Implementation of Abandoned Object Detection in Real Time Environment

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ABSTRACT

This paper presents the extension of previous proposed work of abandoned object detection in real time system [1].Recently the use of CCTV cameras for security purpose is increased .All the public places are now under the CCTV. Now state government has also made it compulsory to use CCTV for cooperative housing societies. This work is done to give the good quality abandoned object detection to enhance the security system. This papers talk about the improved quality by changing image intensity by % reduction approach.

Keywords

Abandoned object, CCTV, Foreground mask, Gaussian blur, Surveillance systems.

1. INTRODUCTION

In recent times there is lot of research done in field of abandoned object detection system for video surveillance systems with the human controlled or monitored CCTV systems. 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 using languages like Matlab, Java etc. In this work the detailed architecture is provide with implementation approach. The available work is done by implementing some algorithms to reduce noise but it was not as impressive as the noise was still creating hurdle in getting the output. In this research work the Gaussian Blur algorithm-method is used for the noise elimination. 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. When an unaccompanied bag is detected, the system analyzes its history to determine its most likely bag position(s), where the position is defined as the location where the bag into the scene is left unattended. Through successive frames, the system keeps a lookout for the bag positions, whose presence in or disappearance from the scene defines the status of the bag, and decides the appropriate course of action[7].Automatic threat detection systems can assist security personnel by providing better situational awareness, enabling them to respond to critical situations more efficiently [2].In this implementation, After getting the intensity Image instead of increasing/decreasing the intensity of pixels by +1/-1, % reduction is used for Comparing and updating current background.

2. LITERATURE SURVEY

Many algorithms and methodologies have been proposed for Abandoned Object Detection. A. Singh has propose the some method on dual background segmentation in which blob detection, tracking is done but main methodology is to find out the object through intensity and frame delay [2]. Another method has also been proposed based on double illumination invariant Foreground mask and also proposes an automatic and robust method to detect and recognize the abandoned objects for video surveillance systems. Two Gaussian Mixture Models (Long-term and Short-term models) in the RGB color space are constructed to obtain two binary foreground masks [6]. The comprehensive solution for managing abandoned objects is proposed by *Lin et.al* which means that the system can deal with the objects that are abandoned and removed. The system contains two adaptive abandoned object detection methods that are both based on the Gaussian mixture model for real environments. The first method is more efficient than the second one, but the latter is more robust than the former. The proposed methods are proved to be characterized with prominent efficiency and robustness according to the experimental results [4]. In our previous work, we have tried to detect abandoned object in real time video where we have given details of few working modules [1].

3. WHAT IS ABANDONED OBJECT?

The detection of abandoned objects is more or less the detection of idle/inactive (stationary or non-moving) objects that remain stationary over a certain period of time. The period of time may be adjustable. In several types of images or frames idle objects should be detected. For example in complex near Elevator bag is left by some person. An unknown object is any object that is not a person or a vehicle. In general, unknown objects cannot move they are considered as stationary.

1. *What should be detected?*

Whenever an unknown object appears in the scene and remains stationary for some amount of time person, an alarm needs to be generated [1].

4. PROPOSED SYSTEM

This system is modified version of our previous work [1]. The present system which is modular in nature and consists of five different modules and each module as follows:

1. Capture/Grab the video
2. Data extraction and conversion unit
3. Dual Background segmentation

4. Object tracking
5. Alarm rising and display of result or detect Abandoned Object

The flow of the implementation of the proposed system is as follows:

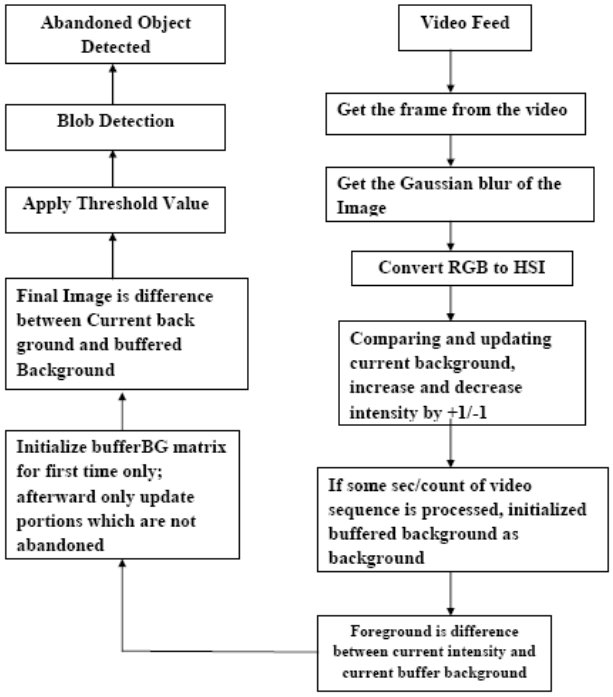

Fig 1: Flow of Implementation

5. OVERVIEW OF MODULES

MODULE 1: CAPTURING THE VIDEO

For this system we are considering the live video as an input to the proposed system. In this module we are going to capture the video through the Webcam or CCTV and it will be given as an input to the system.

A live video stream is initially segmented into individual images from which a region of interest is extracted and converted to 2 Dimensional array (height * width). The default initialization of Webcam is 800*600 pixels (h*w).Forcefully it will change the dimension into the 340*240 (h*w) for the better results. For the capturing video the input device will be mounted at suitable height and position in a clear environment. The resolution of the webcam is 640x480 and it can capture up to 30 frames per second. However the video output resolution is scaled down to 320x240 in order to enhance the processing time of the project.

MODULE 2: DATA EXTRACTION AND CONVERSION UNIT

The video captured in the first module is given as input to the second module. The accepted video is needed to be converted to frames which are needed for further processing. For getting the 10 frames per second (fps) from the video JMyron java library is used. Update method is called once per frame in order to run the vision processing and camera updating. In current work Gaussian blur is used to reduce the noise.

GAUSSIAN BLUR:

A Gaussian blur (also known as Gaussian smoothing) is the result of blurring an image by a Gaussian function. It is a widely used effect in graphics software, typically to reduce image noise and reduce detail. A Gaussian Blur is a general purpose blur filter. This removes fine image detail and noise leaving only larger scale changes. Gaussian Blurs produce a very pure smoothing effect without side effects. A Gaussian Blur is distinct from other blurs in that it has a well defined effect on different levels of detail within an image. As the level of detail becomes smaller the filter lets through less and less. With other types of blur (e.g. Mean Filter) the amount let through may vary considerably. As well as having this well defined and consistent frequency response, certain characteristics of the Gaussian function mean that large blurs can be applied much faster than other similar kinds of filters.

Logic used to generate the Gaussian matrix for the proposed work:

```
col = biScaled.getRGB(x, y);
sumR += (col >> 16) & 0xff;
sumG += (col >>  8) & 0xff;
sumB += (col >>  0) & 0xff;
r = sumR / 25;
```

CONVERSION FROM COLOR TO INTENSITY MATRIX

Once the frame is grabbed, the frame has to go through the chain of the pre- processing. The first process is gray scaling. In image processing, a grayscale image is an image which the value of each pixel is a single sample, or we called it intensity value. This sort of image is typically composed of shades of gray, varying from black at the weakest intensity to white at the strongest intensity. Grayscale images are distinct from black-and-white images, which in the context of computer imaging are images with only two colors, black and white; grayscale images have many shades of gray in between.

The intensity of a pixel is expressed within a given range between a minimum and a maximum. Gray scaling is necessary to remove the color values of the image and converts the image into a grayscale image. The grayscale image simplifies computation drastically, compared to a color RGB image. The intensity image will get through the calculation of Max(RGB).

MODULE 3 AND 4: DUAL BACKGROUND SUBTRACTION AND OBJECT TRACKING

Background subtraction is a commonly used class of techniques for segmenting out objects of interest in a scene for applications such as surveillance. For background subtraction technique, it can be analyses the image with respect to three important attributes: foreground detection, background maintenance and post-processing.

Basically, the background subtraction technique compares the current frame not with the previous one but with the first frame in the video sequence. So, if there were no objects in the initial frame, comparison of the current frame with the first one will give us the whole moving objects independently of its motion. However, the approach has a big disadvantage – the initialize frame must without object of interest. For example, a car on the first frame, but it is gone afterwards. There will be a motion detected on the place, where the car

was.

Of course, we can renew the initial frame sometimes, but still it will not give us good results in the cases where we cannot guarantee that the first frame will contain only static background. In an inverse situation, when someone put a picture on the wall in the room, motion is detected until the initial frame is renewed. The most efficient algorithms are based on building the so called background of the scene and comparing each current frame with the background. In these algorithms, a (moving) foreground object is detected by comparing the current image with the static background of the scene.

Various background subtraction methods can be used for recognizing the object. The most popular being the ones based on Gaussian mixture models, the first of which was proposed by Friedman and Russell and then modified by several authors to suit their specific needs. In this work, a new background subtraction technique is introduced. This method is adaptive, dynamic, non-probabilistic and intuitive in nature. Like the majority of other methods, we also use pixel color/intensity information for background processing. But instead of having one reference frame, we maintain two different reference frames for self adaptability resulting in less computation due to non-inclusion of any complex mathematics. Moving crowd/objects, lighting changes and unnecessary details like shadows, reflections on floors and walls are filtered off efficiently with only stationary objects remaining in the scene, thus leaving us with the prime motive of 'detecting abandoned objects'. Moreover, having two backgrounds has an added advantage that the user can adjust the time interval between the update of reference background frames to suit different needs and environments [2].

After getting the intensity Image instead of increasing /decreasing the intensity of pixels by +1/-1, we can use % reduction for Comparing and updating current background. If we modify intensity of pixel for % reduction rather than +1/-1 result will be good. Maintain one count from the start. After particular interval convert current background image to the buffer background.

In proposed system, the dual background segmentation is used which is having current background, buffer background and foreground. For calculating the fore ground, we have to go for the difference of current intensity and current buffered background. Difference of the two backgrounds is represented as a binary image with the white portion representing foreground. In the proposed system inter buffer delay is 100 milliseconds which can be change at runtime.

Initialize buffer Background matrix for first time only; afterward only update portions which are not abandoned. Do not update the background after particular interval because if the system is installed at the railway station then railway station area will not get change frequently. The abandoned object is difference between current background and buffered background. In the proposed system threshold value is applied means after getting the difference between the current background and fore ground image how many pixel get change of the particular object, if it is more than threshold value then go for the blob detection and if it is less than the threshold value then discard it.

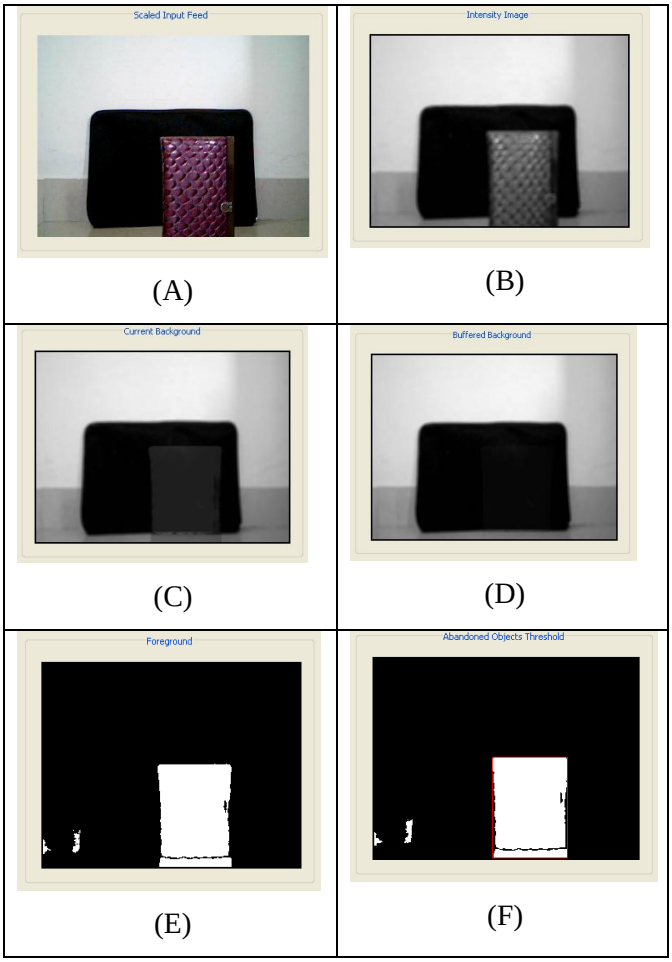

Fig 2: Experimental Result

MODULE 5: RAISING ALARM AND DISPLAY RESULT

Whenever the abandoned object is detected by the system, then the alarm will be raise. The detection of abandoned object should be shown through red rectangular block.

6. CONCLUSION AND FUTURE ENHANCEMENT

This paper gives the details of implementation of abandoned object detection with modified architecture. After getting the intensity Image instead of increasing/decreasing the intensity of pixels by +1/-1, % reduction is used for Comparing and updating current background for good result. This system is working in real time environment. The dual background segmentation which is having current background, buffer background and foreground are found to be useful to find out the abandoned object. In future, Instead of using pixel based approached for abandoned object detection. Future enhancement of this work will be the region level analysis.

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7. REFERENCES

[1] Pallavi S. Bangare, Nilesh J. Uke, Sunil L. Bangare "An Approach for Detecting Abandoned Object from Real Time Video" International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 Vol. 2, Issue 3, May-Jun 2012, pp.2646-2649

[2] A. Singh, S. Sawan, M. Hanmandlu, V.K. Madasu, B.C. Lovell "An abandoned object detection system based on dual background segmentation" IEEE 2009 Advanced Video and Signal Based Surveillance.

[3] Xuli Li, Chao Zhang, Duo Zhang, "Abandoned Objects Detection Using Double Illumination Invariant Foreground Masks", 2010 International Conference on Pattern Recognition,1051-4651/10, 2010 IEEE.

[4] Chih-Yang Lin and Wen-Hao Wang, "An Abandoned Objects Management System Based on the Gaussian Mixture Model", International Conference on Convergence and Hybrid Information Technology 2008 978-0-7695-3328-5/08, 2008 IEEE.

[5] N. Bird, S. Atev, N. Caramelli, R. Martin, O. Masoud and N.Papanikolopoulos, "Real Time, Online Detection of Abandoned Objects in Public Areas", in Proceedings of IEEE International Conference on Robotics and Automation, 2006, pp. 3775 – 3780.

[6] F. Porikli, Y. Ivanov, and T. Haga, "Robust Abandoned Object Detection Using Dual Foregrounds", Eurasip Journal on Advances in Signal Processing, vol. 2008, 2008.

[7] M. Bhargava, C-C. Chen, M.S. Ryoo, and J.K. Aggarwal, "Detection of Abandoned Objects in Crowded Environments", in Proceedings of IEEE Conference on Advanced Video and Signal Based Surveillance,2007, pp. 271 – 276