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Moving object detection in the real world video

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Abstract: *Detecting moving objects using stationary cameras has been responsible for reducing the reliability of many computer vision algorithms, including segmentation, object detection, scene analysis, stereo, tracking, etc. Therefore, detecting moving object is an important pre-processing for improving performance of such vision tasks. In this paper we proposed a method to extract the key frames, detect the moving objects . Firstly the video is segmented into shots after that the key frames are extracted. The moving objects is detected using background subtraction.*

Keywords*—moving object detection, background subtraction*

I. Introduction

In recent years, there has been a dramatic proliferation of research works concerning with content based video retrieval.

Video segmentation is first step towards the content based video search aiming to segment moving objects in video sequences. Video segmentation initially segments the first image frame as the image frame into some moving objects and then it tracks the evolution of the moving objects in the subsequent image frames. After segmenting objects in each image frame, these segmented objects have many applications, such as surveillance, object manipulation, scene composition, and video retrieval [1]. Video is created by taking a set of shots and composing them together using specified composition operators.

A shot is defined as an image sequence that presents continuous action which is captured from a single operation of single camera. Shots are joined together in the editing stage of video production to form the complete sequence. Shots can be effectively considered as the smallest indexing unit where no changes in scene content can be perceived and higher level concepts are often constructed by combining and analysing the inter and intra shot relationships.

Key-frames are still images extracted from original video data that best represent the content of shots in an abstract manner. Key-frames have been frequently used to supplement the text of a video log, though they were selected manually in the past. Key-frames, if extracted properly, are a very effective visual abstract of video contents and are very useful for fast video browsing. A video summary, such as a movie preview, is a set of selected segments from a long video program that highlight the video content, and it is best suited for sequential browsing of long video programs.
Colour component, or a colour channel, is one of the dimensions.

II. METHODOLOGY

In the following section we will explain the methods used in moving object detection:

Shot Segmentation

The video has to be split into "chunks" or video shots prior of conducting any video object analysis. Scene change detection, either abrupt scene changes or transitional (e.g. dissolve, fade in/out, wipe) is employed to achieve the video shot separation [2].
A shot can be defined as a sequence of frames taken by a single camera without any significant change in the colour content of consecutive images

III. Key frame extraction

Key frames may be one frame or some frames reflecting the main information content in the shot. The extraction of key frames is the selection of a frame image in the shot of represents the video contents of the shot. By the calculation of key frame extraction, the redundancy would decrease in the scene effectively [3]. For the selection of the key frames in the videos, the frame must can reflect the primary affairs in the shots, which exactly and fully describes the scene as much as possible.

IV. Motion detection

We assume that the camera for recording video data is stationary and the background changes are relatively slow to the target's motion in the scene. We use some image frames without moving objects to compute statistical quantities for the background scene. Then, we detect the foreground pixels and extract features [4].

We will explain how to extract moving objects in this sub-section.

V. Background image

The initial background image modelling is carried out over first few seconds image frames (n) according to the video shots.. With the assumption of no moving objects in those few image frames (n), build the reference colour background image with a normal distribution. We model the background by computing the sample mean $\mu(x,y)$ and variance $2\sigma(x,y)$ in the colour images over a sequence of those(n) frames. These statistics are calculated separately for each one of the RGB components by using the following iterative formula [5].

For image frame f=2,…,n , we have

$$[\mu(x,y)]_f = [\mu(x,y)]_{f-1} + \frac{1}{f}([C(x,y)]_f - [\mu(x,y)]_{f-1}), \quad (1)$$

$$[\sigma^2(x,y)]_f = \frac{f-2}{f-1}[\sigma^2(x,y)]_{f-1} + \frac{1}{f}([\mu(x,y)]_{f-1} - ([C(x,y)_f\ )^2$$

Where $[.]_f$, denotes the corresponding value at frames f, and $[\mu(x,y)] = [C(x,y)]$ and $[\sigma^2(x,y)] = 0$. Equations (1) can be shown by straightforward calculations that they yield the sample mean and variance over the first (n) image frames [4]. The sample mean is the background image. The background image of the $(x,y)^h$ pixel 's RGB values over the first (n) frames is given by [5] :

$$\mu(x,y) = [\ \mu_R(x,y)\ , \mu_G(x,y), \mu_B(x,y),] \quad (2)$$

and the variance of the $(x,y)^h$ pixel's RGB values over the first 30 image frames is given by[5] :

$$\sigma^2(x,y) = [\sigma^2_R(x,y), \sigma^2_G(x,y), \sigma^2_B(x,y)] \quad (3)$$

Which the image brightness changes sharply or, more formally, has discontinuities. The purpose of detecting sharp changes in image brightness is to capture important events and changes in properties of the world.

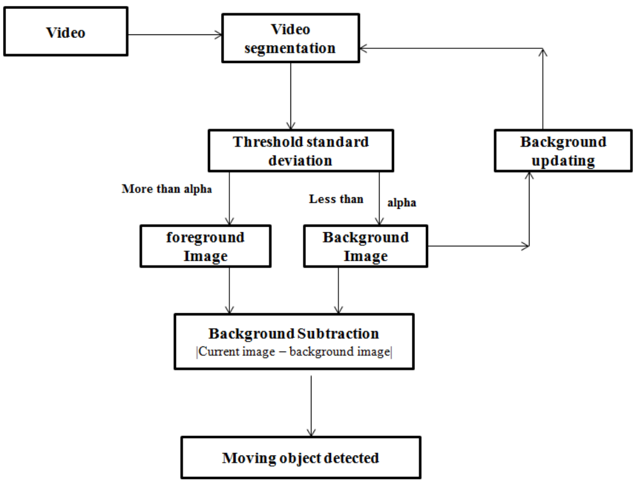

Figure1. Block diagram of moving object detection

i. Background subtraction

We defined the term "moving pixels" as the "foreground." In each new image frame $C(x,y)$, the foreground can be obtained by comparing their RGB values to the corresponding mean values. We first create a binary image $D(x,y)$, with the same dimension as the image $C(x,y)$, and set all its pixel values to 0. The output of the background subtraction method is defined as follows:

D(x,y) = (foreground) , if **[C(x,y)- μ(x,y)] > α. . σ(x,y)**
0(background), otherwise **(4)**

A pixel *(x,y)* is extracted as a foreground if it RGB values *C(x,y)*, satisfies the absolute difference value with μ(x,y), where the parameter α can be adjusted to yield more or less foreground. In all experiments of this paper, we use 3σ as the threshold in background subtraction.

ii. Background updating

The background cannot be expected to be stationary for a long period of time. We need to update the background parameters for the lighting changes. An adaptive scheme makes a constant updating of background as linear combination of previous background image and current image frame. The recursive estimation of mean and variance can be performed using equations (5.1) and (5.2). Equations (5.1) and (5.2) update the background image and sample variance, respectively [6,7]:

$$\mu(x,y)_f = \beta \, . C(x,y)_f + (1-\beta) \, .[\, \mu(x,y)]_{f-1} \qquad (5.1)$$

$$[\sigma^2(x,y)]_f = \beta \, .(\, C(x,y)_f - \mu(x,y)]_f)^2 + (1-\beta) \, . [\sigma^2(x,y)]_{f-1} \qquad (5.2)$$

Where , **C**(x,y) is the current image frame, $\mu(x,y)_f$ and $[\sigma^2(x,y)]_f$ are mean and variance values which updates the current image frame values, β determines the speed rate at which distribution parameters change. (0 < β < 1).

VI. Conclusion

In this paper, we apply the technology of moving-object tracking to content base video retrieval. We use background subtraction algorithm to detect moving pixels. Apart from moving object detection, the work can be done in eliminating shadows from the video.

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