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Review on Moving Object Detection in Video Surveillance

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Abstract: This chapter presents a review and systematic study on the moving object detection and surveillancing of the video as they are important and challenging task in many computer vision applications. Such as human detection algorithm, vehicles detection, threat, security. Video surveillancing in a dynamic environment ,especially for human and vehicles and for specific object in case of security is one of the current challenging research topic in computer vision it is a key technology to fight against terrorism, crime, public safety and for efficient management of accidents and crime seen going on now a days. The paper also presents the concept of real time implementation computing task in video surveillances system. In this review paper various methods are discussed were evaluation of order to access how well they can detect moving object in an outdoor/indoor section in real time situation.

Keywords: Human Detection, Video Surveillance, Moving Object Detection, Background Subtraction.

I. INTRODUCTION

Video surveillance is an active research topic in computer vision that tries to detect, recognize and track objects over a sequence of images and it also makes an attempt to understand and describe object behaviour by replacing the aging old traditional method of monitoring cameras by human operators. Object detection and tracking are important and challenging tasks in many computer vision applications such as surveillance, vehicle navigation and autonomous robot navigation. Object detection involves locating objects in the frame of a video sequence. Every tracking method requires an object detection mechanism either in every frame or when the object first appears in the video. Object tracking is the process of locating an object or multiple objects over time using a camera. The high powered computers, the availability of high quality and inexpensive video cameras and the increasing need for automated video analysis has generated a great deal of interest in object tracking algorithms. There are three key steps in video analysis, detection interesting moving objects, tracking of such objects from each and every frame to frame, and analysis of object tracks to recognize their behaviour. Therefore, the use of object tracking is pertinent in the tasks of, motion based recognition.

Image processing is a term which indicates the processing on image or video frame which is taken as an input and the result set of processing is may be a set of related parameters of an image. The purpose of image processing is visualization which is to observe the objects that are not visible. Analysis of human motion is one of the most recent and popular research topics in digital image processing. In which the movement of human is the important part of human detection and motion analysis, the aim is to detect the motions of human from the background image in a video sequence. It also includes detection, tracking and recognition of human behavior along with some objects which are in motion from video frame. An important stream of research within a computer vision, which has gained a lot of importance in the last few years, is the understanding of human activity from a video. The growing interest in human motion analysis is strongly motivated by recent improvements in computer vision the availability of low cost hardware such as video cameras and a variety of new promising applications such as personal identification and visual surveillances. The goal of motion detection is to recognize motion of objects found in the two given images. Moreover, finding objects motion can contribute to objects recognition. Thus, the main objective of the research is to recognize pixels belonging to the same object.

However, the present research is based on the following assumptions:

- A well fixed camera –stability is key if you want to isolate motion.
- Stable light, no flickering
- Contrasting background
- High camera frame rate and resolution

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This method can get the complete movement information and detect the moving object from the background better. The background subtraction method is to use the difference method of the current image and background image to detect moving objects, with simple algorithm, but very sensitive to the changes in the external environment and has poor anti -interference ability. In the frame subtraction method the presence of moving objects is determined by calculating the difference between two consecutive images. Any motion detection system based on background subtraction needs to handle a number of critical situations such as:

- Image noise, due to a poor quality image source;
- Gradual variations of the lighting conditions in the scene
- Small movements of non-static objects such as tree branches and bushes blowing in the wind;
- Shadow regions are projected by foreground objects and are detected as moving objects.

The main objective of the present research is to develop an algorithm that can detect moving object at certain distance for object tracking applications. The rest of the paper has been organized as follows: section 2 covers literature survey, section 3 covers detection of moving object, section 4 presents the experimental results, section 5 concludes the paper and references are given at the end.

II. LITERATURE REVIEW

Divya.M, Dr. S. Padmavathi "Identification of the movements of Human in a Video" International Journal of Engineering Research in Computer Science and Engineering (IJERCSE) Vol 3, Issue 3, March 2016
In this paper the movements of human in a video is identified by using the Global GIST feature. This feature is used to track the corner of the moving body in each frame. The results for various videos involving single or two persons are summarized. The human movement identification is a challenging part and they are to be trained with the large number of datasets. The dataset involve action of single or two persons. The Gist feature descriptor and skeleton detection has the good efficiency to find the flexible movements of body in the unknown video. In the future work is to identify the clash and non-clash between two people or many people and indicating a censor as violence on the particular clash video.

Swati Gossain, Jagbir Gill "a novel approach to enhance object detection using integrated detection algorithms" International Journal of Computer Science and Mobile Computing, Vol.3 Issue.3, March- 2014, pg. 1018-1023
Image processing plays an important role in the detection of object. The object detection is very necessary. In the object detection many technologies are used. But there are some reasons due to which the detector may face some problems in object detection. These problems are: congestion, noise effect and so on. Hence to remove these distortions, we are going to use the region prop along with skull detection. It helps to remove the distortions coming while we detect an object. It recognize a particular object not the noise or any other distortion.

Tomasz Kryjak, Marek Gorgoń "Real-Time Implementation of Moving Object Detection in Video Surveillance Systems Using Fpga" Computer Science • Vol. 12 • 2011
The article presents the concept of accelerating computing tasks in an advanced video surveillance system and the implementation of background generation and segmentation of moving objects module in a reconfigurable device. Research has shown that the implementation of this type of processing is entirely possible, does not require large FPGA resources and allows to offload the computer's CPU whose processing power can be used in later stages of image analysis. In addition, the results show that the use of colour images, even though it requires the execution of approximately three times more calculations and use of three times more memory, can improve the performance of the segmentation of moving objects.

Rupesh Kumar Rout "A Survey on Object Detection and Tracking Algorithms" Department of Computer Science and Engineering National Institute of Technology Rourkela Rourkela – 769 008, India
In every chapter the object detection and tracking methods are being surveyed. This thesis has examined methods to improve the performance of motion segmentation algorithms and Block matching technique for object tracking applications and examined methods for multi-modal fusion in an object tracking system. Motion segmentation is a key step in many tracking algorithms as it forms the basis of object detection. Improving segmentation results as well as being able to extract additional information such as frame difference, Gaussian of mixture model, background subtraction allows for improved object detection and thus tracking. However a strength of kalman filter is their ability to track object in adverse situation. Integrating a kalman filter within a standard tracking system allows the kalman filter is to use progressively updated features and aids in main training identity of the tracked object, and provides tracking system with an effective means. The simulator and the simulation parameters used for the experiments are disscussed. We have shown the simulation results in the form of images.

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Prithviraj Banerjee and Somnath Sengupta "Human Motion Detection and Tracking for Video Surveillance"
A novel combination of Adaptive Background Modeling and Histogram of Oriented Gradients was presented for tracking and detecting human motion in a surveillance video sequence. The Human Detection for Surveillance (HDS) system was formulated, which could successfully classify a given image to be as Human or Non-Human in nature. The system used a Histogram of Oriented Gradients based approach for generation of feature vectors. The feature vectors were classified into the appropriate categories using a Support Vector Machine. The integrated system was successfully tested on a number of sample videos containing various moving entities. Analyses were made on its performance and certain key issues were identified to be kept in consideration while implementing the system.

Kermani and Asemani "A robust adaptive algorithm of moving object detection for video surveillance" EURASIP Journal on Image and Video Processing2014, 2014:27
A new algorithm was proposed in this paper for the detection of moving objects using the structure of adaptive noise cancellation. The proposed detection algorithm is integrated with Bayesian-MRF algorithm to improve the performance in terms of the shape continuity of detected objects. This algorithm benefits from the correlation of background pixels on the successive frames and removes the background. What is left at the output would be an approximation of moving areas. The shape of moving objects is then improved using Bayesian algorithm. The algorithm appears to be very efficient in eliminating noise, shadows, illumination variations, and repeated motions in the background. Experiments on different environments have shown the effectiveness of the proposed method. Despite earlier adaptive detection algorithms, the proposed method tries to directly detect moving objects using adaptive filtering. The promising detection results and simplicity of algorithm make the proposed method to be a suitable candidate for real time practical implementations.

Payal Panchal, Gaurav Prajapati, Savan Patel, Hinal Shah and Jitendra Nasriwala "A Review on Object Detection and Tracking Methods" International Journal For Research In Emerging Science And Technology, Volume-2, Issue-1, January-2015
It is not possible to consider a single method for all type of images, nor can all methods perform well for particular types of image. The background subtraction method detects object with noise and output is not accurate. Object behind object is not detected. Problem occurs during identification of object when any obstacles come before the object. If the position of camera is not proper and object in image is not captured properly then it cannot be identified. To solve above problems and bring some accuracy and richness by combining multiple methods and make use of it together according to the application.

Nameirakpam Dhanachandra, Khumanthem Manglem and Yambem Jina Chanu "Image Segmentation usingK-means Clustering Algorithm and Subtractive Clustering Algorithm" Eleventh International Multi-Conference on Information Processing-2015 (IMCIP-2015)
We have segmented an image by usingk-clustering algorithm, using subtractive cluster to generate the initial centroid. At the same time partial contrast stretching is used to improve the quality of original image and median filter is used to improve segmented image. And the final segmented result is compare with k-means clustering algorithm and we can conclude that the proposed clustering algorithm has better segmentation. The output images are also tune by varying the hyper sphere cluster radius and we can conclude from that result that by varying the hyper sphere cluster radius we can get different output. And so we should take the value of hyper sphere cluster very carefully. Finally RMSE and PSNR are checked and observed that they have small and large value respective, which are the condition for good image segmentation quality. And comparison for RMSE and PSNR are done for proposed method and classical K-means algorithm and it is found that the proposed method have better performance result. In the future, we can improve the quality of the output image more by using the morphological operation and get better performance measurement. We can also implement different clustering method using subtractive clustering algorithm. And lastly we can implement and analyze in different areas of image segmentation.

Jacinto Nascimento, Member, IEEE Jorge Marques "Performance evaluation of object detection algorithms for video surveillance" IST/ISR, Torre Norte, Av. Rovisco Pais, 1049-001, Lisboa Portugal
This paper proposes a framework for the evaluation of object detection algorithms in surveillance applications. The proposed method is based on the comparison of the detector output with a ground truth segmented sequence sampled at 1 frame per second. The difference between both segmentations is evaluated and the segmentation errors are classified into detection failures, false alarms, splits, merges and split/merges. To cope with ambiguous situations in which we do not know if two or more objects belong to a single active region or to several regions, we consider multiple interpretations of the ambiguous frames. These interpretations are controlled by the user through a graphical interface. The proposed method provides a statistical characterization of the object detection algorithm by measuring the percentage of each type of error. The user can thus select the best algorithm for a specific application taking into account the influence of each

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type of error in the performance of the overall system. For example, in object tracking detection failures are worse than splits. We should therefore select a method with less detection failures, even if it has more splits than another method.

David Moore "A real-world system for human motion detection and tracking" California Institute of Technology June 5, 2003
We make the fundamental assumption that the background will dominate most scenes and will be stationary. This is unacceptable for more crowded environments where surveillance is desired. In addition, the requirement for a stationary background rules out situations where the camera is in motion, such as on vehicles or robotic cameras. Futhermore, any foreground objects that overlap or are close to each other will be treated as a single object. This undesired grouping is the nature of the connected component algorithm currently used by the contour finder. In order to successfully handle these cases, a better algorithm for image segmentation is needed. One that relies on optical flow rather background subtraction would be more robust in these situations.

Nishu Singla "Motion Detection Based on Frame Difference Method" International Journal of Information & Computation Technology. ISSN 0974-2239 Volume 4, Number 15 (2014), pp. 1559-1565
In the present research, moving object is detected by the method of motion detection, which composes of frame difference method and morphological operations. The obvious keystone of the work is studying the principle of frame difference method and to resolve the various problems. The experiment shows that the method has good performance and efficiency. Future enhancement may include alerting the user by sending multimedia SMS, by email or by capturing video and streaming it online.

Jianpeng Zhou and Jack Hoang "Real Time Robust Human Detection and Tracking System" I3DVR International Inc 780 Birchmount Road, Unit 16, Scarborough, Ontario, Canada M1K 5H4
We presented a real time robust human detection and tracking system which can perform in varying environment. In this system, we used the background subtraction technique considering the camera moving, shadow and tree shaking to segment the foreground. This algorithm has been proved to be robust to varying environment. During the process of human recognition, we introduce the codebook to recognize the human. In order to reduce the false alarm, we proposed the algorithms of false detection. The experiments also proved that the tracking algorithm based on color histogram is robust to partial occlusion of people.

Gesture Controlled Robot using Image Processing Harish Kumar Kaura et.al ,[2013]: In this paper author discuss the gesture control robot using the image processing. Robotic industry has been developing many new trends to increase the efficiency, accessibility and accuracy of the systems. The robots replace the human beings. But still these robots want the attention of the human being. To control a robot a human being is required. Robots can be wired or wireless. The wired and wireless robots have the controller device. To control robotic system through physical devices the gesture control is the popular method. The main purpose of using gestures is that it provides a more natural way of controlling and provides a rich and intuitive form of interaction with the robotic system. Service robots directly interact with people, so finding a more natural and easy user interface is of fundamental importance. In this paper, the works have focused on issues related to manipulation and navigation in the environment. To solve this problem, author implemented a system through which the user can give commands to a wireless robot using gestures. With the help of this method, the user can control the robot by using gestures of his/her palm, thereby interacting with the robotic system.

Development of Human Tracking in Video Surveillance System for Activity Analysis Neelam V. Puri 1 and Prof. P. R. Devale,[2013]: in this paper, author discuss about the video surveillance system.
The continuous video capturing systems are the replacement for human watch. As human can be easily distracted and one mistake may lead to big disaster. So video surveillance systems make this kind of work very easier for user and it provides security and control where all time watch is required. In this paper author proposed a algorithm, which helps to detect moving object and classify it as human being and keep track of moving human. It can be done without any use of a sensing device. In this paper proposed system can classify in three steps detection, tracking and action analysis. Detection of human being is done by combination of morphological procedure and featur extraction method.

A survey of activity recognition and understanding the behaviour in video Surveillance, A.R.Revathi and Dhananjay Kumar, [2013]:
In this paper author discuss about the video surveillance. The visual surveillance strategies have long been in use to gather information and to monitor people, events and activities. Video surveillance used to detect moving object, classify the detected object track them through the sequence of images and analysis the behaviors. The goal of visual surveillance is to develop intelligent visual surveillance to replace the traditional passive video surveillance that is proving in effective as the numbers of cameras exceed the capability of human operators to monitor them.

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The automated surveillance systems can be implemented for both offline like storing the video sequence and to analyze Swati Gossain et al, International Journal of Computer Science and Mobile Computing, Vol.3 Issue.3, March- 2014, pg. 1018-1023 © 2014, IJCSMC All Rights Reserved the information in that sequence. In this paper, author presents a review of human activity recognition and behavior understanding in video sequence. The key objective of this paper is to provide a general review on the overall process of a surveillance system used in the current trend.

Visual Surveillance of Human Activity, Larry Davis et.al: in this paper author discuss about the visual surveillances. The ground based mobile surveillance system is used to monitors an extended area for human activity. During motion the surveillance system must detect other moving objects and identify them as humans, animals, vehicles. When one or more persons are detected, their movements need to be analyzed to recognize the activities. In this paper, author uses the detecting independent motion using directional motion estimation. This paper is describes an application of the theory developed in to the problem of detecting independent motion in long image sequences. The approach is based on two simple geometric observations about directional components. Due to the projection method the original problem of detecting independent motion is reduced to a combination of robust line.

The techniques stated in [3] ranges from very basic algorithm to state of the art published techniques categorized based on speed, memory requirements and accuracy. They used methods such as frame difference technique, Real time background subtraction and shadow detection technique, adaptive background mixture model for real time tracking technique. They used algorithms ranges from varying levels of accuracy and computational complexity. Some of them can also deal with real time challenges like snow, rain, moving branches, objects overlapping, light intensity or slow moving objects.

The problems of achieving high detection rate with low false alarm rate for human detection and tracking in video sequence is to maximize performance and improve response time. The stated causes are the effect of scene complexity, scale changes and scene background-human interactions. A two-step processing solution which is, human detection, and human tracking with two novel pattern classifiers presented in [4].

There are three basic phases in video examination: detection of interesting objects in video scene, tracking of such objects from frame to frame, and analysis of object tracks to recognize their activities. Detecting humans from video is a challenging problem owing to the motion of the subjects. In [6] they developed a detector for moving people in videos with possibly moving cameras and backgrounds, testing several different coding schemes of moving object and showing that orientated histograms of differential optical flow give the maximum performance. Motion-based descriptors are combined with Histogram of Oriented Gradient appearance descriptors. Achieved detector is tested on several databases includes a challenging test set taken from video and containing wide ranges of position, motion and background imbalance, including rotating cameras and backgrounds. [14]

In [7], they have analyzed moving object detection techniques, frame difference and the approximate median method. The frame differentiating has been adopted for the reference frame and the step length. They have suggested the moving object detection and object tracking by using the modified frame difference method. In the surveillance system for video captured by single camera is considered for the space under the observation. This method is experiment on almost ten videos and the results are quite satisfactory. Object detection & tracking [7] The background subtraction method which is used for framing the moving object from its background which requires a following steps:

a) Reference frame selection (RFS): In it the initial frame is selected as the reference frame.
b) Step Length: Appropriate step length has been selected on the basis of experimental results.
c) Removing Noise: Noise is affecting the accuracy and performance of system so it has to be removed.
d) Moving object detection (MOD): to detect the moving object from the frame difference with the help of background subtraction methods like Frame difference, approximate median and Modified frame difference methods.
e) Suspicious Activity: The bounding box is constructed in the isolated area of interest from video sequence and the object is tracked according to its movement.
f) Rise alert: After tracking object the recorded sound will Be generate for alert. Below image is the example of these above steps.

In [5] cascade-of-rejectors approach with the Histograms of Oriented Gradients features to achieve a fast and accurate human detection system. The features used are Histograms of Oriented Gradients of variable-size blocks that capture salient features of humans automatically. Using algorithm for feature selection, it identifies the appropriate set of blocks, from a large set of possible blocks. It uses the integral image representation and a rejection cascade which significantly speed up the computation. For an image, the system can process 5 to 30 frames per second depending on the density in which it scans the image, while maintaining an accuracy level similar to existing methods.

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III.METHODOLOGY

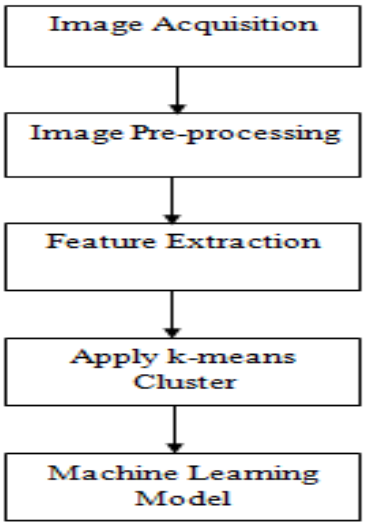

Fig 1. Intrusion Detection

Image acquisition: in image processing can be broadly defined as the action of retrieving an image from some source, usually a hardware-based source, so it can be passed through whatever processes need to occur afterward. Performing image acquisition in image processing is always the first step in the workflow sequence because, without an image, no processing is possible. If the hardware is not properly configured and aligned, then visual artifacts can be produced that can complicate the image processing. One of the forms of image acquisition in image processing is known as real-time image acquisition. This usually involves retrieving images from a source that is automatically capturing images. Real-time image acquisition creates a stream of files that can be automatically processed, queued for later work, or stitched into a single media format.

Image pre-processing: image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, a series of images, or a video, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image.[1]Most image-processing techniques involve isolating the individual color planes of an image and treating them as two-dimensional signal and applying standard signal-processing techniques to them.

Feature extraction: Feature extraction a type of dimensionality reduction that efficiently represents interesting parts of an image as a compact feature vector. This approach is useful when image sizes are large and a reduced feature representation is required to quickly complete tasks such as image matching and retrieval.

k-means: The basic step of k-means clustering is simple. In the beginning, we determine number of cluster K and we assume the centroid or center of these clusters. We can take any random objects as the initial centroids or the First K objects can also serve as the initial centroids. If the number of data is less than the number of cluster then we assign each data as the centroid of the cluster. Each centroid will have a cluster number. If the number of data is bigger than the number of cluster, for each data, we calculate the distance to all centroid and get the minimum distance. This data is said belong to the cluster that has minimum distance from this data.

This were the basic description of block diagram going to be used in this project firstly image will be extracted from any output device such as camera then secondly pre pressing will be don on that image so that we can extract the features from that image which we will later on cluster all the features and obtain the prediction of an object which will be defined later

IV. CONCLUSION

The literature survey that have done during the research work. the related work that have proposed by many researchers has been discuss the most of research papers related to moving object detection, human object detection and surveillance has been shown which is about different method and algorithm to diagnose the surveillance of video.

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