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DETECTION OF MOVING OBJECT WITH THE HELP OF MOTION DETECTION ALARM SYSTEM IN VIDEO SURVELLIANCE

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Abstract- Human body motion analysis is an important technology which modem bio-mechanics combines with computer vision and has been widely used in intelligent control, human computer interaction, motion analysis and virtual reality and other fields. In which the moving human body detection is the most important part of the human body motion analysis, the purpose is to detect the moving human body from the background image in video sequences, and for the follow-up treatment such as the target classification, the human body tracking and behavior understanding, its effective detection plays a very important role. According to the result of moving object detection research on video sequences.

This paper proposes a new method to detect moving object based on background subtraction. First of all, we establish a reliable background updating model based on statistical and use a dynamic optimization threshold method to obtain a more complete moving object. And then, morphological filtering is introduced to eliminate the noise and solve the background disturbance problem. At last, contour projection analysis is combined with the shape analysis to remove the effect of shadow; the moving human bodies are accurately and reliably detected. The experiment results show that the proposed method runs quickly, accurately and fits for the real-time detection.

Keywords- Video surveillance, Motion detection, Background Separation, Frame Separation.

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Introduction

Human body motion analysis is an important technology which modem bio-mechanics combines with computer vision and has been widely used in intelligent control, human computer interaction, motion analysis and virtual reality and other fields [1]. In which the moving human body detection is the most important part of the human body motion analysis, the purpose is to detect the moving human body from the background image in video sequences, and for the follow-up treatment such as the target classification, the human body tracking and behavior understanding, its effective detection plays a very important role.

Currently, methods used in moving object detection are mainly the frame subtraction method, the background subtraction method and the optical flow method. Frame subtraction method is through the difference between two Consecutive images to determine the presence of moving objects. Its calculation is simple and easy to implement. For a variety of dynamic environments, it has strong adaptability, but it is generally difficult to obtain a complete outline of moving Object, liable to appear the empty phenomenon, as a result the detection of moving object is not accurate. Optical flow method is to calculate the image optical flow field, and do clustering processing according to the optical flow Distribution characteristics of image. This method can get the complete movement information and detect the moving object.

From the background better, however, a large quantity of calculation, sensitivity to noise, poor anti-noise performance, make it not suitable for real-time demanding occasions. The background subtraction method is to use the difference method of the current image and background image to detect moving objects, with simple algorithm, but very sensitive to the changes in the external

environment and has poor ant interference ability. However, it can provide the most complete object information in the case of the background is known. In this paper, in a single static camera condition, we combine dynamic background modeling with dynamic threshold selection method based on the background subtraction, and update background on the basis of accurate detection of object, this method is effective to enhance the effect of moving object detection.

Existing Method

Frame subtraction method is through the difference between two consecutive images to determine the presence of moving objects.
Optical flow method is to calculate the image optical flow field, and do clustering processing according to the optical flow distribution characteristics of image.
The background subtraction method is to use the difference method of the current image and background image to detect moving objects, with simple algorithm, but very sensitive to the changes in the external environment and has poor anti-interference ability.

Drawbacks of Existing Method

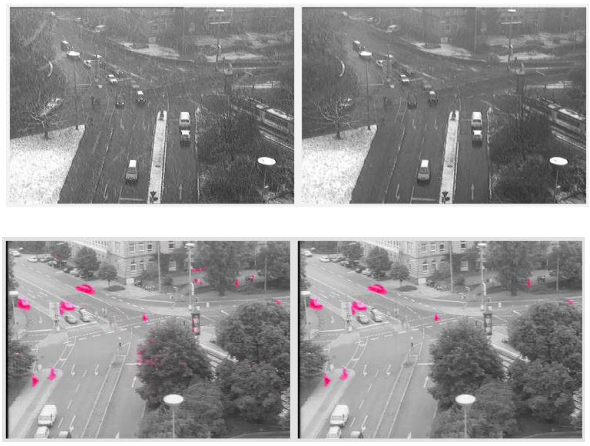
The Frame Subtraction is generally difficult to obtain a complete outline of moving object, liable to appear the empty phenomenon; as a result the detection of moving object is not accurate.
In Optical Flow method, a large quantity of calculation, sensitivity to noise, poor anti-noise performance, makes it not suitable for real-time demanding occasions.
The Background method is very sensitive to the changes in the external environment and has poor anti-interference ability.

Proposed Method

In this paper, in a single static camera condition, we combine dynamic background modeling with dynamic threshold.
Selection method based on the background subtraction, and update background on the basis of accurate detection of object, this method is effective to enhance the effect of moving object detection.

Frame Separation

Frame processing is the first step in the background subtraction algorithm, the purpose of this step is to prepare the modified video frames by removing noise and unwanted object's in the frame in order to increase the amount of information gained from the frame and the sensitivity of the algorithm.
Preprocessing is a process of collecting simple image processing tasks that change the raw input video info a format. This can be processed by subsequent steps. Preprocessing of the video is necessary to improve the detection of moving object's For example, by spatial and temporal smoothing, snow as moving leaves on a tree, can be removed by morphological processing of the frames after the identification of the moving object's as shown in fig.
Another key issue in preprocessing is the data format used by the particular background subtraction algorithm. Most of the algorithm handles luminance intensity, which is one scalar value per each pixel, however, color image, in either RGB or HSV color space, and is becoming more popular in the background subtraction algorithms.



Background Subtraction Method

The basic scheme of background subtraction is to subtract the image from a reference image that models the background scene. Typically, the basic steps of the algorithm are as follows:
Background modeling constructs a reference image representing the background.
Threshold selection determines appropriate threshold values used in the subtraction operation to obtain a desired detection rate.
Subtraction operation or pixel classification classifies the type of a given pixel, i.e., the pixel is the part of background (including ordinary background and shaded background), or it is a moving object.

Background Modeling

In the background training process, the reference background image and some parameters associated with normalization are computed over a number of static background frames. The background is modeled statistically on a pixel by pixel basis. A pixel is modeled by a 4-tuple < Ei; si; ai; bi > where Ei is the expected color value, si is the standard deviation of color value which is defined in ai is the variation of the brightness distortion, and bi is the variation of the chromaticity distortion of the ith pixel. Ei, ai and bi are defined explicitly later in this section. The expected color value of pixel i is given by

$$E_i = [\mu_R(i), \mu_G(i), \mu_B(i)]$$

where $\mu_R(i)$, $\mu_G(i)$, and $\mu_B(i)$ are the arithmetic means of the ith pixel's red, green, blue values computed over N background frames.
So far, we have defined Ei and si. We also discussed about balancing color bands by rescaling the color values by the pixel variation factors (si). Thus the brightness distortion and the chromaticity.

Background Update

For the background model can better adapt to light changes, the background needs to be updated in real time, so as to accurately extract the moving object. In this paper, the update algorithm is as follows: In detection of the moving object, the pixels judged as belonging to the moving object maintain the original background gray values, not be updated. For the pixels which are judged to be

the background, we update the background model according to following rules:

$$B_{k+1}(x,y) = \beta B_k(x,y) + (1-\beta)F_k(x,y)$$

Where *f3* E (0,1) is update coefficient, m this paper *f3* = 0.004. *Fk (x,y)* is the pixel gray value in the current frame. *Bk(x,y)* and *Bk+1 (x,y)* are respectively the
Background value of the current frame and the next frame. As the camera is fixed, the background model can remain relatively stable in the long period of time. Using this method can effectively avoid the unexpected phenomenon of the Background, such as the sudden appearance of something in the background which is not included in the original background. Moreover by the update of pixel gray value of the background, the impact brought by light, weather and other changes in the external environment can be effectively adapted.

Moving Object Extraction

After the background image B(x, y) is obtained, subtract the background Image B(x,y) from the current frame Fk (x, y). If the pixel difference is greater than the set threshold T, then determines that the pixels appear in the moving object, otherwise, as the background pixels. The moving object can be detected after threshold operation. Its expression is as follows:

$$D_k(x,y) = \begin{cases} 1 & |F_k(x,y) - B_{k-1}(x,y)| > T \\ 0 & others \end{cases}$$

Where *Dk (x, y)* is the binary image of differential results. *T* is gray -scale threshold; its size determines the accuracy of object identification.

As in the algorithm *T* is a fixed value, only for an ideal situation, is not suitable for complex environment with lighting changes. Therefore, this paper proposes the dynamic threshold method, we dynamically changes the threshold value according to the lighting changes of the two images obtained. On this basis, add a dynamic threshold!'*1T* to the above algorithm. Its mathematical expression is as follows:

$$\Delta T = \lambda \bullet \frac{1}{M \times N} \sum_{i=0}^{N-1} \sum_{j=0}^{M-1} |F(i,j) - B(i,j)|$$

Then

$$D_k(x,y) = \begin{cases} 1 & |F_k(x,y) - B_{k-1}(x,y)| > T + \Delta T \\ 0 & others \end{cases}$$

Where A is the inhibitory coefficient, set it to a value according to the requirements of practical applications, and the reference values is 2. M x N is the size of each image to deal with. M x N numerical results indicate the number of pixels in detection region. !'1T reflects the overall changes in the environment. If small changes in image illumination, dynamic threshold !'1T takes a very small value. Under the premise of enough pixels in the detection region, !'1T will tend to O. If the image illumination changes significantly, then the dynamic threshold!'1T will increase significantly. This method can effectively suppress the impact of light changes.

Reprocessing

As the complexity of the background, the difference image obtained contains the motion region, in addition, also a large number of noises. Therefore, noise needs to be removed. This paper adopts median filter with the 3 X 3 window and filters out some noise.

After the median filter, in addition the motion region, includes not only body parts, but also may include moving cars, flying birds, flowing clouds and swaying trees and other nobody parts. Morphological methods are used for further processing. Firstly, corrosion operation is taken to effectively filter out non-human activity areas. Secondly, using the expansion operation to filter out most of the non-body motion regions while preserving the shape of human motion without injury. After expansion and corrosion operations, some isolated spots of the image and some interference of small pieces are eliminated, and we get more accurate human motion region.

Extraction of Moving Human Body

After median filtering and morphological operations, some accurate edge regions will be got, but the region belongs to the moving human body could not be determined. Through observation, we can find out that when moving object appears, shadow will appear in some regions of the scene. The presence of shadow will affect the accurate extraction of the moving object. By analyzing the characteristics of motion detection, we combine the projection operator with the previous methods. Based on the results of the methods above, adopting the method of combining vertical with horizontal projection to detect the height of the motion region. This can eliminate the impact of the shadow to a certain degree. Then we analyze the vertical projection value and set the threshold value (determined by experience) to remove the pseudo-local maximum value and the pseudo-local minimum value of the vertical projection to determine the number and width of the body in the motion region, we will get the moving human body with precise edge. This article assumes that people in the scene are all in upright-walking state. Human body detection is to identify the corresponding part of human from the moving region. But the extracted moving region may correspond to different moving objects, such as pedestrians, vehicles and other such birds, floating clouds, the swaying tree and other moving objects. Hence we use the shape features of motion regions to further determine whether the moving object is a human being. Judging criteria are as follows: (1) The object area is larger than the set threshold (2) The aspect ratio of the object region should conform to the set ratio. If these two conditions are met, the moving object is the moving human body, or is not a human body.

Advantages of Proposed Method

- The key of this method lies in the initialization and update of the background image.
- The effectiveness of both will affect the accuracy of test results.

Therefore, this paper uses an effective method to initialize the background, and update the background in real time.

Conclusion

In this paper, a real-time and accurate new method for detecting moving human body is proposed, based on background subtraction. In cognizance of the shortcomings and deficiencies in the traditional method of object detection, we establish reliable back-

ground model, use dynamic threshold method to detect moving object and update the background in real time. At last, we combine contour projection analysis with shape analysis to remove the shadow effect. Experiments show that the algorithm is fast and simple, able to detect moving human body better and it has a broad applicability.

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