subtraction is performed in a discriminative manner using a Support Vector Machine (SVM) over background likelihood vectors for a set of features. The proposed algorithm is robust to shadow, illumination changes, spatial variations of background. We compare the performance of the algorithm with other density-based methods using several different feature combinations and modeling techniques, both quantitatively and qualitatively

In ViBe, each pixel in the background can take values from its preceding frames in same location or its neighbor . Then it compares this set to the current pixel value in order to determine whether that pixel belongs to the background, and adapts the model by choosing randomly which value to substitute from the background model. Kim and Kim introduced a novel background subtraction algorithm for dynamic texture scenes

ViBe is a technique that collects background samples to build background models. Some key points of ViBe are: Background models are made of 20 background samples for each pixel. Background samples are selected randomly to update the model; other samples are discarded. There is a spatial propagation mechanism that inserts background values in the models of neighboring pixels. Once the random policy decides to substitute a value of the model, it also inserts that value in the model of one of the neighboring pixels. Only a very few background subtraction techniques use of spatial mechanism. There is no notion of time in ViBe. Old and recent values are considered equally when there are replaced. And there is a simple decision process to determine if a pixel belongs to the background literature, it is observed that most of the simple schemes are ineffective on videos with illumination variations, motion in background, and dynamically textured indoor and outdoor environment etc. On the other hand, such videos are well handled by complex schemes with higher computational cost.

6. Results and Discussions

In computer vision background subtraction is main task; it is preferred to be as fast as possible. Background subtraction is done by performing the color-based subtraction and the Moving Object Recognition separately and then combining the results.

The moving objects will be captured if these images are matched with the stored images then there are authorized persons if not they are unauthorized persons at that time alert message will be send to the admin person. Classification model that is based upon a small number of correspondences between a candidate value and the corresponding background pixel model. for images embedded in digital cameras and for short sequences.

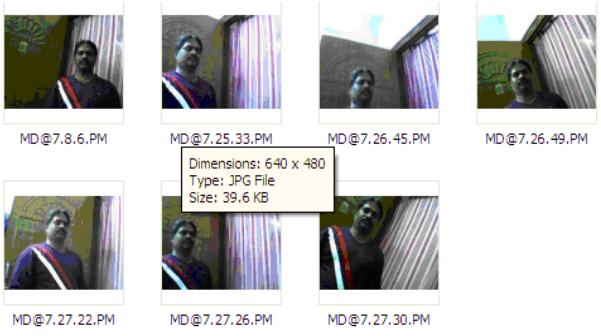

FIG: 6.1: captured moving objects stored images by using background subtraction process

After this if any unauthorized person access then alert message will be send to the admin person

7. CONCLUSION

A technology of background subtraction for real time monitoring system was proposed in this paper. The obvious keystone of my work is studying the principle of 3background, and exploring the base resolve method of the problem. Experiment shows that the method has good performance and efficiency. Here alert text message will be send to the admin person by using GSM (global system for mobile communication) Modem. So then it is very efficiently find out unauthorized person. Introduced a universal sample-based background subtraction algorithm, called ViBe, which combines three innovative techniques. First, we proposed a classification model that is based upon a small number of correspondences between a candidate value and the corresponding background pixel model. Second, we explained how ViBe can be initialized with a single frame. This frees us from the need to wait for several seconds to initialize the background model, an advantage for image processing solutions embedded in digital cameras and for short sequences. Finally, we presented our last innovation: an original update mechanism.

8. FURTURE ENHANCEMENT:

In future alert the user sending by multimedia (audio, video, graphic, animation and text) SMS by using GSM (global system for mobile communication) Modem. So then it is very efficiently find out unauthorized person

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Author's Information:

1 J.Vasavi is pursuing M.Tech in Computer Science and Engineering from Nagole Institute of Technology and Science, JNTUH, A.P, INDIA. Her research areas include image processing, data mining, wireless mobile communication and network security

2. **SANJEEVA RAO SANKU** ,Assoc. Prof. Dept. CSE, M.Tech,CSE(from JNTU Kakinada Campus,Completed in 2006)B.Tech(from Mahatma Gandi Institute of Technology, completed in 2003)Experience: 9+ years Interesting areas: Data warehousing and Data Minig, Computer Networks, Image Processing Attended number of workshops in various engineering colleges and universities. Conducted number of workshops in various colleges