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Segmentation and Descriptors for Pattern

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Abstract
Image segmentation is an essential preliminary step in most automatic pictorial pattern recognition. The purpose of representation and description is used to be the application of Pattern. In the application of image processing, we have to choose an approach and to do description, just like recognition of the image.
Keywords: image processing, Pattern

1. Introduction
Segmentation is to subdivide an image into constituent regions or objects. In this paper, we apply many different approaches to detect the edge. After an image is segmented into regions, each region is represented and described in a form suitable for further computer processing [1].

2. Segmentation Edge-Based
There are three basic types of gray-level discontinuities in a image: points, lines, and edges. The most common way to look for discontinuities is to run a mask through the image[2]. And the response of the mask at any $u_1 = 3$ point in the image is given by

$$R = w_1 z_1 + w_2 z_2 + \ldots\ldots + w_9 z_9 = \sum_{i=1}^{9} z_i$$

3. Fourier Transform
- While a Fourier is useful for periodic functions, the Fourier transform or integral is used for non-periodic functions [14].
- While a Fourier is useful for periodic functions, the Fourier transform or integral is used for non-periodic functions.

The Fourier transform of a function $h(t)$ is,

$$H(f) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} h(t) e^{-2\pi i f t} dt$$

- For compactness we use the complex exponent function.
- The Fourier transform transforms from the *t* domain to the *f* domain.
- By convention time t is used as the functions variable and frequency as the transform variable.

$$H(\omega) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} h(t) e^{-i\omega t} dt$$

4. Descriptors for Pattern
The Fourier descriptors [3] are starting at an arbitrary point (x, y). Each coordinate pair can be treated as a complex number so that

$$s(k) = x(k) + jy(k)$$

This representation has one great advantage that it reduces a 2-D to a 1-D problem. The discrete Fourier transform of $s(k)$ is

$$a(u) = \frac{1}{K} \sum_{k=0}^{K-1} s(k) e^{-j2\pi uk/K}$$

for $u = 0, 1, 2, \ldots\ldots, K-1$. The complex coefficients $a(u)$ are called the Fourier descriptors of the boundary. The inverse Fourier transform of these coefficients restore $s(k)$. That is,

$$s(k) = \sum_{u=0}^{K-1} a(u) e^{j2\pi uk/K}$$

for $k = 0,1,2,....,K-1$. Suppose, however, that instead of all the Fourier coefficients, only the first P coefficient is used [4]. This is equivalent to setting $a(u)=0$ for $u > P-1$. The result is the following approximation to $s(k)$:

$$\hat{s}(k) = \sum_{u=0}^{P-1} a(u) e^{j2\pi uk/K}$$

The smaller P becomes, the more detail that is lost on the boundary. And the bigger P becomes, it more similar to boundary.

4 Statistical Moments

The shape of boundary segments can be described quantitatively by using simple statistical moments, such as the mean, variance, and higher-order moments [6] [7]. Let us treat the amplitude of g as a discrete random variable v and form an amplitude histogram $p(v_i)$, $i = 0,1,2,....A-1$, where A is the number of discrete amplitude increments in which we divide the amplitude scale, and p() is the probability of value vi. The equation of nth moment about its mean is

$$u_n(v) = \sum_{i=0}^{A-1} (v_i - m)^n p(v_i)$$

$$m = \sum_{i=0}^{A-1} v_i p(v_i)$$

An alternative approach is to normalize g(r) to unit area and treat it as a histogram. In other words, $g(r_i)$ is now treated as the probability of value r_i occurring. In this case, r is treated as the random variable and the moments are

$$u_n(r) = \sum_{i=0}^{K-1} (r_i - m)^n g(r_i)$$

where

$$m = \sum_{i=0}^{K-1} r_i g(r_i)$$

In this notation, K is the number of points on the boundary, and $u_n(r)$ is directly related to the shape of $g(r)$. Basically, what we have accomplished is to reduce the description task to that of describing 1-D functions.

Future Outcomes of the Present Study

Image segmentation is an essential preliminary step in most automatic pictorial pattern recognition. The purpose of representation and description is used to be future outcomes study in the application of Pattern. In the application of image processing, we have to present an approach and to do descriptors, just like recognition of the picture or pattern. An alternative approach is to normalize in other functions.

Basic Reference of Present Study

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