A Review of Shape Recognition Techniques

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Abstract—

Shape recognition is one of the key aspects in Computer Vision. From different point of views the problems of object recognition have been resolved and some of the modification in the recognition technique is still going on. This is the main reason that shape recognition is used in a huge number of applications with important challenges such as noise, degradations. In this paper a number of shapes recognition techniques have been defined from which researcher can get an idea for modified efficient techniques.

Keywords: CSS, robotics, Blurred Shape Model (BSM)

I. INTRODUCTION

Shape recognition plays an important role in machine vision applications. The shape of an object is a classic and effective feature of the object which has a significant role in object recognition. There are a number of visual information aspects and among them object recognition certainly has wide range of applications in robotics, fingerprint analysis, handwriting mapping, face recognition, remote sensors and so. Many methods for 2D shape representation and recognition have been reported. The effective recognition algorithm should be less complicated and more accurate. Curvature scale space (CSS), dynamic programming, shape context, Fourier descriptor, and wavelet descriptor are the example of these approaches [6]. Shape descriptors should be strong enough in order to guarantee intra-class compactness and inter-class separability in the presence of distortion. The shape of the object represents a group of pixels which is referring to an image. Shape detection methods, analyzes the objects in various ways based on features, colour and texture. A shape description procedure method generates a shape descriptor vector from a given shape and the descriptor helps in finding the recognition rate of an object. To design a robust recognition system, careful attention to the definition of pattern classes, pattern representation, sensing environment, feature extraction and selection, cluster analysis, classifier design and learning, selection of training and test samples and performance evaluation is inevitable.

There are two approaches which are most commonly used for shape recognition structural or syntactic approach because it uses primitive patterns to represent regular and irregular shapes. Any shape recognition with structural approach has three steps: (1) Extracting the structural feature of the shape, (2) constructing a feature space for comparing and (3) recognition [7].

II. LITERATURE REVIEW

In this section, we are presenting the research work of some prominent authors in the same field and explaining a short description of various techniques used for shape recognition.

A. REN Hong, **"Object Recognition Algorithm Research Based on Variable Illumination",2009[5]** proposed an algorithm which implements image segmentation using color information in the HSV color space obtain the pixel of the object, and use this pixel implement edge detection to recognize the object. Experiments show that this algorithm can recognize the object exactly in the different illumination conditions, satisfy the requirement of the competition.

B. Suhas G. Salve, **"Shape Matching and Object Recognition Using Shape Contexts", 2010[15]** proposed shape detection method using a feature called shape context. Shape context describes all boundary points of a shape with respect to any single boundary point. Thus it is descriptive of the shape of the object. Object recognition can be achieved by matching this feature with a priori knowledge of the shape context of the boundary points of the object.

C. Rong Wang,**"TOE SHAPE RECOGNITION ALGORITHM BASED ON FUZZY NEURAL NETWORKS", 2007[3]** proposed a toe shape description method based on geometric characteristics values of toe images. Corner detection is carried out on toe region, and the characteristic points which can describe the toe shape are confirmed by the edge of toe image. Through finding characteristic points whose distances to the centre are stable and which can distinguish different toe shapes and the correlation among them.

D. Ehsan Moomivand, **"A MODIFIED STRUCTURAL METHOD FOR SHAPE RECOGNITION", 2011[7]** proposed a method in which the main property of shape (centroid) is considered as a basic point for recognition. Then, two structural properties such as distance and angles between the centroid and shape contour are calculated. Finally, by combining these two structural features, a new Feature-Space is constructed. The proposed shape descriptor can measure periodical, smoothness and symmetry of shapes and can be used as a modified method for shape recognition.

E. Jon Almaz´an, **"A Non-Rigid Feature Extraction Method for Shape Recognition", 2011[4]** proposed a novel feature extraction technique, which uses a non-rigid representation adaptable to the shape. This technique employs a

deformable grid based on the computation of geometrical centroids that follows a region partitioning algorithm. The result is a shape descriptor that adapts its representation to the given shape and encodes the pixel density distribution.
F. Ruixia Song, **"The Method of Shape Recognition Based on V-system", 2010[1]** proposed a novel boundary based shape recognition method. First the contour of an object is regarded as a geometric graph, and the graph is expanded in a V-series, which transform the graph to the spectrum space and quantify overall feature of the object. Further a shape similarity measure algorithm based on normalized V-descriptor is presented.

G. S. Thilagamani, **"A Novel Recursive Clustering Algorithm for Image", 2011[2]** proposed a method involving two separate processes. The first process deals with detecting object parts of an image and integration of detected parts into several clusters and second process deals with over segmenting the image into super pixels using Novel Recursive Clustering Algorithm.
H. Yang Mingqiang, **"Shape Matching and Object Recognition Using Chord Contexts", 2008[14]** proposed a new effective shape descriptor, chord context, for shape description image retrieval. For a shape, the chord context describes a frequency distribution of chord lengths with different orientations and this method is unaffected by translation, rotation and scaling.

I. Donggang Yu, **"Shape Analysis and Recognition Based on Skeleton and Morphological Structure", 2010[11]** presents a novel and effective method of shape analysis and recognition based on skeleton and morphological structure. A series of pre processing algorithms, smooth following and liberalization are introduced, and series of morphological structural points of image contour are extracted and merged.
J. Tiago B. A. de Carvalho, **"Neighborhood Coding For Bilevel Image Compression and Shape Recognition", 2010[8]** proposed a coding scheme presents good results in the problem of handwritten character recognition. An algorithm to reduce the number of codes needed to reconstruct the image without loss of information is presented. Using the exactly same set of reduced codes, a lossless compression method and a shape recognition system are proposed.
K. Weiqi Yuan, **"Hand-Shape Feature Selection and Recognition Performance Analysis", 2011[9]** proposed hand shape recognition algorithm which defines that the main hand-shape features which used for identification are more than 10 kinds. The effects of the recognition performance are different for each feature. When few features with better specificity were selected for identification, the recognition accuracy could be close to that used all of the features. The specificity of each feature should be analyzed independently, in order to achieve a certain recognition rate using fewer features.

L. B.SATHYA BAMA, **"Content Based Leaf Image Retrieval (CBLIR) Using Shape, Color And Texture Features", 2011[15]** Propose an efficient computer-aided Plant Image Retrieval method based on plant leaf images using Shape, Color and Texture features intended mainly for medical industry, botanical gardening and cosmetic industry. They use HSV color space to extract the various features of leaves. Log-Gabor wavelet is applied to the input image for texture feature extraction. The Scale Invariant Feature Transform (SIFT) is incorporated to extract the feature points of the leaf image. The performance of the proposed method is proved to be more efficient than the existing algorithms by providing classification accuracy. Combining different color, shape and texture features extracted from the images enhance the accuracy of the system.

M. Zhenhai WANG, Kicheon HONG, "**A Novel Approach for Trademark Image Retrieval by Combining Global Features and Local Features",2012[17]** proposes a trademark retrieval algorithm combining the image global features and Local features. Experimental results show that this method not only keeps high precision- recall of SIFT features are superior than the method based on the single Zernike moments feature, but also improves effective retrieval speed compared to the single SIFT features.
N. Vikram Srivastava and Prashant Goyal, **"An Efficient Image Identification Algorithm using Scale Invariant Feature Detection", 2007[18]** propose an algorithm based on MATLAB based on Lowe's approach to extract image feature using scale invariant feature transform method.. The cost of extracting these features is minimized by taking a cascading approach in which computationally intensive operations are applied only to set of sample points which pass an initial test.

O. A. Kadir ,L.E. Nugroho,A.Susanto and P.I. Santosa, " **A Comparative Experiment of Several Shape Methods In Recognizing Plants",2011[19]** propose a combination of geometric features such as aspect ratio, compactness, moment invariant , Zernike moments and polar Fourier transform(PFT). Based on performance of several methods in the experiment, PFT out perform among others.
P. Mutasem Khalil Alsmadi, Khairuddin Bin Omar, Shahrul Azman Noah and Ibrahim Almarashdeh, "**Fish Recognition Based on Robust Features Extraction from Size and Shape Measurements using Neural Network", 2010[20]** propose a classifier for fish recognition using neural network and ANN. The classifier is able to categorize the given fish into its cluster and categorize the clustered fish into its poison or non-poison fish and categorizes the poison and non-poison fish into its family.

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Table1. **Comparative Analysis of Various Techniques**

Sr No	Paper Name	Author Name	Technique Used	Application Area	*Limitations*
1	The Method of Shape Recognition Based on Vsystem[1]	RUIXIA SONG	V-DESCRIPTOR	Recognize shape with noise, distortion ,partly masking	Applicable only on curved shapes
2	A Novel Recursive Clustering Algorithm for Image algorithm[2]	S. THILAGAMANI	Novel Recursive Clustering Algorithm(NCRA)	To identify an exact object using over segmentation	Requirement of training set
3	Toe Shape Recognition Algorithm Based on Fuzzy Neural Network[3]	RONG WANG	Fuzzy Neural Network	To recognize the toe shape of human for identification	Recognition rate is 92.8%
4	A Non-Rigid Feature Extraction Method for Shape Recognition[4]	JON ALMAZ´AN	Blurred Shape Model (BSM)	signature verification and shape recognition task	Recognition rate is 94.38%
5	Object Recognition Algorithm Research Based on Variable illumination[5]	REN HONGE	Using HSV color space	Autonomous Humanoid robot system	Lighting Conditions required
6	Shape Matching and Object Recognition Using Shape Contexts.[15]	SUHAS G. SALVE	SHAPE CONTEXT	Handwritten Digits, trademark images.	Requirement of training set
7	Shape Analysis and Recognition Based on Skeleton and Morphological structure[11]	DONGGANG YU	Morphological structure	image analysis, intelligent recognition	Applicable only on skeleton and Morphological structures
8	Neighborhood Coding For Bi-level Image Compression And Shape recognition[8]	Tiago B. A. de CARVALHO	Bi-level image compression method Huffman coding and RLE (Run-Length Encoding)	MPEG-7 Core Experiment Shape 1 part A2 and the binary image compression challenge database	Applicable only on binary images

III. CONCLUSION

. This paper presents a short description of various shape recognition techniques in order to make familiar with the object recognition in image processing. These techniques are based on a number of shape descriptors and can be used to evolve out a modified method of shape recognition

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