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OBJECT DETECTION BASED ON SEGMENTATION TECHNIQUES

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Abstract

Image Segmentation is process of partitioning a digital image into multiple parts. The main objective of image segmentation is to represent an image or analyze the image in easier way. Image segmentation for object detection is used to find the object and analyze or process the object into clear information. This technique can be implemented when there is a overlapping or non-overlapping of objects or the objects that couldn't be detected manually. The segmentation is based on the measurements of objects and characteristics like color, texture, depth, motion, etc.

Keyword - Image Segmentation, Image recognition, Object Detection Techniques.

1. Introduction

Image segmentation is an important part of image processing and it also has various applications in engineering, bio-medicine and other areas. So far, a number of methods have been developed with the aim to identify the objects in the image. Object detection is one of the great challenges of computer vision. In this paper we propose efficient object detection and processing algorithm which is effectively used to localize the object by *edge detection, thresholding, region based* methods. Our method segments the possible object of interest before trying to recognize it, this is much faster than previous methods and is applicable to a variety categories. Our approach is based on identifying regions at the time of detection. Before segmenting, the image is enhanced by pre-processing methods, such as de-noising and adjusting of intensity, etc. The most common modern approaches scan the image for candidate objects and score each one. These methods are good to detect the presence of the object and can help point to the possible location of the object
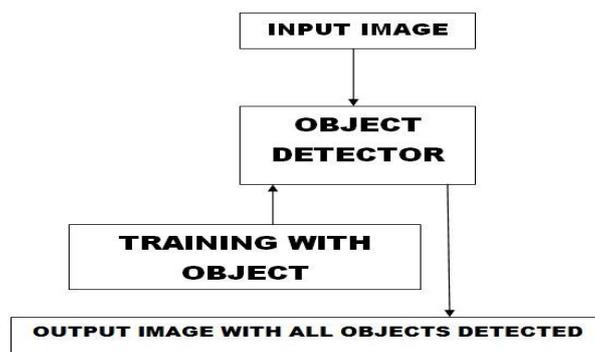
2. Segmentation Techniques

Image Segmentation is the process of dividing an image into many sub parts. So as to represent the image in different format, several techniques and algorithms have been developed.

Segmentation technique is classified based on

- Greyscale

- Texture

- Motion

- Depth

- Edge

- Color, etc.

Image Segmentation technique that are used in this paper are

- Segmentation by Edge Detection

- Segmentation by Thresholding

- Segmentation by Region based

Fig 2.0 Process involved in Segmentation.

2.1 Some of the techniques that were followed previously

2.1.1 Template matching

Template matching is a technique for finding small parts of an image which match a template image. In this technique template images for different objects are stored. When an image is given as input to the system, it is matched with stored template images to determine the object in the input image. Templates are frequently used for recognition of characters, numbers, objects, etc.

2.1.2 Color based

A simple and effective recognition method is to represent and match images on the basis of color histograms. However, it has the drawback that when the illumination circumstances are not equal, the object recognition accuracy degrades significantly.

2.1.3 Active and Passive

- **Window sliding**

Sliding-window object detection is a popular technique for identifying and localizing objects in image. The approach involves scanning the image with a fixed-size rectangular window and applying a classifier to the sub-image defined by the window

2.1.4 Shape based

Object recognition can be done employing a neural system that incorporates aspects of human object recognition, together with classical image processing techniques.

2.1.5 Local and Global Features

The most common approach to object detection is to slide window across the image, and to classify each such local window as containing the target or background. This approach is to use such sliding window classifiers to detect object parts, and then to assemble the parts into whole object.

3. Image Segmentation technique proposed now

3.1 Segmentation by Edge Detection

The effectiveness of many image processing also computer vision takes depends on the perfection of detecting meaningful edges. It is one of the techniques for detecting intensity discontinuities in a digital image. The process of clarifying and placing sharp discontinuities in an image is called the edge detection. The discontinuities are immediate changes in pixel concentrate which distinguish boundaries of objects in a scene. Variables concerned in the selection of an edge detection operator consist of edge orientation, edge structure and noise environment. Operators can be optimized to look for vertical, horizontal, or diagonal edges.

Fig 3.1.1 object before edge detection.

Fig 3.1.2 Object after edge detection.
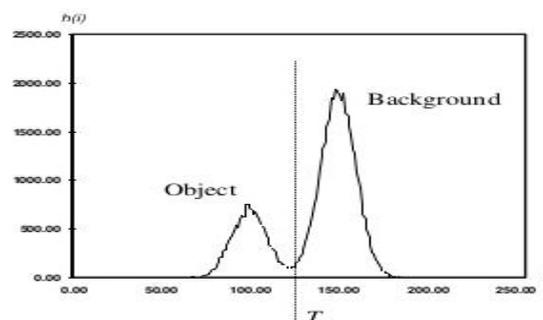
3.2 Segmentation by Thresholding

Thresholding is the simplest segmentation method. The pixels are partitioned depending on their intensity value. It is useful in discriminating foreground from the background. By selecting an correct threshold point T, the gray level image can be converted to binary image. The binary image should contain all of the essential information about position, shape, texture, etc., about the object of interest. Threshold technique can be local based or global based. Peaks and valleys of the image histogramcan help in choosing the appropriate value for the thresholds.

The chances of selecting a good threshold points are increased if the histogram peaks are:

- Tall

- Narrow

- Symmetric

- Separated by deep valleys

The factor that affects the suitability of the histogram for detecting a threshold point:

- The separation between peaks

- The noise content in the image

- The relative size of objects and background

- The uniformity of the illumination

- The uniformity of the reflectance

Fig 3.2.1 Detecting the threshold point.

3.3 Segmentation by Region based

An image is classified into a number of regions or classes with same properties or group of connected pixels with similar properties. REGIONS may correspond to objects in an image. Thus we need to partition an image into regions that correspond to objects or parts of object. Partitioning is done by using gray values of the image pixels. Those pixels are grouped together and marked.

Region based techniques are

- Region growing

- Region merging

- Region splitting

- Split and Merge

- Data clustering

- Partitional clustering
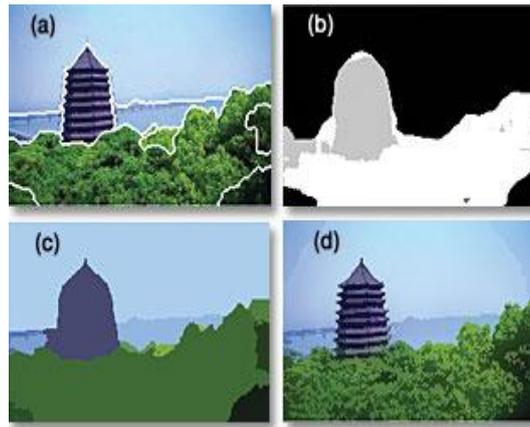
Fig 3.3.1 Segmentation by region based.

4. Literature Survey

4.1 Survey on Image Segmentation Techniques

This paper approaches two techniques: region based and edge or boundary based method and each of them is divided into several techniques. This image is segmented using a series of decision and there is no universal segmentation method for all kinds of images and also image can be segmented by using different methods. [1]

4.2 A Multi Object Image Segmentation C-V Model Based on Region Division and Gradient Guide

This paper proposed an adaptive level set C-V model based on region division and a gradient guide. This paper analyse the inferior of C-V model, find it difficult to process images with inhomogeneous intensity effectively, especially for multi-object segmentation. [2]

4.3 Color-BSED Object Segmentation Method Using Artificial Neural Network

This paper involves training a feature vector of each selected object pixel with its neighbours using color information gained from different color models, and considering the pixel and its neighbours allows the classifier to preserve some texture information. [3]

4.4 Segmentation for Remote Sensing Image With Shape and Spectrum

In this paper, a new segmentation method is proposed to incorporate shape prior and spectrum prior into variation

framework. The prior shapes are collected as training data, which are represented with the level set function and are

Projected onto a low dimensional feature space using PCA. [4]

5. Application

Agriculture:

- Crop analysis

- Soil evaluation

Astronomy:

- Analysis of telescopic images

- Automated spectroscopy

Biology:

- Automated cytology

- Properties of chromosomes

- Genetic studies

Civil Administration:

- Traffic analysis and control

- Assessment of urban growth

Economy:

- Stocks exchange forecast

- Analysis of entrepreneurial performance

Engineering:

- Fault detection in manufactured product

- Character recognition

- Speech recognition

- Automatic navigation systems

- Pollution analysis

Geology:

- Classification of rocks

- Estimation of mining resources

- Analysis of geo-resources using satellite images

Medicine:

- Analysis of aerial photography

- Detection and classification of radar and sonar signals

- Automatic target recognition

Security

- Identification of fingerprints

- Surveillance and alarm systems

6. Conclusion

This paper describes the analysis of object using different detection techniques. The previous techniques used for object recognition are template matching, color based, active and passive, shape based, local and global features. The modern techniques that are approached into this paper are region basedthresholding, clustering, edge detection. It uses MATLAB tool for processing an image. It provides a very easy platform for image acquisition and processing.

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