

AN EFFICIENT CONTOUR-BASED LAYERED SHAPE DESCRIPTOR FOR IMAGE RETRIEVAL

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ABSTRACT. *This paper introduces a novel contour-based shape descriptor for the retrieval of simple shape as well as complex shape images. In this method, the shape points are partitioned into three layers according to their distance to the center of shape distribution. For each layer, we calculate the distance, angle and pixel ratio as the features of a shape. The possible combinations of the features generate various descriptors, and we evaluate and compare their performance with that of curvature scale space (CSS) and angular radial transform (ART) descriptors, which are adopted by MPEG-7 Visual experimentation Model. The method provides good invariant properties in rotation, scaling and their combination. Experimental results show that the proposed method is better than CSS and ART descriptors in most tests. Furthermore, the new descriptor is much more compact and computational efficiency than CSS and ART for shape image retrieval.*

Keywords: Shaped image retrieval, Shape descriptor, CSS, ART, MPEG-7

1. **Introduction.** Content-based image retrieval is a critical technique for building and managing large size pictorial databases such as trademark, art galleries and picture archiving. Color, texture and shape are major features of images, which are used to develop a general image retrieval system. In some applications, such as trademark image retrieval and object recognition, color and texture information are insignificant or do not exist in the images. In such cases, shape would be the major descriptor. In the past few years, various shape descriptors have been developed in the literature, which are broadly categorized into two types: contour-based [1-5] and region-based shape descriptors [6-11].

Contour-based shape descriptors extract the boundary information and does not preserve the information of interior content. Therefore, it is only applied to the shape images with single closed contour. Contour-based shape descriptors include Fourier descriptor (FD) [1,2], wavelet descriptor [4], chain code [5], polynomial approximation [12] and CSS descriptor [13-15], etc. Spectral descriptors [1,2] are derived from spectral transform on shape signatures. However, Shih and Chen [16] noticed that these methods are sensitive to boundary pixel number. For the shape representations in [5,12], the main drawback of the structure approaches is that there is no formal definition for an object or shape. Therefore, it is ineffective to be applied to more general cases [13]. CSS descriptor was adopted by MPEG-7 for single-contour shapes. The main drawback of CSS descriptor