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An Abandoned object Detection System using Background Segmentation

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Abstract- **This paper represents the measures and algorithms for abandoned object detection system. Terrorist activities have threaten the life's of common people and has given a flame for lack of security or the threat about losing their life's in such activities. In this paper, the main emphasis is given on tracking, alert system wide ranging which can be used for the detections of the explosive objects that may cause any harm. Today, video surveillance is commonly used in security system but requires more intelligent and more robust technical approaches. Such system are used at Airports, Railway Station and other public places. Precise and accurate detection of the left luggage or the abandoned object is very essential in today's world. In this context, a system is used which is observed by a multi-camera system and also involves multiple actors .We first detect the object by background subtraction .**

In this system there are 4 blocks which are as mentioned Video Conversion, Blob Detection, Object Tracking, Alarm. Initially the live video stream is segmented into frames or image. By using the image generated in matrix contain the value of each pixel by taking values of pixel and performing various operation on it we able to detect the abandoned object after detection we can track it and raise alarm. The problem of determining if object is left unattended is solved by analysing the output of the tracking system in a detection process.

Keywords- background segmentation, abandoned object, framing, image, pixels

1. INTRODUCTION

All Now a day's terrorism is a very serious problem. Although we cannot stop terrorism but we can avoid the destruction that is cause due to terrorism. Most of the time the destruction is performed by the abandoned objects like a timer bomb, explosives etc.

It's not mandatory possible to keep watch or track on every person. It may happen that a person might be in the mob who have planned cruel activities which can cause a threat to the entire society. Terrorist activities are always threatening and causing the life of common people who are not at all aware of the disaster caused due to terrorism. Keeping track on people with evil mind is not always possible. To handle this situation we have an option to keep track on common places where there is a possibilities of cruel activities using computerized system. Nowadays some software are available in the market it use of these software's are in less proportion due to some drawbacks or might be some other problems. So there is a need to develop some effective software.

In Recent years the surveillance by the smart cameras with higher level of processing capability has made possible to observe the suspicious behaviour but they cannot detect the abandoned object and it is very difficult to detect the object in public places. In this work the analysis of multiple CCTV footage multiple intelligence cameras, also take input or video filler apply the image processing technique to the video file. The location tracking system object is to find the all GPS information about the object to display.

2. OVERALL SYSTEM OVERVIEW

The fig1 shows the system overview architecture. In this architecture there are 4 blocks which are as Mentioned video conversion, Blob detection Object tracking, Alarm. Initially the live video stream is segmented into frames or image. By using the image generated in 2D matrix contain the value of each pixel by taking values of pixel and performing various operation on it we able to detect the abandoned object after detection we can track it and raise alarm.

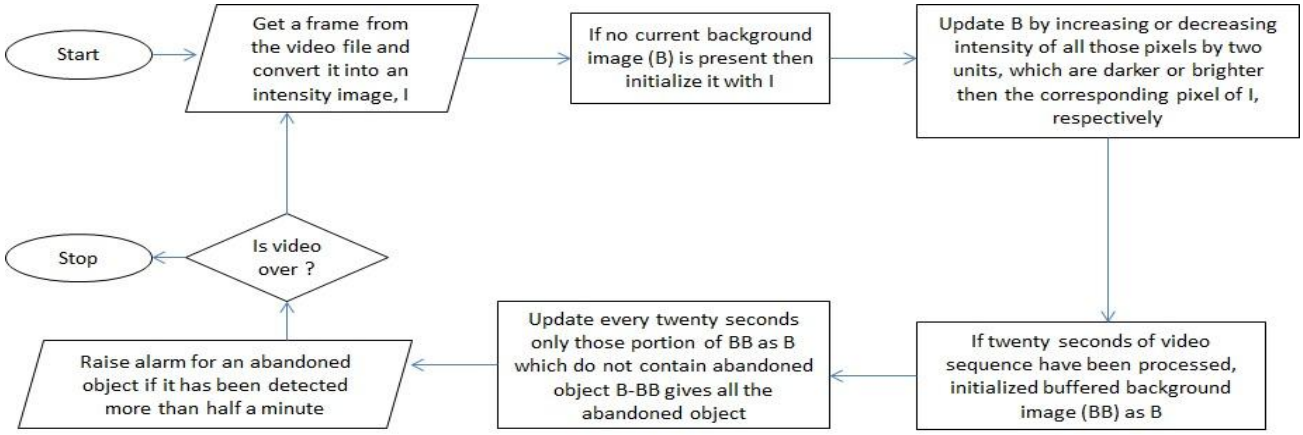

Figure 1: Flowchart of the overall system operation

2.1 Algorithm

To detect an abandoned object we need to perform certain operations on image sequentially one by one they are as follows

1) Separate out images from video.
2) Convert colour image to Grey scale image.
3) Then to remove noise make it Blur.
4) Check Buffer image is set or not if not then set current image as buffer image.
5) If buffer image is set then Subtract buffer image from current image.
6) Then we get a subtracted image in grey scale convert that into black and white image through Threshold.
7) Now we get detected part but in this we need to neglect the small parts detected in image who are not an abandoned object like (chocolate wrapper or paper etc.)
8) To work on size we need to detect area or size of object for this perform Blob detection on image and neglect the abandoned object which are in small size.
9) Now we have detected abandoned objects so calculate the time and raise the alarm.

2.2 Grey Scale

Image is collection of pixel and pixel is a picture element. Each pixel has a three colour s viz. Red, Green and Blue.

This pixel is converted into grey pixel because while threshold we want only two colour s namely black and white. Threshold cannot be performing properly on colour image pixel so there is a need to convert these colour image pixel into grey pixel.

While converting grey pixel from colour pixel we need to perform some operation on it. The size of colour pixel is 24 bit.

In this, the first 8 bits are blue then next 8 bits are green and remaining 8 bits are red respectively. For example: 893A4B (89:R, 3A:G, 4B:B).

The formula for Grey Scaling is Gs=(R+G+B)/3. So for this formula we need R, G, B values separately. So we will perform some mathematical operation on 24 bit pixel.

Pixel & 0xff=4B (blue)

Pixel >>8 & 0xff=3A (green)

Pixel >>16 & 0xff=89(red)

Now by shift operator we get red, green and blue values of 8 bit of each pixel.

Formula for grey scale is

Gs=(R+G+B)/3;

Now we need to formulate the 24 bit value of new grey scale pixel.

Newpixel =Gs<<16|Gs<<8|Gs

a) Original Image b) Greyscale image

Figure 2: Original image converted into grey scale image

2.3 Blur

Now we get the proper grey scale image but this grey scale image may contain some noise so we need to remove the noise blurring image is necessary. Here 3X3 blur is used in which start the pixel from 2nd line of 2nd pixel.

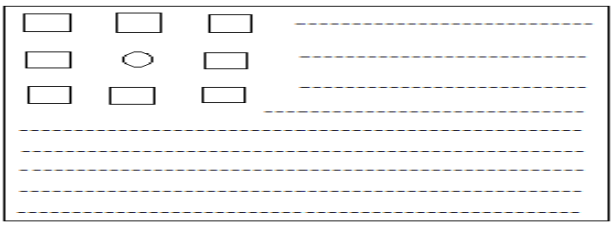

Figure 3: Adding neighbor's pixel values to make blur pixel

To remove noise and make image smooth add neighbor pixel in the selected pixel in above fig circle shows the selected pixel and the neighbor pixel shown by the square add the square value to the middle pixel.

Mathematical module of 3X3 blur is

```
sumR = sumR +R;
sumG = sumG +G;
sumB = sumB +B;

R=sumR/9;
G=sumG/9;
B=sumB/9;
```

a) Original Grey Image b) Converted Blur Image

Figure 4: Grey image converted into Blur image

2.4 Segmentation

In this background subtraction method we need two references of background. The name of this reference is current background and another one is buffer background. The background contain the 1st frame or image and the current background contain the current image which is continuously match with the buffer background and subtract the current background from the buffer background . After subtraction the determined object is an abandoned one or not if it is not abandoned one then remove from the current image and only consider the abandoned object. Here we can apply the mixture of the Gaussian's method for determination of the abandoned object and removed object. If the object is abandoned then track the location of the object by using the GPS method and raise the alarm.

The mixture of k, Gaussian model is valid for the detecting the moving objects for pixel X at time t.

The probability of the pixel can be written as

$$P(xt)= \sum_{i=1}^{K} wi,t * \eta (xt , \mu i,t , \sum_{I,t})$$

Where k is the Gaussian mixture

wi,t is a update weight of the ith Gaussian distribution.

µi,t is a mean of the ith Gaussian distribution.

∑ is a covariance of the mixture of distribution.

I,t

η is a Gaussian probability density fun.

a) Buffer Image b) Current Image c) Subtracted Image

Figure 5: Segmentation perform on buffer and current image

2.5 Threshold

In threshold differentiate the image in to background and foreground based on the pixel value. For separation of foreground and background image make image pure black and white select the threshold value from 0-255.

```
Th =128;
If (Pixel<Th)
Pixel=0; // set Pixel as black
Else
Pixel=255; // set Pixel as white
```

Figure 6: Threshold image

Here 0 is black colour value and 255 is white colour value likewise convert whole image in to black and white.

2.6 Blob Detection

Detect the blob in image and store in the vector each separate blob is store in the separate vector.

Following are algorithmic steps for blob detection

1] Scan image from left to right and top to bottom

2] For every pixel check its neighbor pixel

3] Create a blob vector for each blob

4] Check the size of blob and put value in to blob vector

5] Check the two blob are mergable or not if mergable then put it in to single blob vector

6] Draw rectangle for each blob

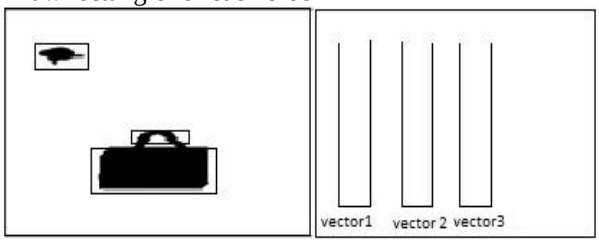

Figure 7: Bag and Handle detect as separate blob

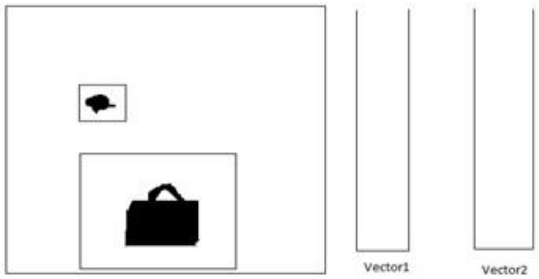

Figure 8: After full scan it detect Bag and Handle as single object

Check the size of blob if the blob size is very small or very large then discard the blob.

2.7 Tracking Object

Keep track on object for particular time if that object still for that particular time it means that object may be an abandoned object so check that object manually and raise the alarm

2.8 Alarm

After detection of object check object size if it is greater than decide size generate alarm and highlight that object we can also inform police and fire workers through mail.

3. SYSTEM DESIGN

While developing modules each module contain a two loops for calculating height and width of image

Pseudo code:-

```
for(x=0 to Height)
{
        for(y=0 to Width)
        {
                Read Pixel[x][y];
                Process();
                Write Pixel[x][y];
        }
}
```

Because of this fixed loop the polynomial time become O(N) where N=(Height*Width) and this came under P-complete phase.

4. CONCLUSION

In this paper Abandoned Object Detection is perform using background segmentation. Where video get converted into frames that frame map with background image some algorithms are run at background to differentiate between images after calculating difference it detect Abandoned object.

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