Performance and Analysis of the Spiral Representation Spatial Feature in Color-Spatial Image Retrieval System

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Abstract

In this paper, we discuss the performance of the spiral representation of spatial feature in color-spatial based image retrieval system. The spiral feature of spatial feature successfully resolves existing problem of most color-spatial approaches. This spiral representation spatial feature is addresses rotation and scaling invariance better than existing approaches. It also detects and retrieves similar images appearing as a sub image in another image. Our result has also been compared to Wang(2000)'s approach for accuracy and retrieval performance. From the experiments, it shown that our approach achieved the higher and better retrieval accuracy.

1 . Introduction

Spatial information has been addressed as important feature in the image retrieval research to produce results that conform to human perception. Incorporating spatial feature in image retrieval is useful to capture more meaningful image contents to complement the basic information such as color and shape. This paper describes the spiral representation of spatial feature that is invariant to both rotation and scaling (used for partial image matching).

Next section will discuss the main problems faced by existing approaches.

2.0 Related works

The detailed study on the various approaches, exploring the strength and the weaknesses of the existing color-spatial approaches described in Wang (2003). As the summary of the comparison between the approach of [1,2,3,8,9,10] as discussed in Wang(2003) is shown in table 1.1

	Feature Extraction	*Feature representation*		*Image Matching*	
Approaches/ Characteristics	**Dependent on Image Color Cluster Set**	**Support Feature Scaling**	**Support Rotation Invariant**	**Whole image Detection**	**Partial image Detection**
Chua, Tan and Ooi[3]	Yes	No	Not	Yes	No
Jo and Um[2]	Yes	No	Limited	Yes	No
Chitkara, Nascrimanto and Mastaller[8]	Yes	No	Limited	Yes	No
Cinque, Levialdi, Olsen and Pellicand[10]	No	No	No	Yes	No
Kankanhalli[1]	Yes	No	No	Yes	No
Wang[9]	No	No	Limited	Yes	No

Table 1.1 Comparison of the various approaches reviewed

Limited rotation invariance is provided by [2,8, 9] for either a limited class of images or a limited degrees of rotations. All works reviewed tend to be dependent on image color clusters set with the exception of the approach of [9, 10]. None of the approached described is able to support feature scaling or partial image detection.

As such, the efficient and effective derivation of rotated features with the ability of detecting partial images is needed. This paper presents the performance of a novel color-spatial representation that addresses these issues.

3. Spiral representation of spatial feature

The spiral representation of spatial feature describes the color distribution of the image based on its bit signature. Each individual color has its own spiral representation. The image is extracted based on Spiral Extraction Method, where the sub area is extracted in a circular manner, starting from the inner square and read in a counter clockwise direction. The starting point of every square is at the left upper sub area and all sub areas of the image are read by going through each square to produce the Spiral feature that is the feature representation of the every single color.

This spiral representation of spatial feature can derive the spatial feature at different angles (e.g. 28 rotation from 0 to 360) as well as different sizes (e.g image 1x, ½x and ¼x) depending on the number of sub-areas the image is divided into. This will mainly contribute to retrieve images rotated at various rotations and to locate/detect similar images appearing as partial image.

Consider the sample SCM image in figure 1.1. The rotated bit strings can be derived from the original bit string by shifting bit(s) from each of the square for each single color. The shifting of bit in each square representing differing degrees of rotation as shown below

4th square is = 13^0 ,

3rd square is = 18^0

2nd square is = 30^0

1st square is = 90^0

Considering the best rotation coverage for the spatial feature, we will obtained 28 bits string all together from 0^0 to 360^0 with one rotation for 13^0 for every of a single color

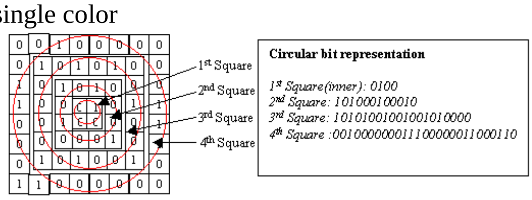

Figure 1.1Single Color Mapping Image