

# Review on Shape Classification Techniques

Meetal Kalantri<sup>1</sup>, Amit Fulsunge<sup>2</sup>, Rahul Dhutur<sup>3</sup>

P.G Student, Department of Electronics Communication Engineering, TGPCET, Nagpur, India<sup>1</sup>

Assistant Professor, Department of Electronics Engineering, TGPCET, Nagpur, India<sup>2</sup>

Assistant Professor, Department of Electronics Engineering, TGPCET, Nagpur, India<sup>3</sup>

**ABSTRACT:** Nowadays, all the images are generated in digital form. There is growing interest in finding images from the databases. The images should be represented or described in some features, so that they can be find out. The important visual feature of an image is shape. Using shape as a feature to search the images is grabbing much attention. There are many shape description and representation techniques used all over the world. In this paper, we review such techniques. The procedure of each technique is examined and discussed.

**KEYWORDS:** Shape, Hidden Markov Model, silhouettes, articulations, contour.

## I. INTRODUCTION

Our visual system uses shape as an important feature to recognize and order the things in the world that surrounds us. The shape of objects or of regions of interest plays a fundamental role in shape classification. Therefore in the attempts to equip machines with recognition capabilities, shape classification has always been an important topic. An important class of shape classification techniques is based on the representation of the boundaries of objects and its skeleton. In many applications, such as for example character recognition. Computer analysis of microscopic slides and many industrial inspection tasks, two-dimensional shape analysis turns out to be important task. The importance of shape as a tool for analysis, ordering and classification has led to the study of shape in many, diverse fields of science and has resulted in an abundant literature on this topic. Because the properties of objects are largely dependent on their geometric features, shape analysis and classification are essential to almost every applied scientific and technological area. There are some criteria to distinguish methods of digital shape classification as follows:

One criterion to distinguish shape analysis techniques is the subdivision into information-non preserving and information-preserving techniques. Depending upon whether a shape can be reconstructed with a controllable level of precision from the representation.

A second criterion to distinguish shape analysis techniques is the subdivision into region-oriented and contour-oriented techniques, also referred to as internal and external techniques, respectively.

## II. RELATED WORK

M. Bicego [1] in this paper, the author has used HMM i.e. Hidden Markov Models for classification of planar shapes which are represented by the curvature coefficients. The approach is not based on any specific topology or a specific training algorithm. The focus is on HMM potentialities assessment, not on representation of actual object recognition system. HMM is a probabilistic model. The HMM is classification method is a Maximum Likelihood approach. If given an unknown sequence N, the probability is computed for each model and the N is classified as to that class for which it shows highest likelihood. The shape classification process includes stages such as object recognition, training which again includes two processes initialization of HMM and model selection and finally shape classification.

This approach has good results when tested with three different datasets and was found robust in presence of noise, shearing, rotation, occlusion and protrusion. But this technique cannot manage all shapes with holes. Also, as this method is based on curvature, it is very noise sensitive.

Y. Zheng [2], in this paper the author has formulated point matching approach as graph matching. And only rigid shapes are considered for study. In the graph each point is considered as node and if Euclidean distance is less than a

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threshold the nodes are connected by an edge. Then the match between two graphs is that one which maximizes the number of matched edges. First in problem formulation stage, point matching is formulated as graph matching. Then relaxation labelling is done. And then TPS-RPM algorithm is used for shape matching. The deterministic annealing algorithm and soft assignment technique are used to search for an optimal solution. This method is rotation invariant and robust to noise but it cannot be applied to non rigid shapes as well as 3D objects. A relaxation labelling based point matching algorithm is presented for nonrigid shapes.

T. B. Sebastian [3] in this paper the author has presented the approach for recognition of objects based on their silhouettes. This is a medial based i.e. region based approach. The distance between two shapes is measured and using shock graph technology shapes are defined. And then edit distance algorithm is applied for optimal path searching. This method was found effective in presence of articulations, shadows and highlights. But it is scale variant. Intuitive pairing is obtained from shock graph matching. And also the edit distance algorithm defines a shock graph sequence that helps in optimal transformation of one shock graph to another.

H. Ling [4] in this paper the author has proposed the use of inner distance as a shape descriptor. The length of the shortest path between specific points within the shape is known as inner distance. The inner distance is used as the replacement for Euclidean distance. First invariant signatures are build for 2D shapes by combining multidimensional scaling and inner distance. Then using shape context with inner distance a new descriptor is formed and a dynamic programming method is used for shape matching. This method is articulation sensitive, but it is sensitive to shape topology. The inner distance is not used for the shapes having large deformation and little part structure.

X. Bai [5] in this paper the author has used graph matching algorithm for recognition of the shape based on object silhouettes. In this method, skeleton graphs are matched by comparing geodesic paths between skeleton endpoints. It is a skeleton graph matching technique. Firstly the skeleton graph of the object or shape is build then they are matched based on shortest pair of end points. This method has good results in even in presence of stretching and articulations, also it needs less time to execute but this method does not have good results for the shape having larger protrusions. The shortest skeletal path between skeleton end nodes are considered, due to which the problem of skeleton junction endpoints is avoided and our approach is made more robust to contour deformation.

Cong Lin [6] in this paper the author has used hybrid descriptors i.e. two types of methods viz. the skeleton based method and the contour based method, overcoming the drawbacks of each one and using the advantages of each method, to classify the shapes. And in matching stage, the optimal path searching algorithm is used. It is based on bellman's principle. Thus the time and computational cost is saved. The Bellman's principle tells us that the optimal path is the concatenation of its two optimal sub-paths. The matching algorithm handles the matching of two different descriptors in different lengths successfully. The proposed method achieves rotation, scale and transition invariance. But the shape or object having large protrusion could be classified with accurate results.

### III. CONCLUSION

In this paper, the existing shape representation techniques has been discussed. There are two categories of shape description and representation viz. contour based and region based. The contour based method has several limitations. They are very sensitive to variations and noise. Sometimes, the shape content is more important than the contour feature. Thus, these limitations can be overcome by using region based method. They use all available shape information and they are robust too. Also they provide accurate image retrieval.

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