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Abandoned Object Detection

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ABSTRACT

Abandoned object detection is practically useful areas of computer vision due to its application in automatic video surveillance systems for the detection of suspicious activities that might endanger public safety, especially in crowded places like airports, railway stations, shopping malls, movie theatres. An abandoned object is defined as one that has been lying stationary at a certain place with unattended by human for an extended period of time. Such objects are usually inconspicuous commonplace objects that people often carry around including backpacks, suitcases and boxes. The present work is try to make a flexible and modular framework that can be used to experiment with several different methods for each stage of the overall task of detecting abandoned and removed objects in a video stream. Many existing methods have been implemented for each of these stages and integrated into the system in a way that makes it possible to switch between them in real time. This enables the user to observe and compare the performance of different methods of solving the same problem.

Keywords: Image Acquisition, Background Subtraction, Preprocessing, Blur, Threshold, Blob Detection.

I. INTRODUCTION

In recent years, the field of computer vision demand of research on the topic of video surveillance has been increasing day by day. In video surveillance, our main focus is on the objects of our interest i.e. we detect objects. As crime rate is increasing day by day, video surveillance has become the need of the human. It provides security at public as well as private places. Suspicious Object Detection is an important part of video surveillances.

A suspicious object could be any unattended object for a specific time period. This suspicious object could be left intentionally or forgotten by someone. If someone forgot to take their object with them, then the system which we are developing could be of great help for the owner. And in case if someone intentionally left the object then our system will be a great help for the security. Incidents of bomb blasts by terrorists at busy public places (like airports, railway stations, bus stations etc.) are among the prime concerns to security agencies across the globe. A huge amount of loss to the society in terms of property and life happens in the case of a bomb blast. Though all of these places are well equipped with CCTV's yet we are not able to make the best use of these cameras and the recorded video footages. In existing devices cameras are used only for storing recordings with imprinted time and date.

Again we need a person to monitor all these recordings. And if there is no person for monitoring then the only help the device provides is just some clues to identify the involved person. The existing device is not a proactive and is not efficient to alarm the security personnel who immediately can check

the incident. So, a system is being presented which is smart enough to detect a suspicious object and requires no manual monitoring.

II. MATHEMATICAL MODEL

Let S be the Suspicious Object Detection as the final set S = {V, DO, AR, F}

Identify the inputs as I

V = {V1, V2, V3, V4 — V given video captured from camera}

Identify the outputs as O

DO= {DO1, DO2, DO3 — DO given Detected object}

AR = {AR1, AR2, AR3 — AR gives the alert report}

Identify the functions as F

F = {F1 (), F2(), F3(), F4(), F5(), F6(), F7()} F1 (V) :: Capture video from camera.

F2 (V) :: divide it into frame.

F3 (V) :: image processing.

F4 (V) :: detect object.

F5 (V) :: analysis and monitoring for particular time.

F6 (V) :: generate alert.

F7 (V):: Send alert report to the system.

III. ALGORITHM

The proposed algorithm to separate background and foreground in the incoming image is based on the 'Approximate Median Model'. However, our technique requires two reference background images namely, 'Current Background' and 'Buffered Background'. This technique of storing two backgrounds can be considered as a dual background method. One of the interesting features of this technique is that both the backgrounds are updated dynamically. The first one is updated frequently while the second one has a slower update rate. The first frame of the incoming video is initialized as 'Current Background'. Subsequently, the intensity of each pixel of this current background is compared with the corresponding pixel of the next frame after every 0.4 seconds. If it is less, then the intensity of that pixel of current background is incremented by one unit otherwise it is decremented by one unit. In case of equality, the pixel intensities remain unchanged. This way, even if the foreground is change at a fast pace, it will not affect the background but if the foreground is stationary, it gradually merges into the background. Since we all those objects which are stationary for a long period of time and thus have gradually merged into the background, we maintain another set of background images called 'Buffered Background'. Here, all those pixels which do not belong to the prospective abandoned objects set are made equal to that of 'Current Background'. This is done at an interval of every 20 seconds. Difference of the two backgrounds is represented as binary image with the white portion representing foreground (blobs).

A. Blur

Algorithm

- Traverse through entire input image array.
- Read individual pixel color value (24-bit).
- Split the color value into individual R, G and B 8- bit values.
- Calculate the RGB average of surrounding pixels and assign this average value to it.
- Repeat the above step for each pixel.
- Store the new value at same location in output image.

B. Blob Detection

The blob analysis takes as an input a binary image, applies an algorithm similar to the one described and returns various properties of the detected blobs like bounding box, area, centroid position etc. A simplified version of the algorithm is as follows:

1. Create a region counter.
2. Scan the image from left to right and from top to bottom.
3. For every pixel check the north and west pixel (4-connectivity) or the northeast, north, northwest, and west pixel (8-connectivity) for a intensity value of 1 in the binary image (termed as criterion of blob analysis)

4. If none of the neighbors fit the criterion then assign to region value of the region counter. Increment region counter.
5. If only one neighbor fits the criterion, assign pixel to that region.
6. If multiple neighbors match and are all members of the same region, assign pixel to their region.
7. If multiple neighbors match and are members of different regions, assign pixel to one of the regions and indicate that all of these regions are the equivalent.
8. Scan image again, assigning all equivalent regions the same region value.

IV. SYSTEM ARCHITECTURE

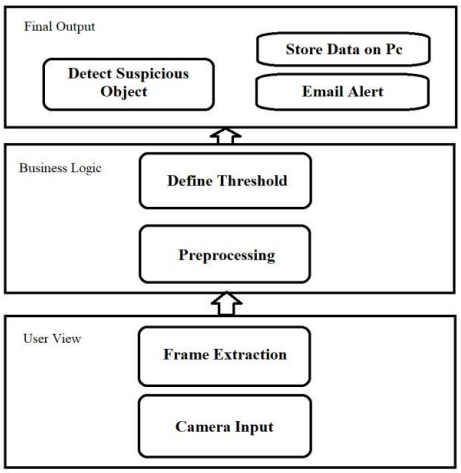

Figure 1

In this system live feed of the CCTV, if a person is dropping off some bag or any such suspicious thing and leaving it running away, the camera will catch this activity and if such bag is untouched for some time span then it will give notification to authority.
First we will take input from live video feed that is captured by any camera. This live video feed is comprised of many frames. And we apply the different image processing techniques on these frames. By applying various techniques like Background Subtraction technique, Threshold and Blur the desired unattended or stady object is detected. When the object is detected as unattended the system will raise an alarm.

A. Software requirement: - 1. Operating System: - Windows
2. Technology: - Java
3. IDE: - NetBeans 7.1

B. Hardware requirement: -
1. Hard Disk :250 GB
2. RAM: 4 GB 3. Dome Camera(CCTV).

V. RESULTS AND DISCUSSION

Based on the results and analysis, we can conclude that low to medium density crowd has no effect on processing speed or accuracy of the model. In a high density scenario, there is a possibility that the object is prone to be hidden from camera view for most of the time or in other words it is camouflaged by the background leading to a failure in detection. Another achievement of this model was that difference in lighting conditions had almost negligible effect on the operating performance. This can be attributed to the use of Dynamic Background technique. The system will thus work perfectly in an open environment (under sunlight) too. Additionally, shadow effects and reflection of light from bright objects do not pose any problems

VI. CONCLUSION

This paper presented an abandoned object detection system based on a dual background segmentation scheme. The background segmentation is adaptive in nature and based on the Approximate Median Model. It consists of two types of reference backgrounds, Current and Buffered background, each with a different time interval. Blob analysis is done on the segmented background. Detection results show that the system is robust to variations in lighting conditions and the number of people in the scene. In addition, the system is simple and computationally less intensive as it avoids the use of expensive filters while achieving better detection results.

VII. REFERENCES

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