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Abandoned Object Detection

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***Abstract:** In the current fast paced life, security has become an important aspect which cannot be ignored. One of the usually neglected butimportant division of security in public areas involves the unattended objects.Bombs and other harmful objects that are incendiary cause great harm. And in most of the cases such objects are left unattendedfor some time before causing harm. As such, unattended objects should be given importance and must be checked to ensure safety. This paper shows a method to identify unattended objects in public areas.This is done by comparing a fixed/initial background frame with frames after a fixed interval. If there is a change in the frames, then that refers to an attended object. No change observed, proves an unattended object which is highlighted by a box. This is done with the help of blob analysis. Thispaper does this with the help of MATLAB. MATLAB being a software accessible to wide range of people provides an easy process with moderate results. It uses a wide range of predefined functions and toolboxes to do this.*
***Keywords:** unattended object, frames, blob, noise removal, MATLAB.*

I. INTRODUCTION

In today's world, the use of surveillance cameras or CCTV have been on rise. Surveillance cameras are used to monitor and observe a definite area. Due to rise in many thefts and criminal cases, these are being employed in many organizations, as well as in public places. As a result, large amount of data is being recorded and storedevery day. Now, we can't always supervisethese recorded data to check for any mishaps, so here comes the concept of automatic systems to detect and analyze thedata for any unusual activities. These systems are expected to track and analyze the data of human activities or non-human activities extracted from surveillance camera and distinguish as well as classify them according to typical and atypical human activities. The common human activities involve walking, standing, running, jogging, clapping, waving etc. whereas the uncommon activities involve suspicious tasks such as fighting, theft, leaving luggage or any bags with incendiary devices, crowd running, vandalism etc.

The suspicious tasks act as a threat to the human nature and needs an area of concern.Therefore, an algorithm is required which can supervise all the activities through the video surveillance and categorize it by detecting and tracking objects. This can beachieved through image processing and computer vision. The research of human activity recognition through surveillance camera in the area of computer vision and image processing is very active and ongoing, thereby extending or improving the already established research.

Object detection is an essential step in video analytics. Numerous object detection techniques have been evolved based on neural network, fuzzy, statistic network etc. which imply complex theory. These techniques can be developed further by complete understanding, experimentation and implementation. For the implementation and design of object tracking and detection algorithm various platforms are being used. These include open CV, C programming, MATLAB, python etc. In this paper, the use of MATLAB software and its toolboxes to implement object detection and tracking is done. Since MATLAB is considered to be an optimal platform for the design and implementation of the algorithm. MATLAB is user-friendly software and it contains 70 toolboxes which covers all the possible technological fields. All these toolboxes are abundant with predefined functions, Simulink blocks and system objects, which helps the user in writing short codes as well as saves time. Matrix operation is an important segment in imageprocessing of a video sequence which is supported by MATLAB, which is a huge advantage. Toolboxes such as image processing, computer vision and image acquisition are used in this study. In this study, MATLAB 2014 b version is used.

II. LITERATURE SURVEY

Much effort has been made in recent years to identify abandoned objects in public areas. Different methods have beenintroduced to detect abandoned objects. These can be understood by proper reviewing and guidance of good professors, though their implementation requires good programmars.L.S. Alandkar and S.R.Gengaje [1] suggested an idea to detectobjects in public areas by use of MATLAB.

S.R. Gengaje [1] utilized MATLAB software where various predefined functions were used to identify unmoved objects. A.

Singh [2] proposed using a method of where a mathematical method which operated at QVGA resolution was used. Most of the surveillance cameras operate at this resolution. Balasundaram [3] suggested a computer vision-based method where abandoned objects were identified without human intervention using blobs. This method required short time to execute. Medha Bhargava [4] gave a method which recognized four parameters and worked oni-LIDS dataset.

Divya C. Patil [5] gave a method where analysis was done on regional basis to detect regions where objects remained unmoved. Rajesh Kumar Tripathi [6] described various strategies that have been used to detect unmoved objects in the past decade, describing the challenges, issues, advantages and disadvantages for each publication. A clear idea of which method can be used can be obtained from these methods.

R. Keerthana [7] proposed a classification method of video objects. Abandoned objects are detected based on the similarityof the object shape based on the surveillance system. Roland Miezianko[8]gave a method where objects were identified by the dynamic threshold values and were demonstrated using object data category set.

III. PROPOSED METHOD

Object detection is a part of deep learning and is one of the computer vision techniques. Object detection is a technique that allows the user to identify and locate the objects in a digital image or video segment. These features or attributes help indetermining and counting the objects in a frame and track the accurate location of the object, all while labeling them. So, it is used to detect an abandoned object in a surveillance video input. There are various techniques or methods to detect an abandoned object which includes using mathematical method which operates at QVGA resolution, MATLAB with pre- defined functions, dynamic threshold values using object data category set, computer vision-based method where abandoned objects were identified without human intervention using blobs.

In this paper, the method used is abandonedobject detection using blob analysis. Here, blob is used to refer to a part of an image or frame which is constant for a period of time. Blob analysis is a method in which an image which has undergone binarization processing is analyzed. It is the most basic image processing method where analyzing the size and shape attributes of an object, such as number, position, presence, length,area, and direction of lumps are done.

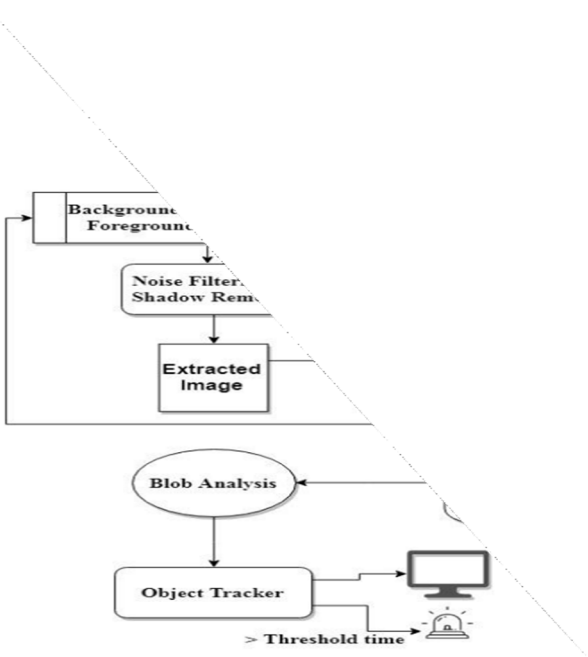

Figure 3.1: Flowchart.

It thus gives a box which defines the region of interest in the image. Abandoned object is detected by comparing a fixed/initial background frame with frames after a fixed interval. If there is a change in the frames, then that refers to an attended object. No change observed, proves an unattended object which is highlighted by a box.

The flowchart shown in the figure 3.1 explains about the general idea of the wholeprocess of detecting an abandoned object and the importance of each block in the given approach.

Each block's significance is described in detail below.

1) *Preprocessing:* In preprocessing, first, the stored video input is taken from the surveillance camera which is installed in any public places. It is usually used for image operations for abstraction at the lowest level where input and output are known to be intensity images. These images captured by the surveillance cameras are usually of the same kind and are represented by a matrix of image function. Preprocessing is used to improve the imagedata by suppressing unnecessary distortion and enhancing important image features forfurther processing
2) *Background subtraction / foreground Extraction:* After prepossessing Image undergoes Foreground extraction andbackground subtraction. As we know, Foreground/background segmentation is a process normally used in a computer vision application system for extracting specific objects (foreground) from the rest (background) of each frame in the input surveillance video sequence. Background subtraction is a famous foreground/background segmentation method where the foreground is detected bythresholding the difference between the current video frame and the modeledbackground in a pixel-by-pixel manner. themodeled background is normally affected by three factors, illumination changes, dynamic backgrounds, and shadows, wheredynamic background refers to objects that are moving (e.g.: fountains) which are not required for a surveillance system, and shadows are often caused by foreground objects and are different from the modeled background.
3) *Noise Filtering and Shadow Removal:* Here, noise is filtered in the image. Noise in an image refers to a random variation of brightness or other color information in images and is usually a feature or characteristic of electronic noise. It is always presenting in images and is very difficult to remove without the knowledge of filtering techniques. There are various noise filtering techniques and these can be selected by analysis of the noise behavior. Filters are used for the removal of noise from images by preserving their details. A filter is chosen depending on the filter behavior and type of data. Shadow removal is necessary as their presence can cause problems for algorithms that are used for segmentation, tracking, recognition of objects. This is due to the changes in the intensity or color of the images. These problems can be solved by the removal of shadows that is images are processed such that shadows are removed while retaining all other important information.
4) *Extracted Image:* Now, the image extracted after noise filtering and shadow removal is compared to the initialbackground. If there is a difference in both images, then the next image/frame is considered and undergoes background subtraction and foreground extraction and the process continues. This change implies that no object has been abandoned as compared to the reference background. If there is no change in the extracted image and reference background, then that would mean that there is a stack of similar frames.This stack would imply that there is anobject that has been unattended for a fixed interval of time.
5) *Blob Analysis:* Now, the frames from the stack undergoes blob analysis. Here, a blobis used to refer to a part of an image or frame which is constant for a period of time. Blob analysis is a method in which an image that has undergone binarization processing is analysed. It is the most basic image processing method where analysing the size and shape attributes of an object, such as number, position, presence, length,area, and direction of lumps are done. It thus gives a box that defines the region of interest in the image. The region of interesthere refers to the area where there is no change in the movement/location of the object. And thus, the system can now track and detect the abandoned object and alert the concerned authorities of the possiblethreats.

IV. RESULTS

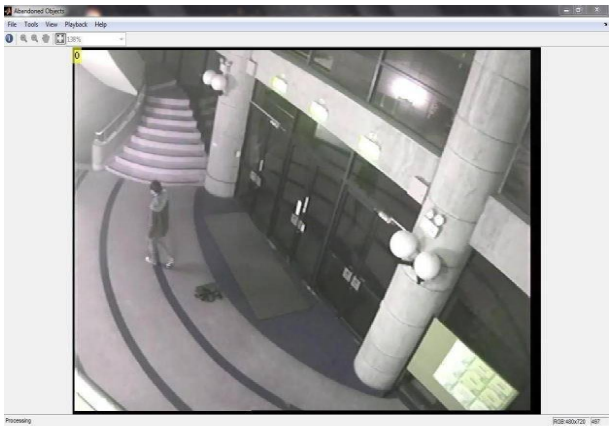

Fig a: Before leaving the object.

Fig b: Abandoned object is detected.

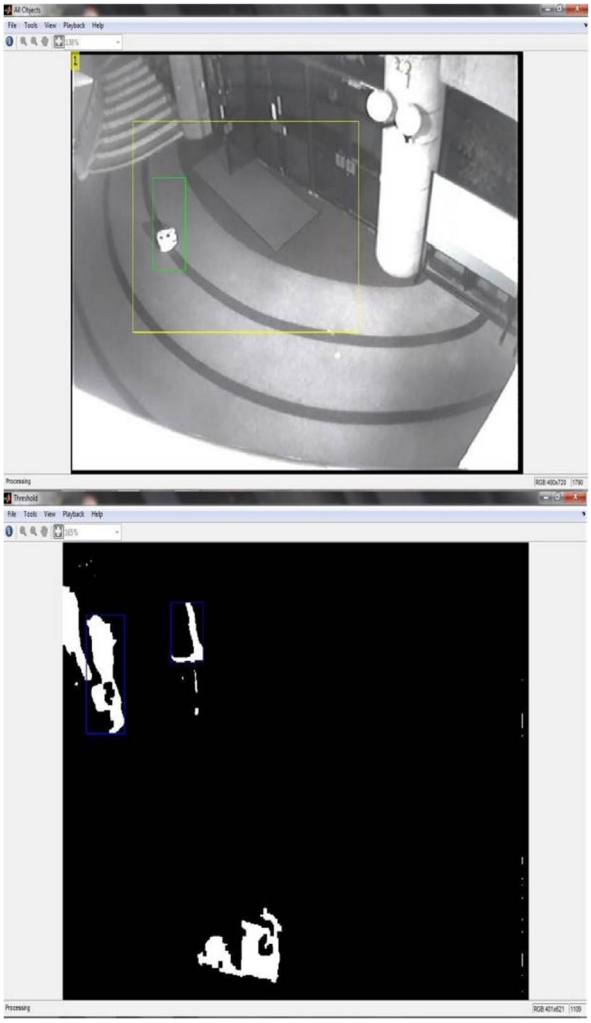

Fig c:(i) All objects window (ii)Threshold window.

The fig a shows the person entering the frame. Fig b shows the abandoned object which is detected by the system through a red color box. Fig c (i) shows the all-objectswindow which represents all the objects detected by the system by a green color boxand also give the number of objects detected. Fig c (ii) shows the threshold window.

V. CONCLUSION

This paper has presented the outcome of the proposed method through the above framework and has efficiently detected the abandoned and still-hold objects in acrowded region of interest for stored videosurveillance. Through this method, it is possible to provide security-based applications for complex environment withcrowd. The results of the example which are based on different scenarios in virtual frames have proved that the proposed method can be approached successfully andcan be applied in real-world surveillance applications.

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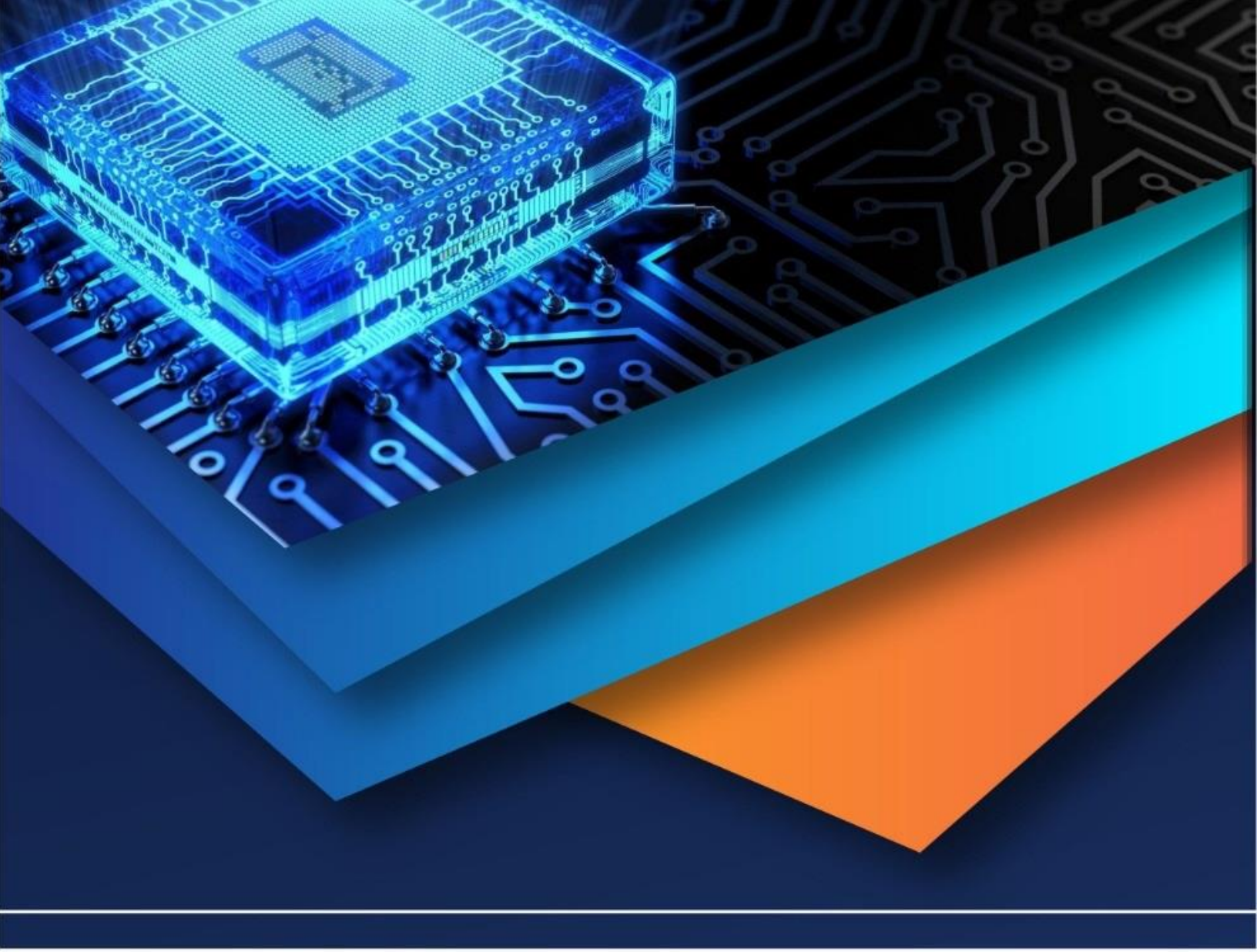

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