Chapter 16
Feature Extraction Algorithms to Color Image

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ABSTRACT

The existing image processing algorithms mainly studied on feature extraction of gray image with one-dimensional parameter, such as edges, corners. However, the extraction of some characteristic points to color image with three-dimensional parameters, such as the extraction of color edge, corner points, inflection points, etc., is an image problem to be urgently solved. In order to carry out a fast and accurate feature extraction on color image, this paper proposes two types of extraction algorithms to color edge and corner points of color image, i.e., similar color segment algorithm and pixel probabilistic algorithm, compares with the two algorithms, gives the two algorithms are used to different color distribution situations, as well as shows the extraction effect of color by the combination of the two algorithms, moreover, gives the contrast experiment and effect analysis of the two algorithms. To compare the similar color segment algorithm with the probabilistic algorithm, experimental results show that the similar color segment algorithm is better than the pixel probabilistic algorithm under the more obvious color edge, because it has the better edge detection, stronger anti-noise ability, faster processing speed and other advantages. Under the transition phase of color edge is gentle or color edge is no clear, the image detection effect of the pixel probabilistic algorithm is better than that of the similar color segment algorithm. But the combinative effect of the two algorithms is the best in this case, which is more close to the color effect of original image. Moreover, this paper analyzes the performance of the similar color segment algorithm, and gives the comparison of the proposed two algorithms and existing classical algorithms used usually to feature extraction of color image. The two algorithms proposed and these researches development in this paper have not only enriched the contents of image processing algorithms, but also provide a solution tool for image segmentation, feature extraction to target, precise positioning, etc., such as extraction of complexion, physiological color photographs processing, feature extraction of ionosphere, detection and extraction of biological composition of oceans, to be applied to a lots of departments, such as the police, hospital departments, surgery, polar department, and so on, as well as provide a way of thinking for the rapid, accurate detection of case, surgery, scientific research information search.

INTRODUCTION

At present, the data of color image is more and more. Because of the feature of color image that the amount of information is larger, its use was widespread concerned and used, for example, when the surgeon was operating some surgeries to implement operation positioning with the help of images often. But a few years ago, most of them were using a gray scale image, thus the success rate of a number of key operations is not too high. In recent years, most of surgeons operate the surgery by means of color Doppler ultrasound, color images, such as color picture or projection, the surgery success rates are improved a lot. To further improve surgical success rates, some image processing algorithms on feature extraction for edges and corner points of color image should be developed, and the developed algorithms should have some good features, such as fast speed, small operation, easy programming, etc. In addition, when the public security system implemented some detection of cases, it required to a fast and accurate extraction for some features, such as complexion, color video, texture of pictures, and searched for valuable information as soon as possible, all these needed urgently to provide a powerful tool. According to some acquired data of color images, such as aurora, ionosphere, geomagnetism, ocean, biology and meteorological data, the polar scientific research departments need to carry out the effective feature extraction, fine classification, and establish a rational database for some scientific researches, such as the environmental control of northern and southern polar, resource conservation, rational exploitation of resources, as well as renewable resources. These issues require the development of feature extraction methods or algorithms of color image for edges, corners, etc.

In image retrieval, calibration, classification, clustering, the effective feature extraction from the image is an important requirement. However, the color feature is one of the most widely used visual features. The color histogram is the most common method to denote the color characteristics. In the paper (Alamdar and Keyvanpour, 2011), it presented the feature extraction of color based on the square histograms. It prescribed for images with different sizes and quadtree decomposition of homogeneous wood, and extracted the color histogram of wood with the same size and skin feature of surface. In contrast to global color histogram, the image retrieval results demonstrated the feasibility and effectiveness of this approach. (Ilbeygi and Shah-Hosseini, 2012) gave a fuzzy recognition systems of facial expression, and carried out the facial recognition for color facial expression. (Aydın and Uğur, 2011) introduced a ant colony optimization method, as a general color clustering analysis method, and used the method to implement a classification and extraction for area of flower in color image. At the same time, it also presented an image segmentation method for flower image. According to flame color and vibrational frequency analysis, (Chen and Bao, 2012) presented digital image processing for the color of flame. For color image processing, (Lissner and Urban, 2012) implemented a unified color space based on perceptual image processing, (Bhuiyan, Khan et al., 2010) proposed a two dimensional empirical mode decomposition method, (Marques, 2011) discussed the actual image and video processing by using MATLAB tools. According to some examples of clinical application of medicine, (Galigekere, 2010) described the importance of applications of color images.

The edge is the most basic feature of image, and is the first step of image segmentation. Some classical edge detection methods and algorithms, such as, Roberts, Sobel, Prewitt, canny, Kirsch, Laplace, and other methods and algorithms (Bayro-Corrochano and Eklundh, 2011), all were almost to construct an edge detection operator for a small neighborhood of pixels in the original image, implemented the first order differential or second-order differential operation, sought a maximum gradient or zero-cross point of the second derivative, and finally select the appropriate thresholds to extract edge. Since these
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