

ROUNDNESS CURVE OF SHAPE AND APPLICATION

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ABSTRACT. *Object shape recognition is important in computer vision and machine learning. Previous works have used circularity to describe the shape feature for different objects. However, the circularity is insensitive to some objects, especially the objects with similar shape. In this paper, we propose an alternative shape feature, roundness curve, to represent the shape of object. The roundness curve is generated by applying the central projection method to binary images. First of all, centroid of each object is calculated. Then, the centroid projects radiate to acquire projection value in pre-defined directions. The roundness curve in an orthogonal coordinate system is established by the projection values and their indices on its two axes respectively. We use the proposed method in classification of kinds of microscopic cell images. Experimental results prove the effectiveness and robustness of our method, it outperforms the conventional circularity.*

Keywords: Roundness curve, Feature extraction, Shape feature, Classification

1. **Introduction.** An object shape lies at the interface between vision and cognition. Yet, a general shape descriptor for applications in industry, bio-medicine and robotics, is notoriously difficult to formulate, whose recognition is important in computer vision and machine learning. For medical image, after detecting the region of interest, the resulting segments can be described by shape features that are invariant with respect to shifts, rotations and scaling [1, 2, 3], a fuzzy binary decision tree was used to classify the segmented regions as masses or normal tissue using features based on shape, region size and contrast [4].

Automatic analysis systems based on shape feature were also invented. Early in 1980s, Thomson-TITN produced SAMBA200 for colored cell image analyzing [5]. It can analyze up to 41 parameters such as shape, color, intensity for blood cells and marrow cell. Academic institutions in MIT and Yale further put this work onto the Internet and process a large amount of microscopic images for retrieval and recognition [6, 7].

Microscopic image is used to observe the microcosmic objects. Morphology analysis of microscope image is widely used. Especially, the microscopic cell image morphology has been used in biology, medicine, agronomy, material, chemical industrial, etc. Most of these works are done manually. However, the manual approach is time consuming