A MOVING TARGET DETECTION ALGORITHM BASED ON THE DYNAMIC BACKGROUND

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ABSTRACT: *Advantages and disadvantages of two common algorithms frequently used in the moving target detection: background subtraction method and frame difference method are analyzed and compared in this paper. Then based on the background subtraction method, a moving target detection algorithm is proposed. The background image used to process the next frame image is generated through superposition of the current frame image and the current background image with a certain probability. This algorithm makes the objects which stay long time to be a part of the background after a certain period of time, but not be detected as a part of foreground. The experimental results show that this algorithm can detect moving targets more effectively and precisely.*

KEYWORDS-background subtraction; frame difference; moving target detection; dynamic background.

I.   INTORDUCTION

Intelligent video surveillance is a new research direction in the field of computer vision. It uses the method of computer vision and detects the movement target in the monitoring scene by automatic analysis the image sequence by the camera recording. And the research on moving target detection and extraction algorithm can be said to be key issues in intelligent video. Its purpose is the detection and extraction of the moving targets from the scene of the video image sequence. Therefore the effective detection of moving targets determines the system performance. Therefore, this article focuses on key technology in the moving targets detection and extraction. In this paper, firstly, it has a brief introduction of pretreatment of the video images. It reduces the error in the image processing after. Secondly the paper focuses on analysis comparison the two algorithms: the background subtraction and the frame difference. Lastly, this paper selects based on the background subtraction method to improve it and present a moving target detection algorithm based on the background which has dynamic changes

II.   IMAGE PREPROCESSING

Noise Noise is any entity which is not of benefit to the purpose of image processing. The influence of noises on the image signal amplitude and phase is complexity. So how to smooth outnoise and keep the details of image is the major tasks of the image filtering. B. Noise Filter We use the median filter in this paper. Median filter is a non-linear method for removing noise. Its basic idea is to use the median of the neighborhood pixel gray value instead of the gray value of pixel point. For the odd elements, the median refers to the size of the middle value after sorting; For evennumbered elements, the median refers to the average size of the two middle values after sorting [1]. Median filter as a result of this method is not dependent on the neighborhood with a lot of difference between typical values, which can remove impulse noise, salt and pepper noise at the same time retain the image edge details. In general the use of a median filters contain oddnumbered points of the sliding window. Specific methods is determining a first odd-numbered pixel window W. Each pixels in window line by the size of the gray value,   and use the location of the gray value between the image f xy (,) gray value as a substitute for enhanced images g (,) x y ,as follows: g(,) { (,),(,) } x y Med f x k y l k l W = −− ∈ (1) W is the window size which is selected.

III. . IMAGE SEGMENTATION

In the Images research and application, Images are often only interested in certain parts. These parts are often referred to as goals or foreground (as other parts of the background). In order to identify and analyze the target in the

image, we need to isolate them from the image. The Image segmentation refers to the image is divided into regions, each with characteristics and to extract the target of interest in processes [2]. The image segmentation used in this paper is threshold segmentation. To put it simply, the threshold of the gray-scale image segmentation is to identify a range in the image of the gray-scale threshold, and then all image pixels gray values are compared with the threshold and according to the results to the corresponding pixel is divided into two categories: the foreground of, or background. The simplest case, the image after the single-threshold segmentation can be defined as: 1 (,) (,) 0 (,) f xy T gxy f xy T $\left\{ \begin{array}{l} >= \\ \le \end{array} \right.$ (2) Threshold segmentation has two main steps: l) Determine the threshold T. 2) Pixel value will be compared with the threshold value T. In the above steps to determine the threshold value is the most critical step in partition. In the threshold selection, there is a best threshold based on different goals of image segmentation. If we can determine an appropriate threshold, we can correct the image for segmentation. IV. ANALYSIS AND COMPARISON OF THE TWO TYPES OF MOTION DETECTION ALGORITHM Intelligent visual surveillance system can be used many different methods for detection of moving targets, A typical method such as background subtraction method, frame difference method. These methods have advantages and disadvantages, the following will be introduced. A. Background subtraction method Background subtraction method is a technique using the difference between the current image and background image to detect moving targets. Process flow chart is shown as Fig. 1.
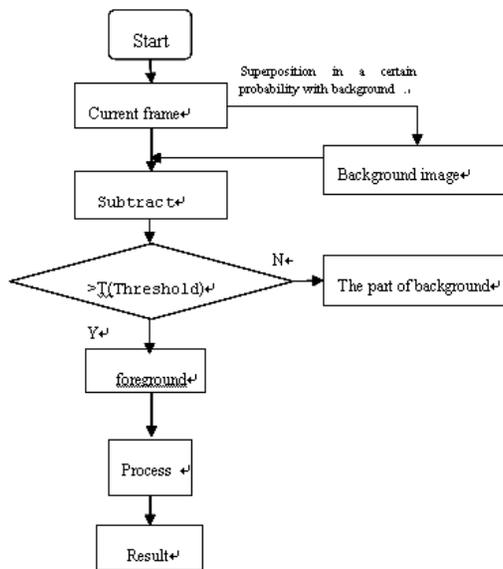
Figure 1. Flow chart of background subtraction method

The basic idea is the first frame image stored as background image. Then the current frame image k f with the pre-stored background image B subtraction, And if the pixel difference is greater than the certain threshold, then it determines that the pixel to pixel on the moving target, or as the background pixel. The choice of threshold of the background subtraction to achieve the success of motion detection is very important. the threshold value is too small will produce a lot of false change points, the threshold choice is too large will reduce the scope of changes in movement. The appropriate threshold request be adapt with the impact which be had by scenes and camera on the wavelength of the color, the changes of light conditions, so the choice of the dynamic threshold should be selected [3].

Background subtraction is used in case of the fixed cameras to motion detection. Its advantage is easy to implement, fast, effective detection, can provide the complete feature data of the target. The shortcomings are frequent in moves of the occasions may be difficult to obtain the background image. Immovable background difference is particularly sensitive for the changes in dynamic scenes, such as indoor lighting gradually change. The following is the video screenshot of the background subtraction method to achieve , as Fig. 2 – Fig. 5 shows Figure 2. Background image Figure 3. Current frame image Figure 4. Contour map after subtraction Figure 5. Target image From the images we can see that a car that does not belong to the moving target appeared in the upper right corner of the target figure. This is due to the fixed background subtraction method does not process the dynamic changes in background. This is an important drawback of the method. B. Frame Difference Method Frame difference method, is also known as the adjacent frame difference method, the image sequence difference method etc. It refers to a very small time intervals Δt
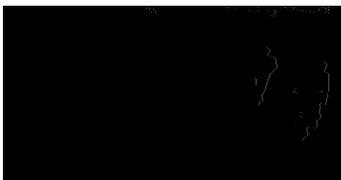
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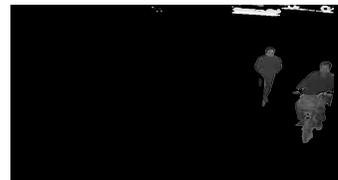

Figure 2. Background image

Figure 3. Current frame image

Figure 4. Contour map after subtraction

Figure 5. Target image

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From the above screenshot we can see that the advantages of frame difference method is the computation of small, fast, simple, low complexity of program design. It is only sensitive to the movement of objects. In fact, only detect relative motion of the object. Because there is a very short time interval between the two images, and the impact of the differential image by changes in light is small. So it is very suitable for dynamic changes in the scene [5]. Its drawback is that can not be completely extracted features of all relevant objects pixel point, unless the moving object itself has more complex texture features; After differential the interior of movement entities is easily empty; the non-zero area shown is generally the continuous or intermittent stripe-shaped region which is closely related with the edge of moving objects, as shown in Fig. 9. This region is more large than the region of the actual objects, its external rectangular were stretching on direction of the movement; it is very sensitive to noise and do not detect

the accurate location of objects. Relative to the velocity of target, the video system sampling quickly (Δt is very small), its objectives in the location of two adjacent frames will be a very small difference. The location of the mid-point in the frame can be used as the approximate target location. If the speed of moving target detection compared with the sampling rate is very fast, this method will be improved.

IV. MOVING TARGET DETECTION ALGORITHM BASED ON THE DYNAMIC BACKGROUND

Through the comparison of two moving target detection algorithms in the above section, in this paper it present a moving target detection algorithm based on the dynamic background. A. The dynamic update of the background In the background subtraction method, we can consider that the whole scene from two parts: the background, the foreground. Background is a static scene and which can be seen; Foreground is the moving objects which are interested in the video surveillance, such as: vehicles, pedestrians, etc [6]. However, due to the scene of the monitor changes over time, the foreground stagnation in the picture for a long time should be re-classified as part of the background; and objects which is belong to the background should be classified as part of the foreground when it starts moving. Background pixel that changes and updates over time, It is the basis of background subtraction method. In this paper, background is updated over time to re-construct the background images.

V. CONCLUSION

Although the moving target detection algorithm based on the dynamic background can better meet the set performance requirements. However, to design a perfect intelligent visual surveillance system, we should further improve the system robustness and increase target identification functions. ACKNOWLEDGMENT This paper is supported by the National High Technology Research and Development Program of China under Grant No. 2007AA04Z114.

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