ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

Moving Object Detection in a Surveillance Video

Smt.M.Tirupathamma

Assistant Professor, Department of ECE, JNTUH College of Engineering Jagtial, Kondagattu, Jagtial, Telangana, India

ABSTRACT: Detecting human beings accurately in a visual surveillance system is crucial for diverse application areas including abnormal event detection, human gait characterization, congestion analysis, person identification, gender classification and fall detection for elderly people. The main objective of this research is to assist the human operators, by implementing intelligent video surveillance systems which help in detecting and tracking suspicious or unusual events in the video sequence. The video surveillance system requires fast and robust methods of detecting and tracking moving objects. In this project, we have investigated methods for detecting objects. Moving objects were detected using frame difference technique.

KEYWORDS: Video, Surveillance, Moving Object, Detection.

I.INTRODUCTION

In recent years, as a sharp increase in terrorist attacks on crowded public places, like airports, stations, subways, entrance to buildings, and other public venues, video surveillance systems have been more demanded. Many methods have been recently proposed to automatically detect objects (parked vehicles and left-luggage) in video surveillance for different applications such as traffic monitoring, public safety, retail, etc. At train/subway stations, airports, big cities, and other public spaces with high traffic flows, it becomes very challenging for security officers as well as video surveillance solutions to quickly detect objects that have been left behind. Detecting static objects in video sequences has several applications in surveillance systems such as the detection of illegally parked vehicles in traffic monitoring or the detection of objects in public safety systems and has attracted the attention of a vast research in the field of video surveillance. In addition to security applications, video surveillance is also used to measure traffic flow, detect accidents in highways and military applications. It alerts the security officers of a burglary in progress or a suspicious individual loitering in a restricted area helping to avoid threat. These items can be grouped into two main classes, dynamic suspicious behaviours (e.g., a person attempting to attack others) and static dangerous objects (e.g., luggage or bombs in public places). The scope of this project falls into the latter category. To improve the quality and the effectiveness of system various algorithms and techniques are suggested and implemented by researchers in various ways. But due to their complexity and probability issues, the implementation was not so fruitful. For security concerns it has become vital to have in place efficient threat detection systems that can detect and recognize potentially dangerous situations, and alert the authorities to take appropriate action by raising alarm on right time.
Section 2, Presents introduction to the surveillance system. Section 3, talks about proposed algorithm of object detection in a video. Section 4, Presents the experimental results. Section 5 concludes the paper.

II.VIDEO SURVEILLANCE SYSTEM

Video surveillance is a process of analysing video sequences. It is an active area in computer vision. It gives huge amount of data storage and display. There are three types of Video surveillance activities. Video surveillance activities can be manual, semi-autonomous or fully-autonomous. Manual video surveillance involves analysis of the video content by a human. Such systems are currently widely used. Semi-autonomous video surveillance involves some form of video processing but with significant human intervention. Typical examples are systems that perform simple motion detection only in the presence of significant motion the video is recorded and sent for analysis by a human expert. By a

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

fully-autonomous system, only input is the video sequence taken at the scene where surveillance is performed. In such a system there is no human intervention and the system does both the low-level tasks, like motion detection and tracking, and also high-level decision making tasks like abnormal event detection and gesture recognition. Video surveillance system that supports automated objects classification and object tracking. Monitoring of video for long duration by human operator is impractical and infeasible.

When using a video solution, it is important to consider whether you need video security or video surveillance. While both play a role when protecting outdoor areas, understanding how they differ is important to meet your security objectives. Basically video security is about actively detecting intruders as soon as they enter a secured area, while video surveillance generally means passively recording events for future use.

Motion detection and object tracking is a very rich research area in computer vision. The main issues that make this research area difficult are:

1. Computational Expense. If an algorithm for detecting motions and tracking objects is to be applied to real-time applications, then it needs to be computationally inexpensive so that a modern PC has enough power to run it. Yet many algorithms in this research area are very computationally expensive since they require computing values for each pixel in each image frame.

2. Moving Background Rejection The algorithm also needs to be able to reject moving background such as a swaying tree branch and not mistakenly recognizes it as a moving object of interest. Misclassification can easily occur if the area of moving background is large compared to the objects of interest, or if the speed of moving objects is as slow as the background.

3. Tracking Through Occlusion. Many algorithms have devised ways of becoming robust against small occlusions of interested objects, but most algorithms still fail to track the object if it is occluded for a long time.

4. Modelling Targets of Interest. Many algorithms use a reasonably detailed model of the targets in objects detection and consequently require a large number of pixels on target in order to detect and track them properly. This is a problem for real-world applications where it is frequently impossible to obtain a large number of pixels on target.

5. Adapting to Illumination Variation. Real-world applications will inevitably have variation in scene illumination that a motion detection algorithm needs to cope with. Yet if an algorithm is purely an intensity-based method then it will fail under illumination variation.

III. PROPOSED ALGORITHM FOR OBJECT DETECTION IN A VIDEO

Even though there exist numerous of object detection algorithms in the literature, most of them follow a simple flow diagram , passing through four major steps, which are

(1) Pre-processing
(2) Background modelling (also known as background maintenance),
(3) Foreground detection (also known as background subtraction)
(4) Data validation

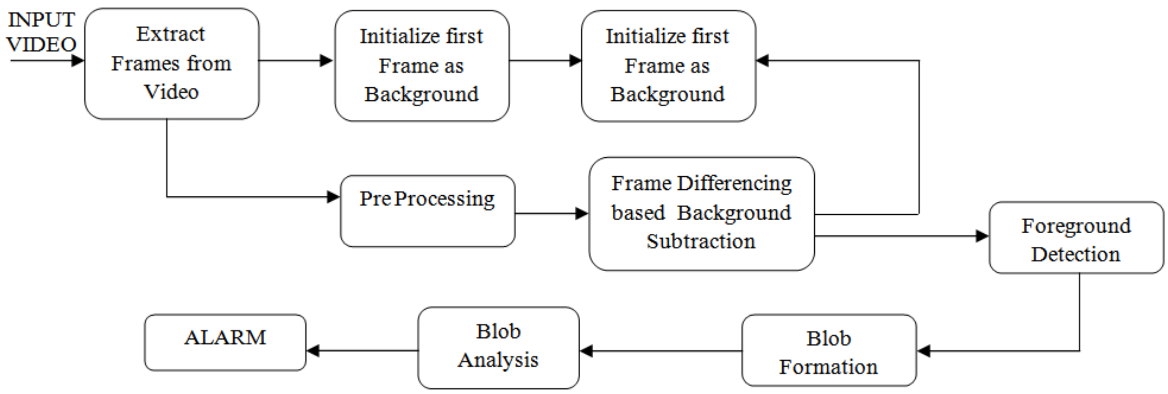

Fig.1 *Block diagram of object detection*

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

Object detection is the method of detecting moving objects from a sequence of frames. We have deployed method frame differencing for object detection followed by binary thresholding function. Thresholding function output will be again a binary image which is further processed by iterative mathematical morphological dilation and erosion operation.

The problem of real time object detection and tracking is divided into several steps. Here we will provide the algorithm for these steps.

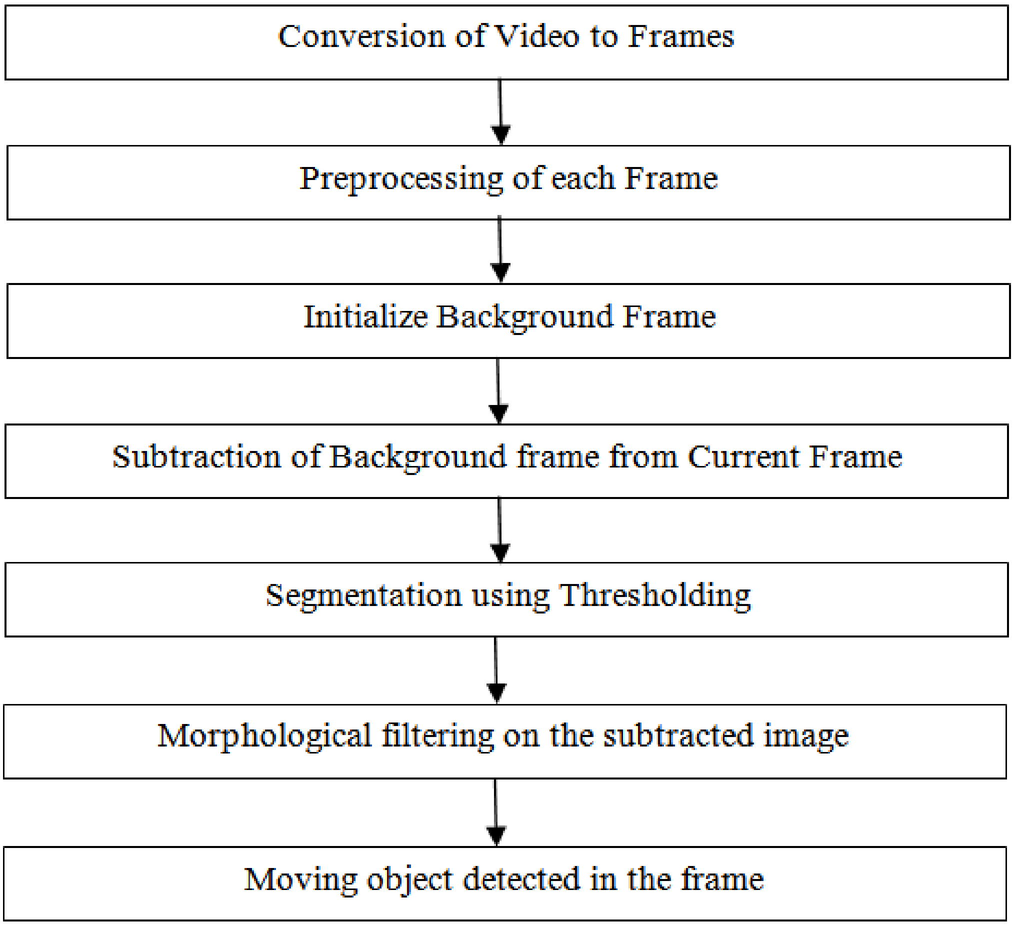

Fig.2 Algorithm for moving object detection in a video

Step 1. Input Video

For this system we are considering the recorded video as an input to the proposed system. The video stream is initially segmented into individual RGB frames. The system is compatible with any video format and resolution. Generally the frame rate of the standard videos is 30fps or 19fps or 22fps. The proposed work will be simulated using MATLAB and Tool Boxes and will be validated using standard videos available on internet. Videos are actually sequences of images, each of which called a frame, displayed in fast enough frequency so that human eyes can percept the continuity of its content. It is obvious that all image processing techniques can be applied to individual frames.

Step 2. Pre Processing

After the video to frame conversion pre-processing is done on each frame to reduce the noise which is present in frame. The pre-processing is done using the mean filter, convolution filter, and median filter. The mask of the filter will

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

multiply with the frame and noise will get removed so that the result is accurate. Due to this only the background or foreground objects are preset and unwanted factors in the frame presents at the time of the capturing the images like dust.

Step 3. Object Detection

Object Detection is the initial step for tracking in surveillance system. Background subtraction based method has been used for detection. After successfully developing the background model, background subtraction is used to detect the moving object using a local Thresholding based method. Here, constant C is used which helps to calculate the local lower threshold and the local upper threshold. These local threshold values help in successful detection of objects, removal of misclassified objects, and suppressing shadows if any.

The steps of the background subtraction process are given as below:

1) Input: Background model and a frame f.
2) At each pixel location threshold T(i, j) is calculated as T(i, j) .
3) Considering T(i, j) local thresholds are calculated ,
   Local lower threshold: (i, j) = M(i, j) − T(i, j)
   Local upper threshold: (i, j) = N(i, j) + T(i, j) .
4) If f(i, j) value lies in between and , then it is a background pixel else a foreground pixel.
5) Output: Detected objects in frame.

This process is repeated for each location in the frame. Frame differencing, also popularly known as temporal difference is the method of subtracting the video frame at time t-1 with the background model for the frame at time t. Inter frame difference method computes the absolute difference between the previous frame and current frame.

Frame difference method is simple and easy to implement. Fundamental logic for detecting moving objects from the difference between the current frame and a reference frame, called “background image” and this method is known as Frame Difference Method. For implementation we consider first frame to be the background frame and compare the next frames against the background frames and keeping the threshold value =40.

The algorithm is relatively simple.

1. Convert the incoming frame to gray scale.
2. Subtract the current frame from the background model(in this case it is just the previous frame) .
3. For each pixel, if the difference between the current frame and background is greater than a threshold the pixel is considered part of the foreground.

In frame differencing method, two frames are taken into consideration and then subtracted in terms of intensities at each pixel resulting in an image giving brief idea about the moving object region. In this method pixel wise differences current frame and previous frame of the video pixel wise differences are used to get extract the moving object. It is type of background subtraction method in which the last frame becomes the background for the current frame and difference is calculated.

Thresholding is used for image segmentation. Binary thresholding operation is performed to separate the pixels corresponding to the moving object to that of the pixels of the background. This operation is used to remove any inaccuracies present due to the camera flickering. This operation result is a binary image where the pixels corresponding to the moving object is set to 1. In thresholding we choose a parameter called the threshold of brightness (T) and applied to the frame difference image as follows

IF f[m,n]>=T
fb[m,n]=object=1
ELSE
fb[m,n]=background=0

It is necessary to determine a suitable threshold (T) value where the foreground and background pixel will be separated completely. the output will be evaluated based on the accuracy, true positive rate (TPR) and false positive rate (FPR). Fig shows the output of block namely video viewer. As the o/p is, only the subtraction of two consecutive frames.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

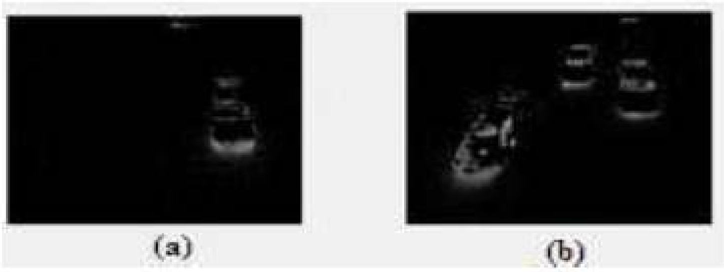

Fig.3 Moving Object Detection with Output of FD with binary thresholding
(a) one car (b) more than 1 car.

A range of threshold value from 8 to 14 is acceptable. This range of threshold value gives lower FPR, medium TPR but high accuracy within 95%.For adaptive threshold, the threshold value depends on the neighbourhood pixel intensity and size of the neighbourhood pixel needs to be considered. As the o/p is, the product of a constant and the subtraction of two consecutive frames.

Fig.4 Moving Object Detection with Output of FD with adaptive thresholding
(a) one car (b) more than 1 car.

Through all the experiments, the accuracy is increasing stage by stage when different value of threshold been selected as shown. FD is the accuracy line for traditional background subtraction frame differencing alone. FD+AT is the accuracy line after adaptive threshold technique is performed.

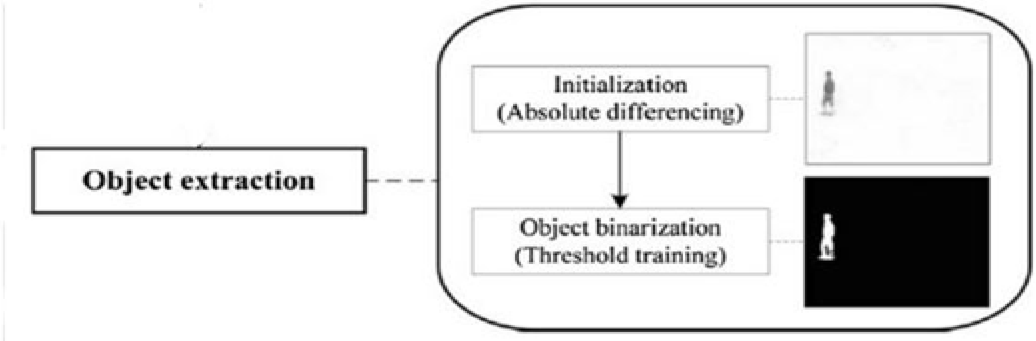

Fig.5 Moving Object Detection

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

The result of foreground detection is represented as binary image with the white portion representing foreground (blobs). In this module, we divide the binary image from the previous unit into a number of legitimate blobs. Each blob represents an object. In this step, morphological operations are performed on the binary images of the candidate foreground pixels. Morphological operations are affecting the form, structure or shape of an object, applied on binary images.
Morphological image processing is a collection of nonlinear operations related to the shape or morphology of features in an image, these operations rely only on the relative ordering of pixel values, not on their numerical values, and therefore are especially suited to the processing of binary images. Morphological techniques probe an image with a small shape or template called a structuring element.
The structuring element is a small binary image, i.e. a small matrix of pixels, each with a value of zero or one. The matrix dimensions specify the size of the structuring element. The pattern of ones and zeros specifies the shape of the structuring element.
An origin of the structuring element is usually one of its pixels, although generally the origin can be outside the structuring element.
When a structuring element is placed in a binary image, each of its pixels is associated with the corresponding pixel of the neighbourhood under the structuring element. The structuring element is said to fit the image if, for each of its pixels set to 1, the corresponding image pixel is also 1. Similarly, a structuring element is said to hit, or intersect, an image if, at least for one of its pixels set to 1 the corresponding image pixel is also 1.

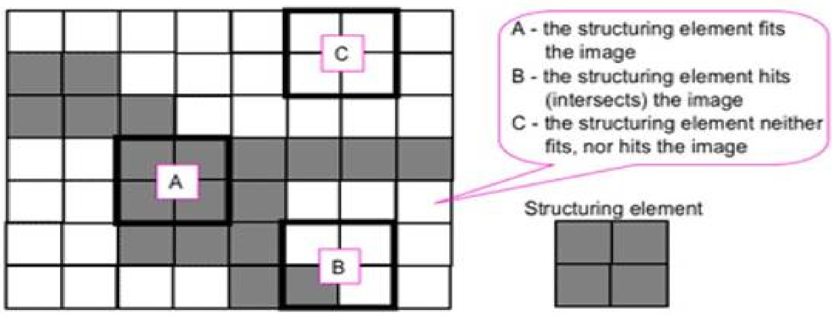

Fig.6 Structuring element

The erosion of a binary image f by a structuring element s (denoted f s) produces a new binary image g = f s with ones in all locations (x,y) of a structuring element's origin at which that structuring element s fits the input image f, i.e. g(x,y) = 1 is s fits f and 0 otherwise, repeating for all pixel coordinates (x,y). Erosion with small (e.g. 2×2 5×5) square structuring elements shrinks an image by stripping away a layer of pixels from both the inner and outer boundaries of regions associated with the foreground (usually the white pixels).

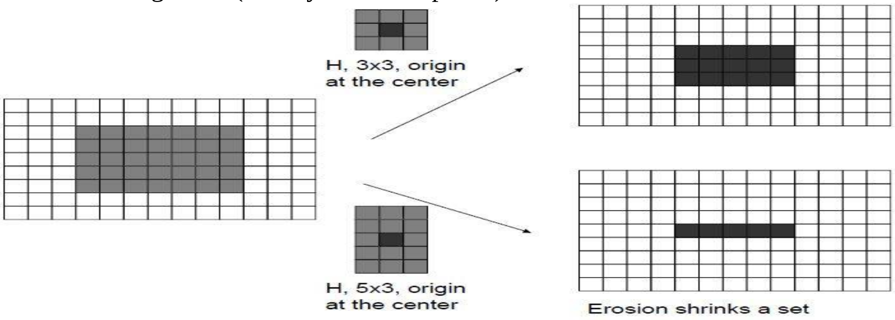

Fig.7 Erosion

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

Thus areas of foreground pixels shrink in size, and "holes" within those areas become larger in size. The holes and gaps between different regions become larger, and small details are eliminated. The basic function of erosion operator on a binary image is to erode away the boundaries of pixels

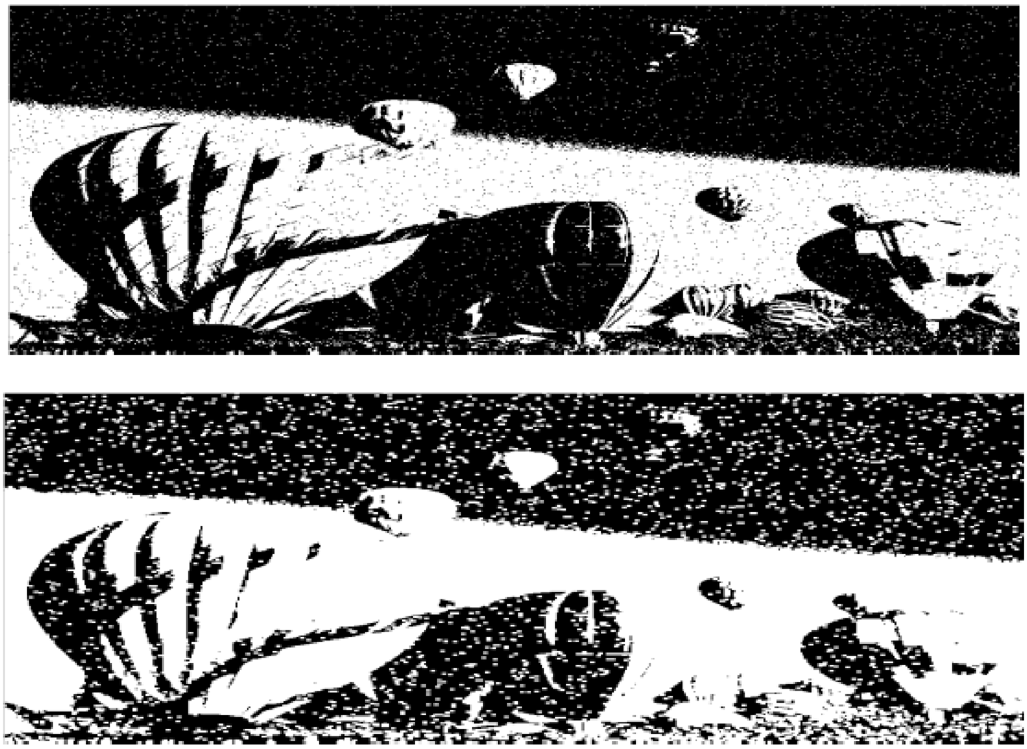

Fig.8 Example of Erosion

The dilation process is performed by laying the structuring element B on the image A and sliding it across the image in a manner similar to convolution.

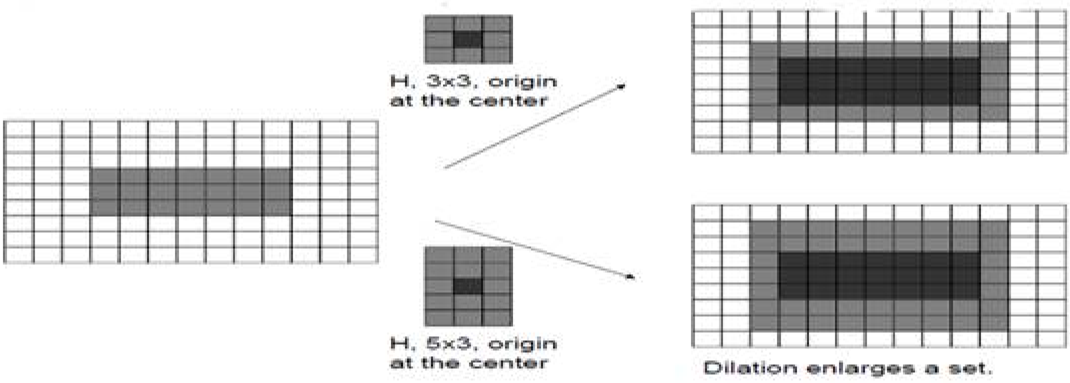

Fig.9 Dilation

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

The dilation of an image f by a structuring element s (denoted f s) produces a new binary image g = f s with ones in all locations (x,y) of a structuring element's origin at which that structuring element s hits the the input image f, i.e. g(x,y) = 1 if s hits f and 0 otherwise, repeating for all pixel coordinates (x,y). Dilation has the opposite effect to erosion it adds a layer of pixels to both the inner and outer boundaries of regions. The holes enclosed by a single region and gaps between different regions become smaller, and small intrusions into boundaries of a region are filled in Dilation function on binary image is to enlarge the areas of pixels associated with the foreground (i.e. white pixels) at their borders resulting in growth of size of the areas of the foreground and the background pixels within them shrink. Above two operations are performed to remove small particles from the binary image. The operation again produces a binary image. Thus this function is used to ensure insignificant small movements in the background are ignored properly in order to ensure better detection of object.

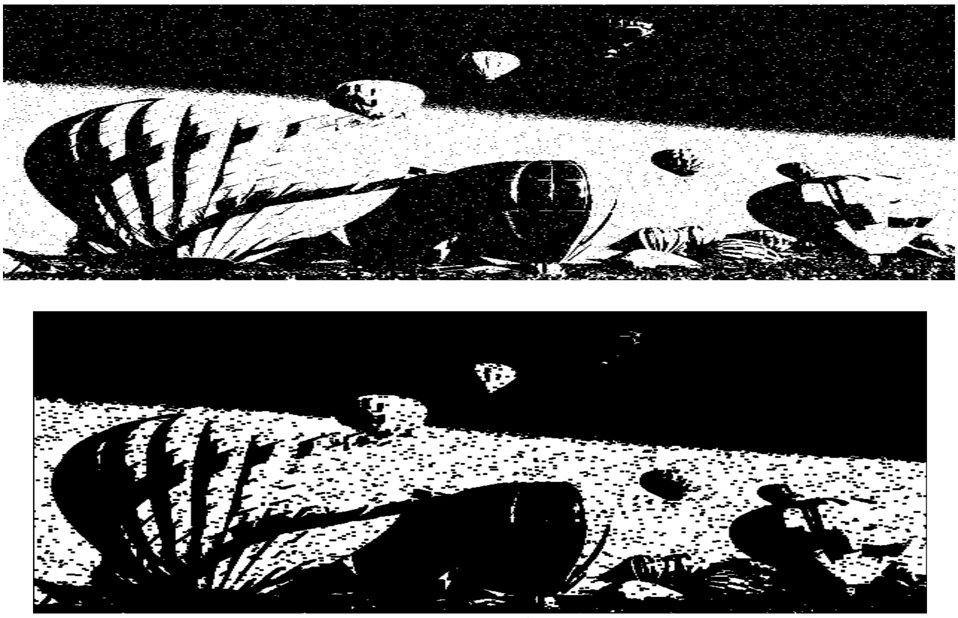

Fig.10 Example of Dilation

The opening of an image f by a structuring element s (denoted by f s) is erosion followed by dilation. Opening is so called because it can open up a gap between objects connected by a thin bridge of pixels. Any regions that have survived the erosion are restored to their original size by the dilation.

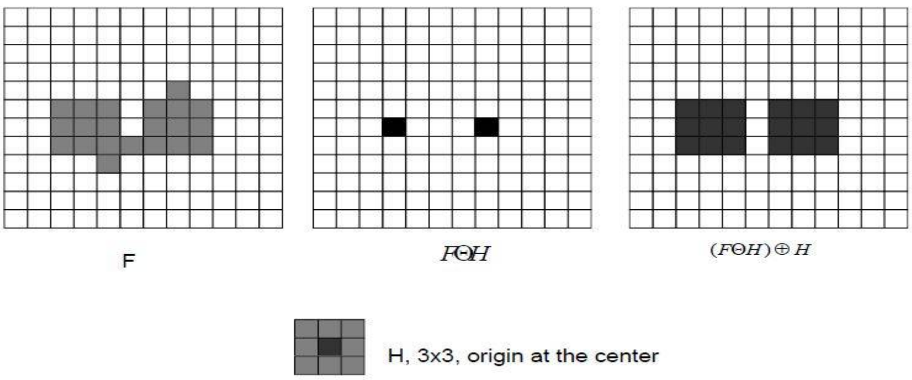

Fig.11 opening

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

Candidate foreground object pixels, which are in the binary images, undergo the blob analysis. Blob analysis takes as an input a binary image, creates a region counter. The binary image is scanned from left to right and from top to bottom. For every pixel the north and west pixel (4-connectivity) or the northeast, north, northwest, and west pixel (8-connectivity) is checked for a intensity value of 1 in the binary image. If none of the neighbours fit the criterion then assigning to region value of the region counter and increment region counter. If only one neighbour fits the criterion, assigning pixel to that region. If multiple neighbours match and are all members of the same region, assign pixel to their region. If multiple neighbours match and are members of different regions, then assigning pixel to one of the regions and indicating that all of these regions are the equivalent. Scan image again, assigning all equivalent regions the same region value. Thus, corresponding blob images are formed.

VI. EXPERIMENTAL RESULTS

In this experiment we use the background subtraction algorithm for the detection of the moving object in the surveillance area. The demonstration system has the set up for the implementation of proposed system in the MATLAB software.

Fig.12 Input Frames of Video Sequence

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

Fig.13 Object Detection

The simulation of object detection is done by using MATLAB by considering background Image in a video. The simulation results for all the techniques are explained. Initially the moving objects in video images are tracked based on image segmentation, background subtraction and object detection techniques. The simulation results of the algorithms are shown above.
Object detection: The input video sequence is shown as frames in Figure 12. The objects that are detected are shown in Figure 13. The object found is marked in red colour.

V. CONCLUSION

Along with the increasing popularity of video on internet and versatility of video applications, availability, efficiency of usage and application automation of videos will heavily rely on object detection and tracking in videos. In these project we have proposed a system for automatic object detection without any human interference. Such system proves to be efficient in public place for providing security. It is aimed to be highly beneficial for any person or organization. Experimental results showed that the proposed method is more robust in nature as it can avoid the noise in motion detection. Therefore this method is useful to reduce the number of false positive alarms.

.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 4, April 2017

REFERENCES

[1] A Review on Moving Object Detection and Tracking, International Journal of Computer Application (2250-1797) Volume 5– No. 3, April 2015 .

[2] Moving Object Detection and Tracking for Video Survelliance International Journal of Engineering Research and General Science Volume 2, Issue 4, June-July, 2014.

[3] A Review on Object Detection and Tracking methods international journal for research in emerging science and technology, volume-2, issue-1, january-2015.

[4] An Efficient Approach for Real Time Tracking of Intruder and Abandoned Object in Video Surveillance System International Journal of Computer Applications (0975 – 8887) Volume 54– No.17, September 2012.

[5] Study and Analysis of Methods of Object Detection in Video Sanjivani Shantaiya, Kesari Verma, Kamal Mehta International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-6, January 2013.

[6] YingLi Tian, Rogerio Schmidt Feris, Haowei Liu, Arun Hampapur, and Ming-Ting Sun, “Robust Detection of Abandoned and Removed Objects in Complex Surveillance Videos”, IEEE transactions on systems, man, and cybernetics—part c: applications and reviews, vol. 41, no. 5, september 2011, pp. 565-576.