Moving Object Detection and Extraction in serial Image

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***Abstract*—A moving object detection and extraction algorithm for serial video images is studied in this paper, and also is simulated on computer. Using the background difference method obtain the object. First, established a background model based on Gauss statistical through several serial images, and then differ current image with rebuilt background to extract the moving object, Morphology filter is used to wipe off the yawp. The simulation results indicated that the algorithm is efficient, and receives the better results.**

Keywords-Image object; Moving object detection; Object recognition; Morphology Filter

I. INTRODUCTION

The detection and extraction of the mobile object is an important problem of the seeing application field, it widely apply for the military affairs and industry field. The detection and extraction of moving object in several serial images is that detecting and extracting moving object, and offering data for identifying object.

The familiar arithmetic of moving object detection includes the arithmetic based on border upon image difference and the arithmetic based on margin between background image and currently image. The arithmetic based on border upon image difference is used for detecting object, when moving object in scene moves indistinctively; the part of object can not be detected. The arithmetic based on margin between background image and currently image mostly comes down to the estimation of the background image, and uses the margin for detecting and extracting object. When the object start to move from stillness, the detecting result is wrong. In a word, the arithmetic based on border upon image difference and the arithmetic based on margin between background image and currently image can not often accurately detect and extract moving object, it brings some difficulty for the detection and analysis of object. So this paper use the arithmetic based on blending margin between the estimation image of the background and current border upon two images for accurately detecting the contour of moving object, basing on the estimation image of the background is emphasis of this paper. The result is dealt with using the morphological arithmetic; it can receive explicit and intact foreground moving area.

II. THE ARITHMETIC AND EXPERIMENTAL SIMULATION

The arithmetic and realization is shown in the picture below:

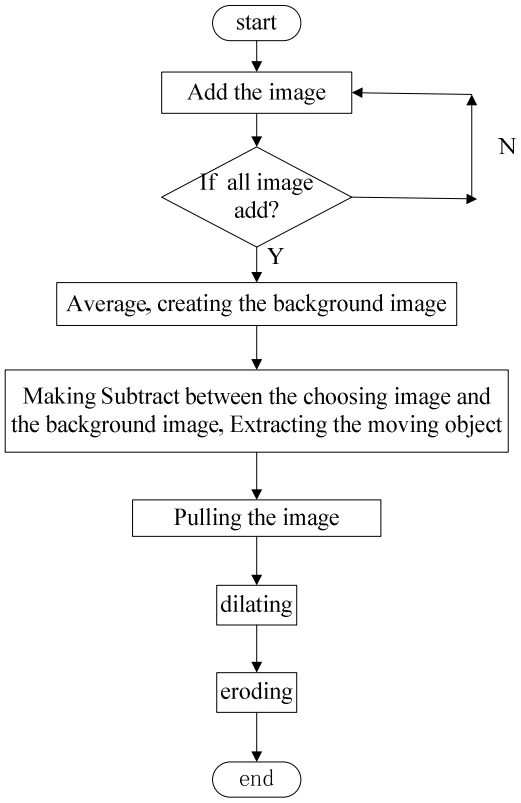

Figure 1. The flow chart of software

A. *The estimation of background image*

The arithmetic of the paper is the estimation arithmetic of background image based on gauss statistical model. This arithmetic includes the initialization and updating of the estimation of background image. In initialization arithmetic of background image, the average brightness of each pels in video sequence image is calculated in long time segment T, the variance of each pels brightness is calculated in this time segment as the initiatory estimation image of background.

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$$B_0 = [u_0, \delta_0{}^2] \quad (1)$$

$$u_0(x,y) = \frac{1}{T}\sum_{i=0}^{T-1} f_i(x,y) \quad (2)$$

$$\delta_0{}^2(x,y) = \frac{1}{T}\sum_{i=0}^{T-1}[f_i(x,y) - u_0(x,y)]^2 \quad (3)$$

When the initialization of background image is finished, along with arriving new image arriving, we need to use the follow formula to constantly renovate the image parameter, the background image after renovating is:

$$B_t = [u_t, \delta_t{}^2] \quad (4)$$

$$u_t = (1-a) * u_{t-1} + a * f_t \quad (5)$$

$$\delta_t{}^2 = (1-a) * \delta_{t-1}{}^2 + a * (f_t - u_t)^2 \quad (6)$$

$$a = K \frac{1}{\sqrt{2\pi} * \delta} \exp\left\{-\frac{(u_{t-1} - f_t)^2}{2}\right\} \quad (7)$$

The path of the image is: c:\car, the file name is: four140.bmp~four153.bmp, they show running journey of a car. We use MATLAB6.1 to program to realize the estimation of background image, the code as follows:

```
background=uint16(zeros(128));
for i=1:4
   image=imread('c:\car\four140.bmp');
   image=uint16(image);
   background=imadd(background,image);
   for num=141:153
      imagename=strcat('c:\car\four',num2str(num),'.bmp');
      image=imread(imagename);
      image=uint16(image);
      background=imadd(background,image);
   end
end
background=double(background);
background=background./56;
background=uint8(background);
    imshow(background);
```

The experiment image is 10Hz, 128×128, 8 bits grayscale image.

First, we found background, it is a 128 × 128, Uint16 matrix, the matrix is 0:

background=uint16(zeros(128))；

The style is defined as uint16, it is for avoid overflow when operating. All image are added and averaged, it can be used as background image. If the circle add is once, the moving track of the object is clear, so we need to time after time add to desalt the car track, after running the image is as shown in the picture below:

Figure 2. Reconstructed background

B. Detection of moving object and morphologic filter

After finishing the estimation of background image, we need to detect the object in current image, the arithmetic of detecting and extracting the object in this paper includes movement detection, wiping off the noise, distinguishing and extracting the object. First, the margin between the estimating background image and the current image is used to detect the change; the used detecting formula is as follow:

$$Bf_t(x,y) = \begin{cases} 0 & if \quad |f_t(x,y) - u_t(x,y)| \omega_1 \delta(x,y) < \omega_0 \\ 1 & otherwise \end{cases} \quad (8)$$

ω_1 and ω_0 are constant in formula.

The nether program is used to extract the moving object.

First, we subtract the background image from the choosing image:

image=imread('c:\car\four149.bmp');

car=imabsdiff(image,background);

figure,imshow(car);

four149.bmp and background image is as shown:

Figure 3. The current image

Figure 4. The reconstructed background image

After subtract, the image is as shown in the picture below:

Figure 5. The difference image

The contrast of this image is not ideal, the moving object is not evidence, we need to pull the image, and boost up the difference of the pels.

```
car=immultiply(car,2.5);
figure,imshow(car);
```

The element of the image matrix is multiplied by 2.5, the contrast is enlarged, after disposing, the image is as shown in the picture below:

Figure 6. The disposing result

The result is the clear image, in order to acquire the better effect than the result, we need to make binaryzation disposal, the morphologic method of dilating and eroding for the binaryzation image is used to repair the body of the binaryzation image.

```
se=ones(2,2);
car=imdilate(car,se);
car=imerode(car,se);
figure,imshow(car);
```

se is the matrix of 2×2, it is 1, it is used to dilate and erode the image as the structure element, after disposing, the image is as shown in the picture below:

Figure 7. The image after filter

This image is clearer than the image before filter.

C. The accurate extraction of moving object

The result of detecting object Bf_t and Bf_{t+1} is educed by detecting the background image and the current image f_t and f_{t+1} using introducing arithmetic. In order to accurately extract the moving object, Bf_t and Bf_{t+1} need to subtract in follow formula, the different part is as extracting object, finally the object silhouette is extracted accurately.

$$R_t(x,y)=\begin{cases}1 & [Z>K\cup Bf_{t+1}(x,y)=0]\cap Bf_t(x,y)=1\\ 0 & otherwise\end{cases} \quad (9)$$

$$Z=\left|Bf_t(x,y)*f_t(x,y)-Bf_{t+1}(x,y)*f_{t+1}(x,y)\right| \quad (10)$$

This arithmetic is simple, and dose not use complicated mathematic operation, when the difference between the background and moving object is not evidence, it can acquire the perfect effect. A set of image have 51 frames, through the background estimation, we can receive the image:

Figure 8. The reconstructed background

We arbitrarily choose the image:

Figure 9. The current frame

We make subtract between two image, the image can be got:

Figure 10. The difference image

We make binaryzation disposal for this image, dilate and erode this image, eliminate the noise in the image. We can receive the clearer image than the difference image; the image is as shown in the picture below.

Figure 11. The result of extracting

The scene is very perfect.

III. SUMMARIZATION

In simulation, when the difference between the object and the background is great, the result of background has light track, we can increase the circular degree to desalt the track. In difference image, when the contrast is not clear between the moving object and the background, we can pull the image, and enlarge the contrast, we can receive the clear image. When filtering the difference, sometimes the part of object can be lost, we can adjust the value of SE matrix, or the dimension of matrix, the whole object can be acquired.

The difference arithmetic based on the background estimation in paper can accurately extract the moving object, it is not hypersensitive to the environment, and the request for background is low. This method can be widely used to deal with the moving object in freedom background.

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