ABANDONED OBJECT DETECTION FOR INTELLIGENT VIDEO SURVEILLANCE

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ABSTRACT

Today CCTV only acts as evidence and is in effect as the illegal work is already done. In such cases (Abandoned Object Detection) AOD has been used to monitor places in a real time environment. Detection of abandoned objects from real time video surveillance has many applications from avoiding the bomb blasts, vehicle tracking to hospital monitoring. It could even detect illegally parked vehicles in sensitive areas.

Main aim of this paperwork is to detect foreground objects in real time video surveillance which are static and were previously moving. Once static objects are verified or detected we will classify them into human and nonhuman objects. We will consider nonhuman objects as abandoned objects. After detection if the object remains still for a particular time alert message will be sent to security or the nearest police station. Such a system proves to be efficient in public places for providing security.

Lot of work is carried out in a single stationary camera. We intend to perform abundant object detection using multiple cameras captured from different cameras.

General Terms
Artificial Intelligence, Machine Learning, Visual Computing, Video Processing, Computer Vision.

Keywords
Abandoned object detection, intelligent video processing, object detection, object tracking.

1. INTRODUCTION

Object detection is basically locating the objects but moving object detection technique is a challenging task and it is used in computer vision and image processing.it has been used for several applications like video surveillance, activity recognition, traffic information, airport safety, monitoring the places like airport, metro stations, public places etc.the applications of moving objects detection and tracking is depend on the accuracy.the speed with which we detect and track objects objectively,we can control the dangerous situations.

Intelligent Video Surveillance is beneficial in various places like Airports, metro stations etc.It is Second Eye of Human Being Useful for People to be safe.To improve security of our places.It captures Large Wide Areas and Recordings of every Object.

To intelligently detect Abandoned or Moving objects in real time.Video surveillance camera have been emerged as a rapid growing technology from the point of security purpose in airports, railway stations and many public places.But they lack behind as crime is already taken place and you are left only with a video.They don’t alert people or police.Detection of Abandoned baggage will be done using artificial

video surveillance.Object detection helps to identify and locate objects in a videoOnce they are found stationary they will be identified whether they were earlier moving or not.

For many years, terrorist attacks have been taking place around the world. Due to such activities, people face many casualties in public places. CCTVs only act as evidence it is ineffective while stopping such kind of suspicious behavior. It is used after the illegal work has been done. Intelligent Video Surveillance systems have become popular due to the growing demand for such kinds of systems.

In this paper, we deal with the problems of real-time abandoned object detection. When there is any bag or suitcase left unattended in a public place such as airport terminal, train station, bus-stop, malls or crowded places. It becomes a security threat towards public safety, because it may contain explosive items or biological welfare in it.

For this reason, we have proposed a system that is able to automatically detect any abandoned objects in real-time by using video surveillance cameras.

2. BACKGROUND STUDY

Generally, many people have done research on moving object detection and tracking. There are some systems already implemented by using various object detection techniques and tracking algorithms, in this paper we are studying those algorithms and techniques.

OPENCV

In computer vision there are some famous libraries such are OpenCV, TensorFlow, PyTorch, Dlib, etc. OpenCV is a python open-source library, which is used to solve computer vision problems. OpenCV stands for Open Source Computer Vision. OpenCV is a library used to develop real-time computer vision applications. It mainly focuses on image processing, video capture and analysis of features like face detection and object detection. OpenCV has a bunch of pre-defined classifiers that can be used to identify objects such as trees, number plates, faces, eyes, etc.

OpenCV is more advanced image manipulating and processing software than others like PIL(Python Image Library). OpenCV module cv2 is three times faster than PIL. There are different types of methods is used to detect, locate and recognize the objects in images and videos such as R-CNNs(Region Based Convolutional Neural Networks), SSD(Single Shot Detectors), HOG(Histogram of Oriented Gradients), YOLO(You Only Look Once), etc. OpenCV is a very vast library which is used to perform operations in image and video functions. By using OpenCV we can capture video from the camera, it can be done easily. There are some methods which are used to capture video in python using OpenCV[1].

Surveillance is an important technology in life. When there are any stationary objects such as luggage, electronic devices like Mobile, Laptop, etc[2].An impuissance of these methods is the high mendacious alarm rate, which is typically caused by imperfect background subtraction resulting from a ghost effect, also stationary people,and crowded scenes.In additament,these methods involve utilizing only the foreground information as compare to per single image to locate regions of interest of forsook-object

candidates. Process of tracking begins and helps the security for getting an abandoned object within 5 sec.

As all we know that the Importance of Surveillance has been increased in all countries[3] which is useful for tracing,Detecting every moving object. Also there are three categories that are Captured through Surveillance are Human, Vehicle and Background Clutter We have studied all about Visual Surveillance from how much distance it's frequency is used for capturing every Image. It is constantly used for detecting stationary objects as well as movements of Human beings. But in rare cases Background Clutters are also very useful for black and white images for capturing whole footage of any places.

Now we see the vision based detection and tracking of moving objects[4]. Vision based detection is divided into four phases i.e.object segmentation, object recognition, object representation, object tracking and for this technique they used the frameworks to detect important objects and ignore the other objects based on the size and track the object movement in the video.

The Automatic K-means algorithm is a new fast and accurate method used to detect and track moving objects[5]. The k-means algorithm is creating the frames, extracting the feature points in the frames, detect those feature points and calculate the motion direction, and motion magnitude of each feature point then remove all the feature points and estimate the no.of moving objects.

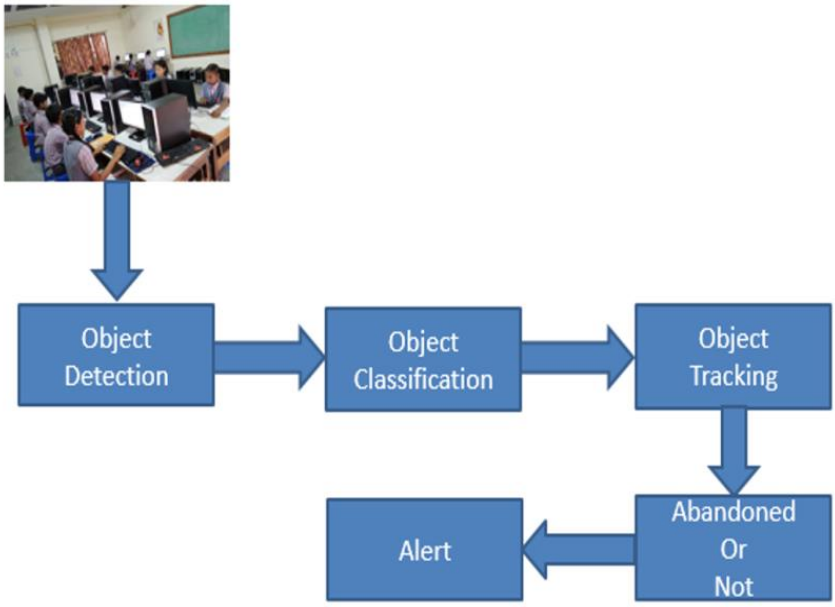

Fig.1.Basic Diagram for object detection and tracking

Background subtraction is the main task to perform while we are detecting the moving objects[6]. There are different methods which are used for the background subtraction. These techniques are implemented by using varying complexity.

1] Frame difference method - Low complexity.

2] Approximate median method - Medium complexity.

3]Gaussian method - High complexity.

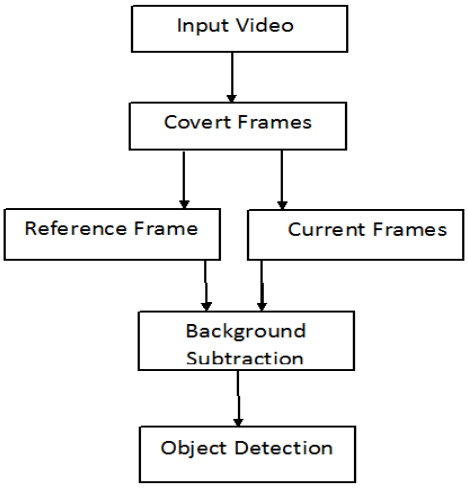

Fig.2.Background subtraction flowchart.

In the below figure, in image A. Background Subtraction method is used. In this the foreground and background images are separated and at the end only the moving objects are highlighted. In image B Motion Estimation method is used. This method highlights only the objects which are still in the frame. In this case you have a person with some luggage. In the Climate static object detection objects which remain static for a long time are identified.

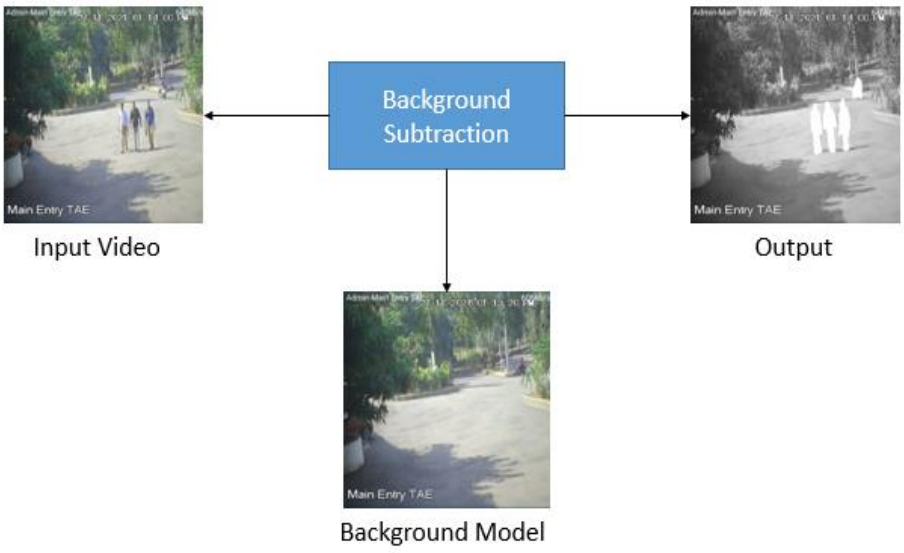

Fig.3.Background Subtraction Image

3. DIFFERENT METHODS USED IN OBJECT DETECTION

3.1 YOLO (You Only Look Once).

YOLO is a popular algorithm for object detection. It is used by researchers around the country for object detection. The base YOLO model processes the images in real-time at the rate of 45 frames per second[1], Fast YOLO processes can be up to 155 frames per second while achieving double the mAP in the real-time detectors.

There are algorithms which outperforms the other detection methods, including DPM and R-CNN methods, The natural images to other domains like artwork. In the figure shows that (bx, by) object coordinates and (bh, bw) height and width of the picture this values can be calculated using formula bounding box y=(pc,bx,by,bh,bw,c) as show in the below fig.

Fig.4.YOLO

3.2 SSD(Single Shot Detector).

Single Shot Detector (SSD) is a method used for detecting objects in the images using a single (DN) network. The SSD approach discretises the output space of bounding boxes and the default boxes with different ratios. After this, the method features a map location. The SSD network combines the multiple feature maps with different resolutions to handle objects in various sizes.

The SSD has two components and they are the Backbone Model and the SSD Head. Backbone Model is a pre-trained image classifier to feature extractor. The connected layer is removed from the model. SSD is a set of convolution layers which is added to this backbone and the outputs are interpreted as the bounding boxes.

4. FRAMEWORK DESIGN

Framework Design: Abandoned object detection through video surveillance.

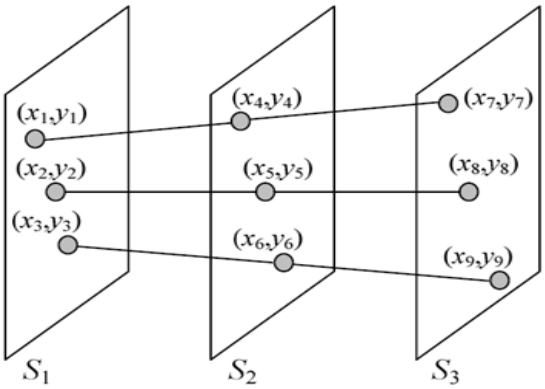

Fig.5. Frames

Object trajectories –

Identify input as –

A series of M snapshots Si, each containing exactly N measurements from timestamp ti.

Let H = {S1, S2, . . . , SM snapshots.}

N = {N1, N2,……, Nn Each snapshot contains measurements from exactly N objects.}

t = { A snapshot Si of H is a set of locations (measurements) at time ti the time difference is ti+1.}

Identify the output as –

A set of N trajectories.

where each trajectory has the form {(xi1 , yi1 , t1), (xi2 , yi2 , t2), . . . , (xiM , yiM , tM)}.

The process will be –

When we consider fig 1, the topmost trajectory is represented as {(x1, y1, t1), (x4, y4, t2), (x7, y7, t3)}.

S1 = {x1y1t1, x2y2t2, x3y3t3,…….}……1.

S2 = {x4y4t4, x5y5t5, x6y6t6,…….}……...2.

S3 = {x7y7t7,x8y8t8, x9y9t9,…….}……....3.

5. IMPLEMENTATION

The basic representation overview on the system block diagram. Our system block diagram as shown in fig.6 in which the system captures the whole environment and we are taking this video as an input for further process. The next step is to convert the given video into the frames then the system will read each and every frame. Now after reading each and every frame system will observe the frames and using the background modeling system will subtract every frame with its previous frames. In this

process the system will subtract the background and system will be left only with the objects that are present in the frame.

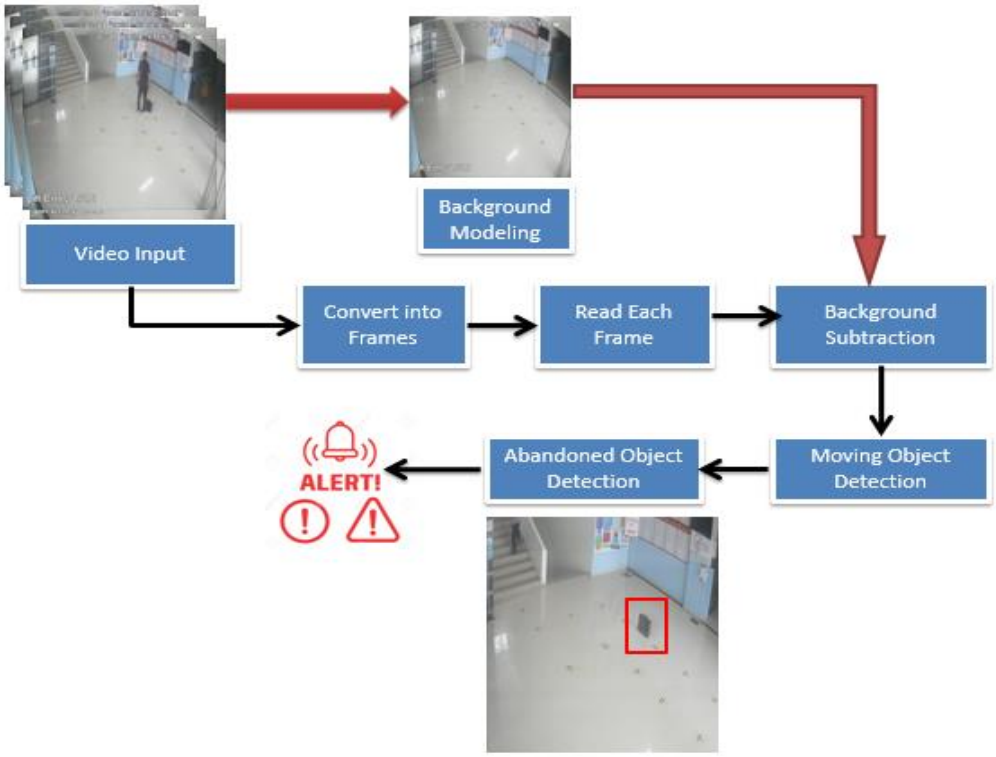

Fig.6.Block Diagram for Abandoned object detection

Our next step is to detect the moving objects and now the system will detect the abandoned objects, in short the objects which were moving previously and now they are static. If the object is abandoned then the system will pass the alert message to the nearest security.

6. APPLICATIONS OF OBJECT DETECTION

6.1 Video Surveillance for object detection

Detection is basically locating objects in video in sequence.Intelligent Video Surveillance[7] is beneficial in various places like Airports, metro stations etc. It is used to secure our places and monitor them.It detects humans and non human like bags, luggages, and abandoned objects.

Fig.6.Detection object through video surveillance

6.2 Activity Recognition

Activity recognition detects the activities that are performed in the real time environment[8]. It has a wide range of applications such as security, healthcare etc.The researchers can also use the sensors for catching the activity that are performed in the environment.It is also a good application of object detection.

6.3 Luggage Detection

It happens many times when people leave their bags or luggages in public places and metro stations or airports[9]. In this situation object detection is the best application to find or detect the luggages. In airport security scenarios, luggage detention is carried out in. They also introduced a method based on distance-based matching mechanism to connect passengers with their luggage. Also we can use this technique for abandoned luggage detection in a video[10].

Fig.7.Luggage Detection

6.4 Traffic Counting

The real-time automatic vehicle detection and vehicle counting on expressways and highways is carried out by[11]. The extracted background from the video is used in subsequent analysis to detect and classify moving vehicles as light vehicles, heavy vehicles and motorcycles.

Fig.8.Traffic Counting

6.5 Monitoring Protection for Border Regions

The terrorist attacks create problems for security.To avoid these attacks it is important to detect those objects which are the reason for these attacks. .For solving these problems researchers can use the wireless sensors network for ontinuous monitoring of sound, temperature, wind, humans, bombs,etc

7. CONCLUSION

In this project work we have studied Abandoned object detection and studied Various methods for detecting moving objects for monitoring our places. And detect the abandoned objects in real time surveillance. And in this paper we have studied opencv python library and different algorithms which are used for object detection. Also we have studied different applications of moving object detection and tracking.We also studied the different algorithms and methods of detecting and tracking the moving objects.

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