

Visual Surveillance System to Detect Abandoned Object for Public Security

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ABSTRACT

Global security is one of the major concern issue the world is facing today. Terrorist leaves behind some suspicious bags, boxes, or other things in the public areas and are not paid attention because of this many lives are lost. So abandoned object detection becomes the important aspect in order to provide public security. This paper puts forward an effective method in order to detect abandoned objects in surrounding areas such as railway stations, shopping malls, airports etc. The aim of this project is to capture and process the video taken through surveillance camera, detect the abandoned object and finally provide an alarm when abandoned object is detected. Major steps involved are object detection, object extraction and object recognition.

Keywords—abandoned object detection, surveillance, object extraction, object recognition.

INTRODUCTION

The word surveillance can be splitted to get the meaning ‘sur’ means from above and ‘veiller’ means to watch i.e to watch from above .Surveillance is definetly the monitoring of behaviour, activities from the point of managing directing or protecting people.The purpose of visual surveillance is to provide safety and security in public areas.Abandoned object is one which is left in the particular area which is under surveillance and has been not attended by anyone over a longer period of time . The anandoned object should remain static i.e non moving in frames for sometime period say ‘t’ time. So the abandoned object detection is one of the greatest research topic to provide public security.In the visual surveillance research ,detecting abandoned luggage is referred to as the problem of abandoned-object or left-luggage detection[1].



Fig 1:Suspicious luggage

Mainly the places like airports, Railway stations ,shopping malls are at higher security threats because they are always surrounded by many people. Abandoned object detection is a bigger challenge and lot of research is being carried out to have automatic video surveillance system. As we have seen over the last few years terrorist have taken hundreds of innocent lives for their selfishness and immoral interest.Most of the terrorists attacks the streets that are full of people around ,buildings and many other places where people live ,do their work or business.Nowdays people are more scared to use public transportation due to incidents occuring all over the world.They are mostly scared of the abandoned luggage and suspicious behaviour of people around

them .So it is necessary to have the safe public transportation by providing better security surveillance systems.Surveillance system depends on human operator who inspects the suspicious activities in videos from surveillance cameras.To provide safety to the people in the areas such as railway stations, shopping malls and airports the security surveillance cameras at fitted at different locations covering different areas.The guard has to monitor many cameras at a time .Sometimes it becomes the tedious work to monitor every camera carefully.Even though they monitor the camera videos it is not sure that the crime will be detected.There is a need of automated surveillance system.In which a software will automatically detect crime and the guard will be warned so he can detect suspicious thing and alert people to keep them safe.The saying ‘Prevention is better then cure’ is true .So it is necessary to provide safety to public in a better way. A safer environment can be created and crimes can be stopped using automated video surveillance system.The abandoned object detection involves three main stages:

- I. Object detection
- II. Object Extraction
- III. Object recognition

The main objective is to build a user friendly system which can detect the abandoned object in the public areas and surroundings.

RELATED WORKS

The way of finding semantic objects like human, animals, carriage in video scenes is called object detection [4].The object detection may be static object detection or moving object detection. Object detection uses the information in the current frame. Kevin Lin et al. [1] Abandoned Object Detection via Temporal Consistency Modeling and Back-Tracing Verification for Visual Surveillance system, this method presents an effective approach for detecting abandoned luggage in surveillance videos. They combine short- and long-term background models to extract foreground objects. They introduced a framework for identifying static foreground regions based on the temporal transition of code patterns, and to determine whether the candidate regions contains abandoned objects. Y Tian et al. [6] robust detection of abandoned and removed objects in complex surveillance videos introduces a method based on background subtraction and foreground analysis in which three Gaussian mixture is used. Occlusion, lighting changes and some other factors causes difficulty in detecting abandoned objects in tracking based methods. This algorithm focuses on removing shadows and Adaptation to sudden light changes. Wahyono et al. [3]detecting Abandoned objects in crowded scenes of surveillance videos using adaptive dual background model explained that the most crucial task is to detect objects in the crowded scenes due to occlusion and other factors. They introduced a method which uses dual background model subtraction and also used matching based tracking scheme for occlusion handling. LV et al. [5] used a blob tracker to track objects based on size, aspect ratio and their location. The abandoned object is detected when the moving object stops moving for longer duration of time. Huihong et al. [2] introduced a methodology for detecting abandoned objects with moving cameras by matching a reference and current video sequence. Global positioning system is used to align two videos.

PROPOSED METHOD

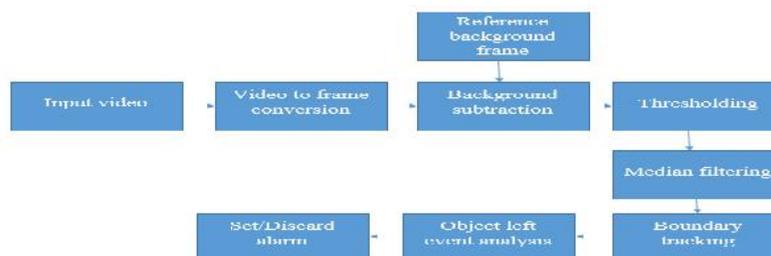


Figure 2: Block diagram of proposed method

The block diagram of the proposed abandoned object detection framework is as shown in above figure. The input video is captured through the surveillance camera on which the abandoned object detection algorithm is to be applied. The video is then converted to frames on which the process is carried out. Image is converted to grayscale and background subtraction is carried out in order to get the moving objects. Noise are removed from the images. The region of interest is obtained using boundary tracking and decisions are made according to the object which is suspicious remains stationary in frames for given time period. If object is abandoned object the alarm is set and guard is alerted.

Three major steps carried out in this proposed methodology are:

- I. Image Extraction: It is the process to obtain the region corresponding to object. Thresholding process is used.
- II. Refinement: The regions in image may contain noise because of poor lighting or poor quality.
- III. Analysis: The analysis such as some measurements are carried out on refined image and results are computed.

Video capture: The video from surveillance camera is input to abandoned object detection system

Image Capture: As we know video is the continuous moving images, after receiving the video the image frames are separated into single frame.

Background Subtraction: It is the process which takes reference background image as well as current image and calculated the difference between them. Background subtraction is used for detecting moving objects and also referred as foreground detection. Pixels in the current image are subtracted with corresponding pixel in the background image. The variations between current image and reference frame signify the existence of moving object information in terms of pixels [4].

Thresholding: Thresholding mainly does the task of converting the Grayscale image to binary image. Mainly used to improve results of background subtraction. Important operations performed are erosion, dilation, morphological open and close.

Median filtering: It removes the noise from the image by preserving the edges.

Boundary tracking: The boundary pixels of the region of interest are found. The object can be tracked using boundary tracking.

Object left event analysis: The luggage can be declared abandoned object when left by the owner and not attended for the time $T=30$ seconds AND then the alarm is triggered and guard can be alerted.

RESULTS

The Experiments are carried out on the Abandoned object dataset (ABODA). This dataset includes different scenarios such as indoor, outdoor environment.



Fig 3: object detection and tracking of moving and stationary object

The figure3 shows the results obtained for object detection and tracking the moving and stationary objects. The bounding box has been drawn around around the region of interest.

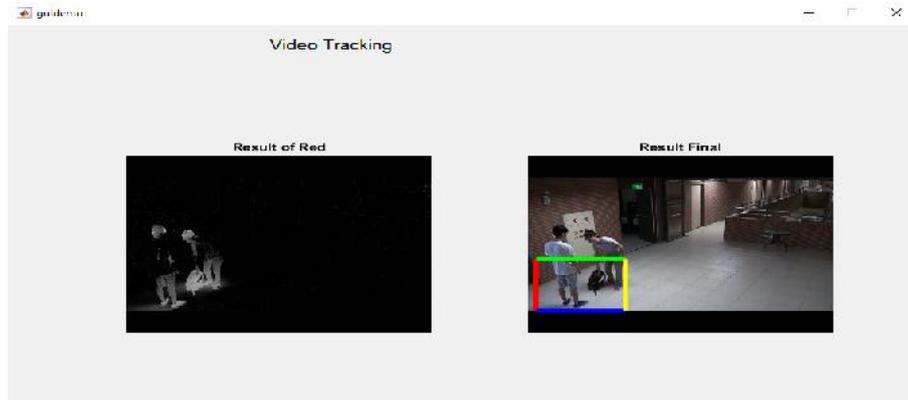


Fig4: Result of background subtraction for red scomponent

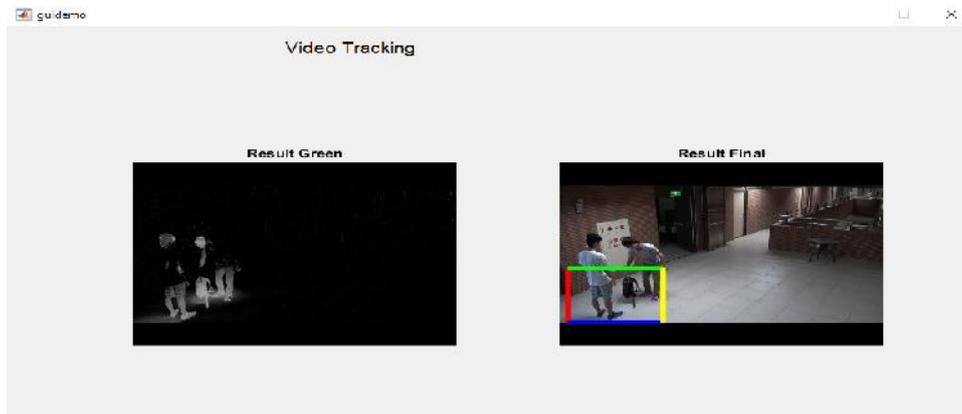


Fig5: Result of background subtraction for green scomponent



Fig6: Result of background subtraction for blue scomponent

Figure 4,5,6 shows the results obtained from background subtraction for different red,green,blue color components. The foreground detection is done. To detect the moving objects in the videos this process is carried out. The region of interest such as humans passing by, luggages etc are obtained.

CONCLUSION

This system introduces a framework to discover the abandoned objects in the public areas such as railway stations, shopping malls, airports etc. The experiments were carried out on ABODA dataset. The owner of the abandoned luggage can also be detected. This system becomes very helpful to the guards monitoring the public places as they get alerted before any dangerous circumstances occur. The drawbacks such as occlusion handling and effects due to sudden light changes are to be enhanced in the future work.

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