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Technique According to the Calculation of Thresholds of Histogram Based on Overlap Areas for Reducing

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Abstract

In In this study, technique has been suggested according to the calculation of thresholds of histogram based on overlap areas for reducing noise while analyzing the functions of them. Suggested algorithm is to convert histogram extracted from color images to gray level and select overlap areas from extracted histogram. In addition, feature table is configured after extracting histogram in the relevant overlap area while comparing and retrieving for query and database video images by using this feature table. Suggested retrieval system has been confirmed to be more outstanding with retrieval function in video images with more noises than the system that only used color histogram.

Keywords : Overlap areas, Histogram, Thresholds, CBIR

1. Introduction

Current Internet era has been witnessing an increasing amount of audio-video information along with the development of network. Such multi-media information is expressed in various forms including photos, videos, graphics, three-dimensional models, sounds, or voices. Furthermore, as digital camera has come into wide use among public, it has become available for anyone to make and distribute digital photo images, and they are becoming a consumer and a supplier for video images at the same time. In addition, it has become more convenient to generate, transmit, and process digital image information according to the development of computer network that is represented by commercialization of high-functional personal computers and mass storage devices as well as world-wide-web. Therefore, images had been searched mostly by text-based system with queries in the past. However, such retrieval system has several problems. Text-based retrieval system requires an effort to setup keywords to well-represent each of the video on all the video images. At the same time, subjectivity of a user is included when setting up keywords. Therefore, there might be cases where it is not possible to setup unique keywords. Hereupon, research has been actively conducted on content-based retrieval system to effectively manage and search recently increasing video image data. Especially, there has been an increasing concern on effective extraction of features for video image retrieval. Feature information that is generally used on content-based video image retrieval includes color, shape, and texture, and feature information extracted from images is used as the following retrieval method[1-5].

Retrieval method in the use of color feature information is the most widely used. However, it has a weakness to be significantly sensitive with changes in the histogram including the changes in brightness or color[6-8]. Retrieval method in the use of shape feature information has a strength not to be influenced by the size or location of an object as it uses features for distinguishing contour of an object shape in the images. However, it has a weakness for being difficult to extract contours as the object contour is sensitive with conversion of a shape or direction. Retrieval method in the use of texture feature information is divided into a structural method to deal with the arrangement in regular space from the primitive image and a statistical method to analyze correlation among pixels in the image. Structural method expresses texture information by defining

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the structural primitive feature of video images and their locational rules. However, it has a weakness for how the size of primitive structure in the video image is large, and also that it is available to analyze only video images with regularity. In addition, as the simplest approach to describe the texture feature, statistical method analyzes spatial correlation among pixels to obtain statistical values representing one specific video image[9-11].

Content Based Image Retrieval (CBIR) system uses feature values of visual attributes extracted from video images. Therefore, it has an advantage of providing the retrieval with various query methods. However, effective extraction of feature values of low-level visual feature such as shape, color, and texture that represent database retrieval image data is the most important for effective information retrieval system[1-6].

Retrieval method in the use of color feature information is the most widely used. However, it has a weakness to be significantly sensitive with changes in the histogram such as changes in brightness or color[6-8].

In the suggested algorithm, color feature, one of the visual attributes that has been the most widely used in image retrieval, was considered. Color is strong against relative complicated background and is not influenced by the size and direction of an image. As mentioned above, it is very sensitive with the changes in histogram[7-9]. Therefore, this study suggests a technique by the calculation of histogram threshold based on overlap area for the accurate retrieval. Measurement of performance from the retrieval results is compared with the existing color histogram-based image retrieval algorithm.

This study is organized as follows. Chapter 2 states visual feature information for the image retrieval. Chapter 3 states suggested algorithm. In addition, conclusion is drawn in Chapter 4.

2. Visual Feature Information

2.1. Color Space

Color is a very important feature and is widely used in content-based image retrieval (CBIR) system.

Including the RGB that is widely used in general, color space includes Munsell, CIE L*a*b*, CIE L*u*v*, HSV (or HSL, HSB), YIQ, and etc. There is no specific one that is known to be the best, but different color spaces are based on RGB. In other words, other color spaces are configured with three values other than R, G, and B just like how RGB is configured with three values of R, G, and B.

2.2. Color Histogram

Color histogram is used for many image retrieval systems in general[6-9].

If color pattern in the color histogram is the only comparative method to extract data, it is an effective method for color image retrieval system. However, color histogram has a weakness to be significantly sensitive with the changes in the histogram including the changes in brightness or color[6-9].

If color pattern in the color histogram is the only comparative method to extract data, it is an effective method for color image retrieval system. Color histogram is strong against the slight changes in perspective axis and size, blockade, and viewing angles and also rotations. Any pixels in the video can be stated by each of the components in the color space. Distribution of pixels for quantized bin is defined by each component. Histogram containing many bins not only increases the cost of calculation but also is inappropriate for effective extraction for database of images. Furthermore, color histogram does not consider space information of pixels. Therefore, many of the different images can have a similar color distribution. Such issues of histogram become severer in database in large scale.

3. Suggested Algorithm

3.1. Technique in Reducing Noise by Calculation of Histogram Threshold Based on Overlap Area

In this study, technique has been suggested by the calculation of threshold of histogram based on overlap area. Fig. 1 represents an order of suggested algorithm.

First of all, histogram is extracted after converting color video images to gray level.

Second, it is to divide extracted histogram to eight areas in overlap followed by extracting seven overlap areas from these eight areas to select total fifteen histogram areas.

Third, histogram values are extracted from fifteen areas extracted from the second stage.

Fourth, feature table is configured with histogram values in fifteen areas extracted from the third stage.

Using this feature table, query images and database

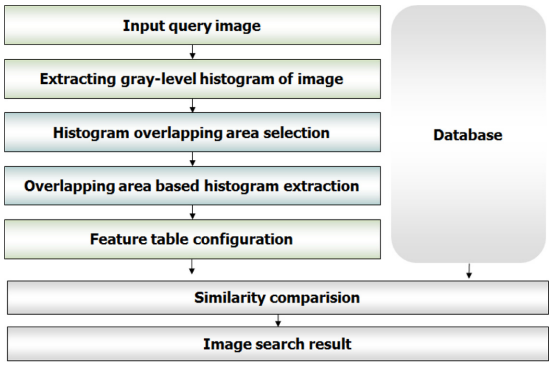

Fig. 1. Proposed algorithm flowchart.

NO	Histogram threshold based on overlap area
1	0 ~ 47
2	16 ~ 63
3	49 ~ 95
4	81 ~ 127
5	113 ~ 159
6	145 ~ 191
7	177 ~ 223
8	209 ~ 255

Overlap area	NO
16 ~ 47	9
49 ~ 63	10
81 ~ 95	11
113 ~ 127	12
145 ~ 159	13
177 ~ 191	14
209 ~ 223	15

Fig. 2. Overlapping area extraction.

Range	0 ~47	16 ~63	49 ~95	...	145 ~159	177 ~191	209 ~223
bin	1	2	3	...	13	14	15
Mean value	1.77	5.29	10.15	...	19.97	12.92	12.92

Fig. 3. Feature table configuration.

images are compared and retrieved. Therefore, configured feature table is a core element in this algorithm. After performing this operation on the entire images, feature values are saved in database. When entered images are retrieved, feature value information extracted by using the suggested algorithm on entered images is utilized to compare with images saved in the database and retrieve similar images.

3.2. Simulation

Content-based image retrieval system calculates visual similarity between query images and the ones in database instead of manually matching them all. As shown in the Fig. 4 and 5, it includes query of images instead of one specific image showing how images are

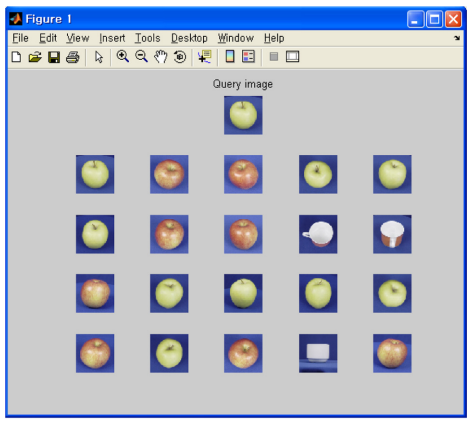

Fig. 4. Existing algorithm search results.

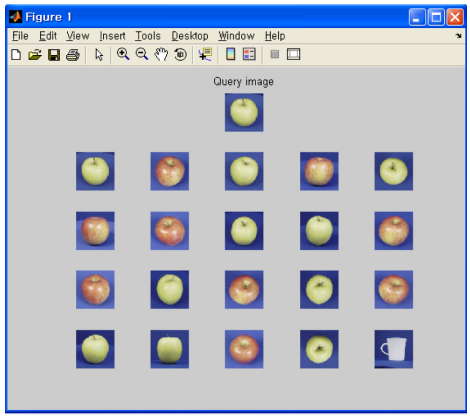

Fig. 5. Proposed algorithm search results.

listed in an order of similarity.

This experiment is analyzed when all the query images are identical. Firstly, query images are all maintained to be identical. Then, they have been defined to find about twenty similar images on the video image to be compared. Database is configured with three thousand JPEG color images in different sizes.

According to the results of simulation, suggested retrieval system turned out to be outstanding with retrieval function in images with more noise than the system in the use of only the color histogram.

4. Conclusion

In this study, technique has been suggested according to the calculation of thresholds of histogram based on overlap areas for reducing noise. Suggested algorithm is

to extract histogram in eight areas through overlap after converting the histogram extracted from color video images to gray level while extracting seven areas in the use of overlap parts in eight areas. Using the average of histogram values in fifteen extracted areas in overlap, feature table is configured. Using this feature table, query images and video images in the database are compared and retrieved.

Suggested retrieval system turned out to be more outstanding with retrieval performance in images with more noise than the system in the use of only the color histogram. It is anticipated to conduct researches on the image retrieval system in the use of other types of feature information.

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