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A MOVING TARGET DETECTION IN REAL-TIME VIDEOS

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ABSTRACT

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 project, two algorithms named the background subtraction, and the frame difference are analyzed and compared for performance evaluation.

Keywords: Moving target, background subtraction, frame difference, video survillence.

1. INTRODUCTION

1.1 Aim of the Work

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 project, two algorithms named the background subtraction, and the frame difference are analyzed and compared for performance evaluation.

1.2 Background

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

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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.

In modern battles, long-distance attacking missile develops to intelligent, high precision and remote controllability. Midcourse guidance uses GPS/INS with terrain matching. Terminal guidance uses radar, infrared imaging technology or infrared imaging technology with data link. Infrared imaging guidance technology can auto search, auto-capture, auto-identify target, then can auto trace target because there are many features such as high precision, good anti-interference, good concealment capability and so on and it has been research hotspot in accurate terminal guidance field [1]. At present, the infrared seekers have been the second products whose type products are AAWS-M in America and Triget belongs to German, France, and Britain. The information captured by infrared seekers usually is serial image [2]. To treat infrared serial images intelligently is the precondition for accurate terminal guidance, and we can make infrared seekers have better tracing target ability. From martial application, region of interest (ROI) of target in serial images is the region in moving target. So, the process of automatic extraction of ROI in infrared serial images is the process of detecting moving target then extraction moving target region. It is a hotspot in computer vision fields that to trace target and to extract ROI from serial images with complex background. The technology used in missile guidance, video controller and traffic manager commonly while it also is an important issue for automatic extraction of ROI. There are two methods for extraction ROI: one is human detected regions of inertest (hROI) which is selected according to ROI by human, and another is algorithmically detected regions of inertest (aROI) which is selected according to characters of the image [3]. This paper mainly studied the target detection algorithm in static scenes and dynamic scenes, automatic extraction algorithm of ROI and image segmentation issues. The result can improve the efficiency of accurate guidance.

2. LITERATURE SURVEY

The research on face segmentation has been pursued at a feverish pace, there are still many problems yet to be fully and convincingly solved as the level of difficulty of the problem depends highly on the complexity level of the image content and its application. Many existing methods only work well on simple input images with a benign background and frontal view of the person's face. To cope with more complicated images and conditions, many more assumptions will then have to be made. Many of the approaches proposed over the years involved the combination of shape, motion, and statistical analysis. In recent times, however, a new approach of using color information has been introduced.

In this paper, we will discuss the color analysis approach to face segmentation. The discussion includes the derivation of a universal model of human skin color, the use of appropriate color space, and the limitations of color segmentation. We then present a practical solution to the face-segmentation problem. This includes how to derive a robust skin-color reference map and how to overcome the limitations of color segmentation. In

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addition to face segmentation, one of its applications on video coding will be presented in further detail. It will explain how the face-segmentation results can be exploited by an existing video coder so that it encodes the area of interest (i.e., the facial region) with higher fidelity and hence produces images with better rendered facial features.

3. IMAGE SEGMENTATION

3.1 Segmentation

In computer vision, segmentation refers to the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image (see edge detection). Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristics.

Thresholding

Edge finding

Binary mathematical morphology

Gray-value mathematical morphology

In the analysis of the objects in images it is essential that we can distinguish between the objects of interest and "the rest." This latter group is also referred to as the background. The techniques that are used to find the objects of interest are usually referred to as segmentation techniques - segmenting the foreground from background. In this section we will two of the most common techniques thresholding and edge finding and we will present techniques for improving the quality of the segmentation result. It is important to understand that:

1. There is no universally applicable segmentation technique that will work for all images, and,

2. No segmentation technique is perfect.

4. PROPOSED METHOD

1. Introduction

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Separating foreground from background plays an important role in many computer vision systems, including action recognition, motion capture, video compressing, teleconferencing and surveillance tracing. [1] Most major challenges to background subtraction methods include sudden illumination changes, shadows, camera shakes, and various changes in the background example waving trees flickering screens and shadows [2], [3]. The temporal differencing method utilizes two or more consecutive frames to extract moving regions. This method is vulnerable and prone to false detection if the temporal changes area unit generated by noise or illumination change due to weather conditions [4]. To overcome these challenges, various methods have been presented in the literature. However, background from foreground separation still remains a challenge to the computer vision community. In this paper, firstly, it's a short introduction of pretreatment of the video pictures. It reduces the error within the image process once. second the paper focuses on the analysis and also the frame difference. in conclusion this paper selects supported the background subtraction technique to enhance it and present a BSFD algorithm based on the background subtraction and the frame difference method.

5. 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 the process [9]. 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 compared with the threshold and according to the results to the corresponding pixel is divided into two categories, The foreground and background. The simplest case the image after the single-threshold segmentation can be defined as

$$g(x,y)=\begin{cases}1 & f(x,y)>T\\ 0 & f(x,y)\le T\end{cases}$$

Threshold segmentation has two main steps: 1) 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.

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

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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. The basic idea is the first frame image stored as a background image. Then the current image fk with the pre stored background image B subtraction, and if the pel difference is larger than the bound 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 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 [10]. The appropriate threshold request adapts 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. The method formula is shown as

$$R_k(x,y) = f_k(x,y) - B(x,y)$$

$$D_k(x,y) = \begin{cases} 1 \ background & R_k(x,y) > T \\ 0 \ target & R_k(x,y) \le T \end{cases}$$

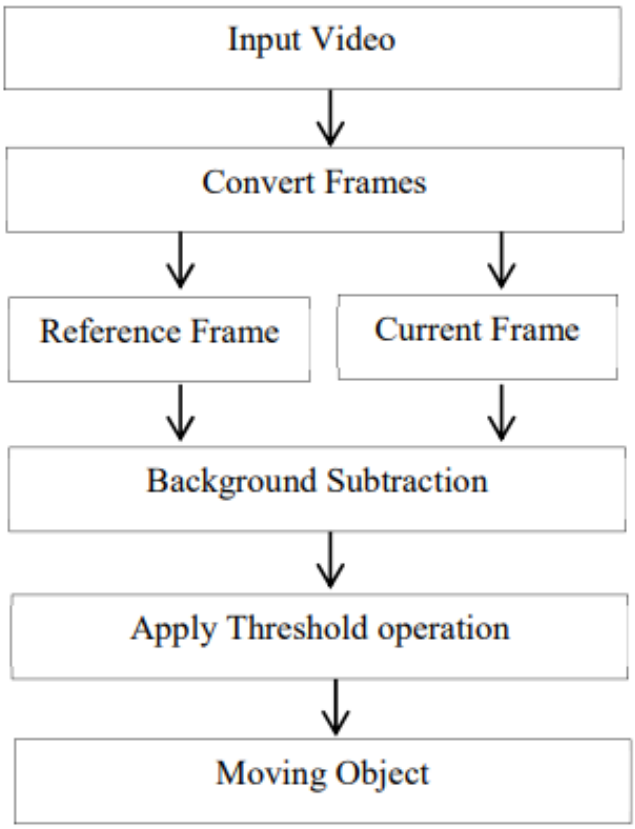

Fig. 1: Flow chart of background subtraction method.

Background subtractions used in case of the fixed cameras for motion detection. Its advantage is easy to implement, fast, effective detection, can provide the complete feature

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data of the target. The shortcomings are frequent in the moves of the occasions may be difficult to obtain the background image. The immovable background difference is particularly sensitive to the changes in dynamic scenes, such as indoor lighting gradually change.

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 of the two images before and after the pixel based on the time difference, and then thresholding to extract the image region of the movement, according to which changes in the difference of the specific flow chart as shown in Fig.2 The specific method of calculation of difference image Dk between the kth frame images fk with the k-1 the frame image fk-1 is differential, the negative differential and fully differential, the corresponding formula is as follows.

Differential:

$$D_k = \begin{cases} f_k - f_{k-1} & if\,(f_k - f_{k-1}) > 0 \\ 0 & else \end{cases}$$

Negative Differential:

$$D_k = \begin{cases} |f_k - f_{k-1}| & if\,(f_k - f_{k-1}) < 0 \\ 0 & else \end{cases}$$

Fully Differential: $D_k = |f_k - f_{k-1}|$

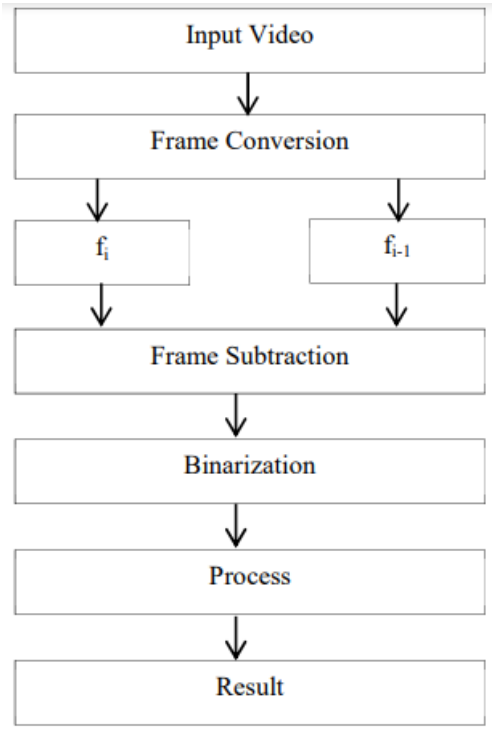

Fig. 2: Flow chart of frame difference method.

The binarization for the differential image can get a collection of pixel movement.

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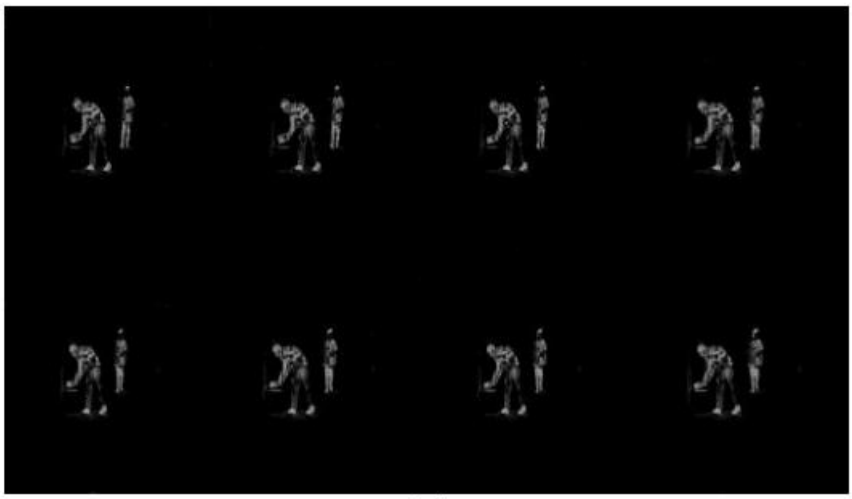
6. RESULTS

In this section, several experiments were performed to prove the feasibility of the proposed moving object identification and segmentation algorithm. Both the indoor and outdoor environment video has been experimented. Three test videos namely "hall_monitor.avi", "outdoor.avi" and "road_side.avi" are used in the experiment.

(a)

(b)



(c)

Fig. 3: (a). Background frame (b). Group of eight consecutive frames (c). Difference of background frames and the eight frames.

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7. CONCLUSION

A new moving object detection and segmentation based on differencing and summing technique is presented in this paper. This method is simple and low in computational complexity as compared to traditional object identification and segmentation technique. This method efficiently identifies the moving objects and segments them from the static background. However, this method does not consider the shadows of the moving objects, so they are also segmented as moving objects if they are large as compared to the threshold values.

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