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Movement Detection Using Image Processing

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Abstract: ***In this paper, we present an algorithm for moving object detection from video sequences. Here we propose new method for the movement detection i.e. Background subtraction method .We establishes reliable background updating model by using threshold method to detect complete moving object. By using filtering background disturbance and noise will be eliminated. The used method will quickly and accurately runs and fit for real-time detection.***

Keywords: background subtraction; background model; moving object detection.

1. Introduction

Detection of moving object in an image sequences is crucial issue of moving video. A very common difficulty in the detection of moving object is the presence of ego motion. We solve it by computing the dominant motion . Visual surveillance is a very active research area in computer vision. The use of this concept in surveillance for security, fight against terrorism and crime. The main task includes motion detection , object classification ,tracking activity. The detection of moving objects in video streams is the first relevant step of information extraction in many computer vision applications. Many organizations and institutions needs to secure their facilities thus need to use security and surveillance systems that are equipped with latest technology. Intelligent video sensors were developed to support security systems to detect unexpected movement without human intervention. The important information of move , location , speed and any desired information of target from the captured frames can be taken from the camera and can be transferred to the analysis part of the system. Movement detection is one of these intelligent systems to which detect and tracks moving targets. There are different methods to detect moving objects but these methods having some limitations for real time application. Due to this reason, in this paper we use background subtraction method, which is more suitable for real time application which gives accurate result.

In this paper we use method in which single static camera to capture video for that captured video we convert in to frame and apply background subtraction method with updating background.

2. Method Used For Detection of Moving Object

The inter-frame difference method modeled by mixture of Laplacian distribution and Gibbs random field is used for describing the label set [1].Representing moving images as set of overlapping layers. An image coding involves three parts encoder, representation and decoder . The most common image coding system used today based on Low level image processing concept like DCT's [2]. Tracking moving object in cluttered scene is also done by background modeling. Two processes involved in this method are technique to extract an initial background model when background situation changes at later time [3]. The knowledge segmentation and edge detection is used in this modeling. Different types of moving objects share similarities but also express differences in terms of their dynamic behavior and the nature of movement [4,5].

Different method used for movement detection .frame subtraction method is suitable for variety of dynamic environment but generally it is difficult to get complete outline of moving object, as result the detection of moving object is not accurate. Large quantity of calculation, sensitivity to noise, poor anti-noise performance makes Optical Flow method 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 anti-interference ability. The Background method is very sensitive to the changes in the external environment and has poor anti-interference ability.

3. Advanced Method Used For Movement Detection

This paper describes a real-time system for human detection, tracking and motion Analysis. The system is an automated video surveillance system for detecting and monitoring people in both indoor and outdoor environments. Detection and tracking are achieved through several steps: First, we design a robust, adaptive background model that can deal with lightning changes, long term changes in the scene and objects occlusions. This model is used to get foreground pixels using the background subtraction method. Afterwards, noise cleaning and object detection are applied, followed by human modeling to recognize and monitor human activity in the scene such as human walking or running. Techniques Used:

- Motion Detection
- Tracking
- Human Model
- Surveillance
- Motion Analysis
- Image Processing

3.1 Application of Background Subtraction Method

The background subtraction method is the common method of motion detection. It is a technology that uses the

difference of the current image and the background image to detect the motion region, and it is generally able to provide data included object information. 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, we use an effective method to initialize the background, and update the background in real time.

Input video is given as input which converted in to frame . From these frames images are separated. From these images initial background image is constructed. This image divided in to two images current frame image and background frame image. After separation background subtraction method applied to detect moving object for next frame background updated.

A. Background image initialization

There are many methods to get initial background image .Time average method can not deal with image shadow problems. While the method of taking the median from continuous multiframe can resolve this problem simply and effectively. So the median method is selected for background initialization.

B. 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. The camera is fixed; the background model can remain relatively stable in the long period of time. At this stage we 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.

C. Moving Object Extraction

To extract moving object dynamic threshold method is suitable by using dynamically changed threshold values according to lighting changes of the two images .This method effectively suppressed the effect of light changes.

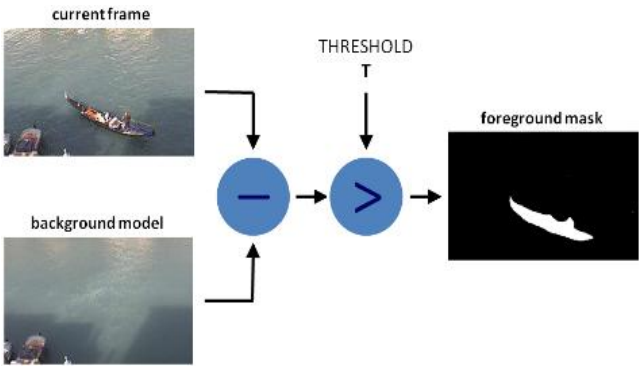


Figure 3.1: Background subtraction

D. Reprocessing

As the complexity of the background, the difference image obtained contains the motion region, additionally it also contains large number of noise. Therefore, noise needs to be removed. To remove this noise we use 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 too effectively to 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.

E. 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. Also it is seen that while moving object appears shadow will also appear in some region of scene. It will affect to accuracy of moving object detection. By using vertical and horizontal projection to detect the height of motion region. This will help to eliminate the impact of the shadow up to certain degree. 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.

4. Methodology

This system follows following stages to track moving object

Input video

Actually input video is taken from Real time camera is also possible and also we can able to apply pre defined video (MATLAB support only .avi format video)

Frame Separation

In this project we need to convert input video to frame's by using MATLAB. Combination of frame's is called as video. Each and every video have no of frames, by using that value we can take the no of frame's.

Current Image & Background Image

After converting video to frames first frame (image) is called background image, and other then first image are current image and these images are not similar at the time of moving object detection video. And also these current images are similar at the time of non moving object detection[20].

$$\Delta t = \lambda . \frac{1}{(M \times N)} \sum_{i=0}^{N-1} \sum_{j=0}^{M-1} |F(i,j) - B(i,j)| \quad \text{----(4.1)}$$

Then,

$$Dif\_frm\ (x,y) = 1\ |Fk(x,y) - Bk - 1(x,y)| > t + \Delta t \text{------(4.2)}$$

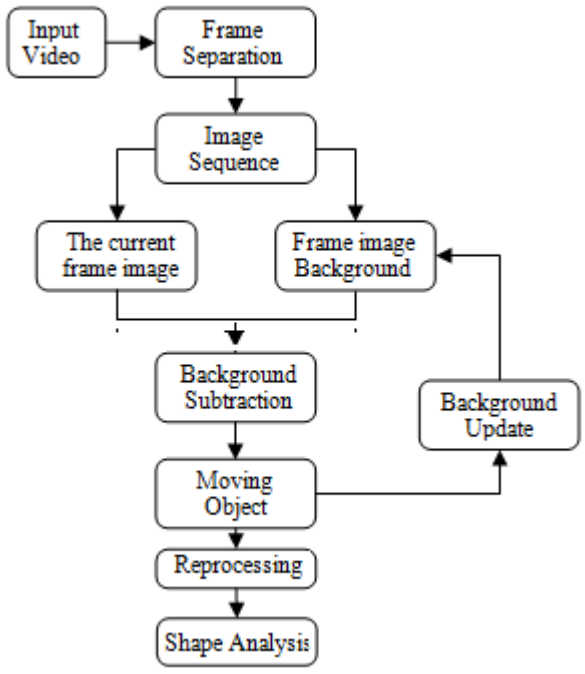
Background Subtraction

Background subtraction means we just subtract the current image and background image, and the current image is updated in each and every time, background image is constant. by using these technique we can easily find the

moving object. For ex. background image pixel – current image pixel
If the output is 0 means no moving object detected.
If the output is 1 means moving object detected.

Preprocessing & shape analysis
By using this technique we can identify the shape of the moving object (if there is any variation in background image and current image).otherwise no moving object is detected (if there is no variation in background image and current image).

Working flow of project
1) First we are taking one video file as input then we are going to convert video to "n number of frames" by using MATLAB. and save the frames in any format with proper name. Here we do 30 frames of taken video.
2) In frame separation we use image resizing .
3) In that video first frame is consider as Background image (say as previous image), other than first image we consider as current image. (and background image is constant but current image is different based on iteration and video). By subtracting background image from current image we get difference image. Before background subtraction we have to convert every current image from RGB to Grey scale.
4) For this difference image we apply thresholding as follows Difference image >35=1 otherwise 0
   For dynamic thresholding,
   Difference image >100=1.Otherwise 0
5) After background subtraction we are going to update the current image by using loop Fn.
6) Then we are applying the median filter for noise suppression.
7) Using Morphological functions we track object. If the background image and current image is similar means no moving object detected or moving object detected. For more than one object we use different outbox of different colors to track them.



8) In validation by comparing Ground Truth image with our output image we estimate the parameters like MSE , Entropy, Precision, PSNR etc.

Implementation

Technical Requirement
Software Requirements Platform: Windows 7
Programming Language: MATLAB Version 7.9.0.529 (R2009b)
Hardware Requirements: Main processor: Intel Core i3 processor 2.30GHz.
RAM: 4 GB Hard Disk: 160 GB

5. Result and Conclusion

The problems associated with the background-based moving object detection techniques are mainly due to the variations of ambient lighting. In this paper we introduced an effective moving object detection algorithm based on method background updating technique under conditions where illumination cannot be controlled.

We have also introduced the process of background updating in this technique, at every frame. That is why we introduced an improvement of this method that makes it function well even when there is a moving object detected in the scene (when background updating is locked out which makes the algorithm susceptible to illumination changes in that period). The new described algorithm was applied on three more video sequences and it also showed very good and promising results. One of the colored sequences had two moving objects. The proposed method succeeded to completely successfully detect the both moving objects in the scene independently of the luminance conditions. We showed in this paper the results obtained from the one of the used sequences that was the most convenient for the representation. The proposed algorithm, invariant to external luminance changes, has been tested under various lighting conditions, artificially simulated on the computer and with the moving object brighter and darker than the background, and satisfactory and promising results have been achieved.

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.

6. Conclusion

A real computer vision system able to model a stationary object background or a movement object background in cluttered environment has been presented. The proposed system is based on the modeling of the structure of the scene. The quality of the detection is improved when the background is highly texture .Therefore in our future works we will use this modeling method in our object tracking system for tracking rigid and non –rigid movement object . It will be used for to tracking multiple non-rigid movement objects in a cluttered scene.

7. Future Scope

Future work will be directed towards achieving the following issues:

Object classifications, Better understanding of human motion not only vehicle, including segmentation and tracking of articulated body parts .Improved datalogging and retrieval mechanisms to support 24/7 system operations .Better camera control to enable smooth object tracking at high zoom, in case, video is vibrating Video stabilization algorithm is required. Acquisition and selection of "best views" with the eventual goal of recognizing individuals in the scene.

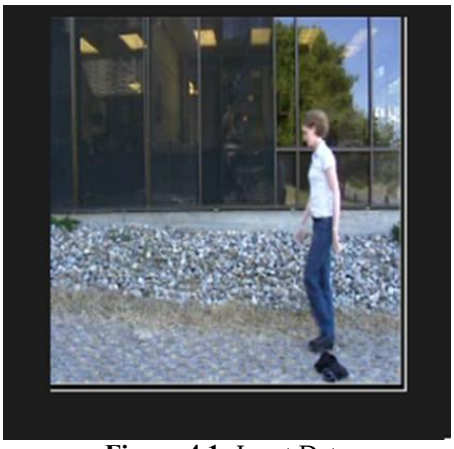


Figure 4.1: Input Data

Figure 4.2: Background subtracted image

Figure 4.3: Tracking object

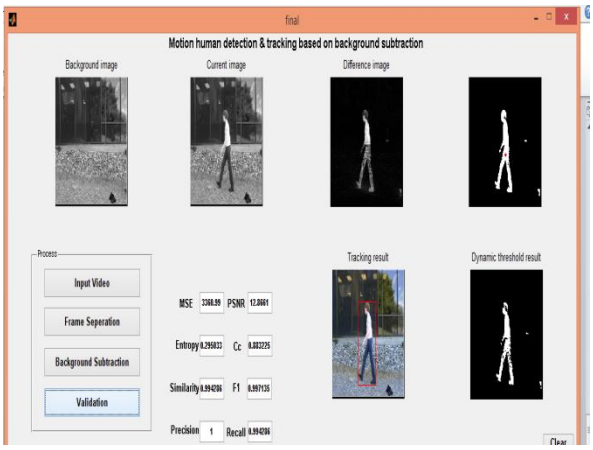


Figure 4.4: Output result of video

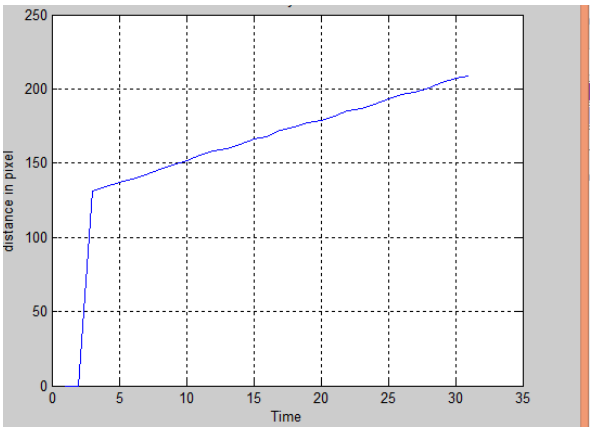


Figure 4.5: Graphical representation of movement of object as displacement Vs time

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