Research Paper

Volume : 3 | Issue : 12 | December 2014 • ISSN No 2277 - 8179

Detecting and Recognition of Object

Engineering

KEYWORDS : Edge Detection, Histogram, Thresholding

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ABSTRACT

In its simplest form, tracking can be defined as the problem of estimating the trajectory of an object in the image plane as it moves around a scene .Detection of moving object is the basic step for further analysis of video. Further, classification of object aims to categorize detected objects into predefined classes such as human, vehicle, animal, clutter, etc. Also it is important to distinguish objects from each other in order to track and analyze their actions more reliably depending upon requirement of user. So called produced output by tracking step is generally used to support and enhance motion segmentation, object detection and classification and higher level video activity analysis.

INTRODUCTION

Here we designed a smart visual surveillance system with real-time moving object detection, having tracking and classification capabilities, operating on both color and gray scale video imagery from a camera which is not moving. This designed system uses of an adaptive background subtraction scheme [2] which reliably works in indoor and outdoor environments for detecting moving objects. Initially, image noise should be eliminated through image preprocessing, accompanied by some specifically given work (such as region extraction and image marking) to do after the main operation of image segmentation for the sake of getting better visual effect. Image segmentation used is based on measurements taken from the image and might be grey level, color, texture, motion or depth. As a result of image segmentation is a set of segments that cover the entire image collectively. Edge detection is one of the frequently used techniques in digital image processing for determining the boundaries. The task of finding a given object in an image or video sequence is object recognition. Feature extraction of any object in an image extracts 'features' which are interesting points on the object to provide a "feature" description of the object, extracted from a training image can then be used to identify the object when attempting to locate the object in a test image containing many other objects [6]. Canny, Sobel, Prewitt, Roberts, LoG, EM algorithm, and Genetic Algorithm [3].are some algorithms used for image segmentation Experimentation is performed on gray scale image using MATLAB.

1. OBJECT DETECTION AND TRACKING

I. MOVING OBJECT DETECTION

Video processing based every application has different needs, thus requires different treatment. As in video most common thing noticed by almost every vision system is moving objects like vehicle, people etc. Commonly used technique for moving object detection is background subtraction, optical flow statistical methods and temporal differencing. We made use of background subtraction which is explained as under.

II. Background Subtraction

Background subtraction attempts to detect moving regions by subtracting the current image pixel-by-pixel from a reference background image. A threshold is defined, pixels having the difference above a threshold are classified as foreground, rest as background. Subsequently with the use of some morphological post processing like erosion, dilation, opening and closing to reduce the effects of noise and develop detected region. Figure 1 depicts the result obtained after background subtraction.

I. THRESHOLDING

Thresholding is the simplest method of image segmentation. During which, individual pixels in an image are marked as "object" pixels if their value is greater than some threshold value (assuming an object to be brighter than the background) and otherwise as "background" pixels. This convention is known as threshold above. Other variants include opposite of threshold above, threshold below. Another is threshold outside, opposite to it [4] is where a pixel is labeled "object" if its value is between two thresholds ,called threshold inside .Generally, an object pixel is given a value of "1" while a background pixel is given a value of "0."

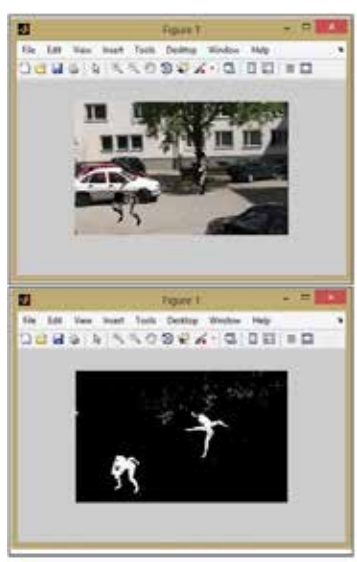

Figure 1 Background Subtraction

Thus, a binary image is created by coloring each pixel white or black, depending on how pixels are labeled.

A. Threshold selection

The key parameter in the thresholding process is the choice of the threshold value (or values, as mentioned earlier). Several different methods for choosing a threshold exist; users can manually choose a threshold value, otherwise a value can be computed automatically by algorithm, which is known as automatic Thresholding [5] for a noiseless image with uniform background and the median or mean will work well as the threshold for that image. Another well calculated approach might be to create a

histogram of the image pixel intensities and use the valley point as the threshold of an image. This approach assumes that there is some average values for both the pixels of background and object, but that the actual pixel values have some variation around these average values of the pixels. It can be computationally heavy, and image histograms may not have valley points clearly defined, making the selection of an accurate threshold difficult for particular application of image processing.

II. HISTOGRAM

It is a graphical representation of data distribution and is used to enhance the image contrast or to determine the threshold values of an image. Histogram is a useful tool to analyze the brightness and contrast of an image based on intensity of pixels in a particular image. It figures out how the intensity values of an image is distributed and the range of brightness from dark to bright or vice versa. Thus an image can be enhanced by remapping the intensity values. Also it is used to segmentize an image into the several regions by thresholding of pixels.

A. HISTOGRAM EQUALIZATION

Histogram equalization redistributes the pixel intensity values evenly by using cumulative (sum) histogram as a transfer function or as a look-up table.

For histogram equalization, x, the input pixel intensity is transformed to new intensity value, by T, the transfer function which is the product of a cumulative histogram and a scale factor, needed to fit the new intensity value within the range of the intensity values of pixels.

$$x^t = T(x) = \sum_{i=0}^{x} n_i \frac{\text{max. intensity}}{N}$$

Where ni is the number of pixels at intensity I, N is the total number of pixels in the image.

3. RESULTS

In order to do object tracking in videos, I first did object tracking on stil images with the help of MATLAB using normal morphological operations like erosion, dilations, segmentation and then generated a program to find target set of objects in given images.

The output of that program is given below. As clear in the figure that the highlighted portion is the target object in the image.

After the completion of the above task that is to find target image in given image, then we come to apply the same to videos. The concept of videos is little bit different as there are number of frames. So we select first of video as reference and then apply the same concept of background detection on it to get and track the desire object as shown in figure 2.

In short, the methods we presented for "smart" object detection and tracking system which show promising results and can be both used as part of a real-time surveillance system or utilized as a base for more advanced research such as activity analysis in video.

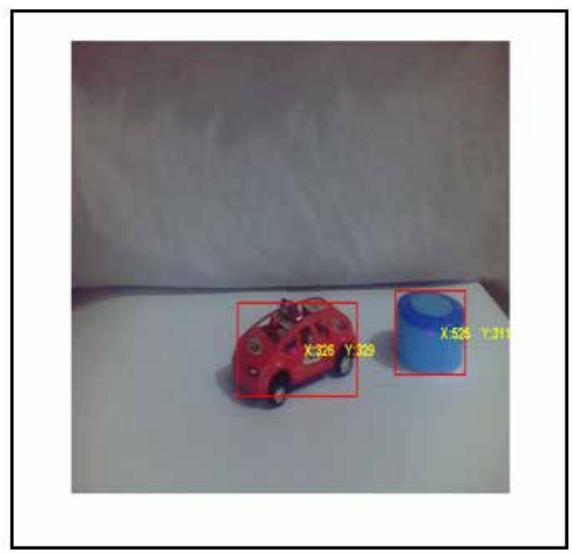

Fig 2 Result of doing object detection

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