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Background Subtraction Methods in Video Streams: A Review

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Abstract

Background subtraction is one of the most important parts in image and video processing field. There are some unnecessary parts during the image or video processing, and should be removed, because they lead to more execution time or required memory. Several subtraction methods have been presented for the time being, but find the best-suited method is an issue, which this study is going to address. Furthermore, each process needs to the specific subtraction technique, and knowing this issue helps researchers to achieve faster and higher performance in their research. This paper presents a comparative study of several existing background subtraction methods which have been investigated from simple background subtraction to more complex statistical techniques. The goal of this study is to provide a view of the strengths and drawbacks of the widely used methods. The methods are compared based on their memory requirement, the computational time and their robustness of different videos. Finally, a comparison between the existing methods has been employed with some factors like computational time or memory requirements. It is also hoped that this analysis helps researchers to address the difficulty of selecting the most convenient method for background subtraction.

Keywords: Image processing, Computer vision, Background subtraction, Video surveillance

1. Introduction

Background subtraction is a common approach in the image processing and computer vision fields. It means that the foreground of the image is extracted for further processing. Generally a Region of Interest (ROI) of the image can be several objects like humans, cars, texts, and so on in the foreground. After the image preprocessing step which may compose image de-noising, or filtering, object localization is needed that may make use of this method. Background subtraction is a widely used method to detect the moving objects in the videos obtained by static camera. The moving object detection between the source frame and current frame, which called "background model" or "background image" (Piccardi, 2004). Background subtraction is conducted if the image would be a part of a video stream. In shortly, the main goal of the background subtraction process is: obtained the frame sequence by one or more camera, detection of the objects in the foreground, and offer an explanation of the method. It means that detection of the foreground objects are known as the difference between the static background and current frame.

Background subtraction process is usually used in many applications which work on the video, such as video surveillance which is one of the hottest applications today, gesture recognition for interacting between human and machine, and also traffic monitoring, to name a few (Sebastian *et al.*, 2011). On the other word, the applications of background subtraction can be divided into four categories: Optical Motion Capture, Video Surveillance, Human-Computer Interfaces (HCI) for Interacting goals, and Content-based Video Coding.

According to previous research, too many techniques have been employed for background subtraction, which have different weakness and strength points in performance or computational costs. A robust background subtraction method capable to manage duplicate motions from cluttered backgrounds, lighting changes, and changes in the long-term scenes (Tamersoy, 2009).

2. Method

One easy approach for modelling the background is through a single color/grayscale image of moving objects in the scene which acquired without motion or estimated via a temporal median filter (Cucchiara *et al.*, 2005; Heikkilä and Silvén, 2004; Zhou and Aggarwal; 2001).