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Image Segmentation Using Wavelets

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Abstract-In our proposed technique we have first removed the noise using wavelet and then detected the corners and correspondence points of the image. Results are compared in order to find blurred image for final evaluation of true image. In this paper we presented an approach to measure the similarity between the two images by comparing the shapes for object recognition. This technique can be widely used in medical imaging.

Index Terms- Affine cost, boundary points, contours, image recognition, pixels, samples, warping.

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1 INTRODUCTION

In this work we have taken different sample pixel values to compare the results. We have used 10, 100 and 200 samples comparison to show that by using more samples we get a much better shape recognition. Two digits are taken as vectors of pixel values which are not similar but they appear to be similar to human observer when regarded as shapes. Our objective in this paper is to recognize shape similarity for object recognition. D'Arcy Thompson observed that related but not identical shapes can often be deformed into alignment using simple coordinate transformations. Fischler and Elschlager [1] operationalized such an idea by means of energy minimization in a mass-spring model. Grenander *et* al. [5] developed these ideas in a probabilistic setting. Yuille [6] developed another variant of the deformable template concept by means of fitting hand-crafted parameterized models. Also computational approach in this vein was developed by Lades *et* al. [11] using elastic graph matching.

We have developed a simple algorithm for finding correspondences between shapes. Shapes are represented by a set of points sampled from the shape contours (10, 100, 200 or so pixel locations sampled from the output of an edge detector are used). If we consider more samples, we obtain better approximations of the shape. Finding correspondences between the two shapes is equivalent to finding for each sample point on one shape the sample point on the other shape that has the most similar shape context. Also we can use nearest neighbour techniques for object recognition. The nearest neighbour techniques can be related to prototype-based recognition as developed by Rosch [18] and Rosch *et* al. [19].

The structure of this paper is as follows: We have discussed problem defining in Section 2. In Section 3, we have described shape-matching for object recognition. In section 4, our proposed technique is presented. In section 5, results and discussions are presented and concluded in Section 6.

2 PROBLEM DEFINITION

Identification of unidentifying objects by computing and analysing the edges or contour points and energy levels. So here we can identify the objects after comparison of an original or proposed data and segmented data. By finding the correspondence points boundary will be defined. Shape context matching is used for object recognition.

3 SHAPE MATCHING FOR OBJECT RECOGNITION

Mathematicians define shape as class under a group of transformations but for visual analysis this concept is incomplete. This only tells when two shapes are exactly the same. But a lot more is needed for shape similarity.

Bookstein [6] a statistician addresses the problem of shape distance, but assumes that correspondences are known but statistical approaches to shape comparison do not require correspondences.

There are two approaches of shape matching:

1) Feature based approach
2) Brightness based approach

Feature based approach

The 1D nature of silhouette curves leads to dynamic programming approaches for matching which uses the edit distance between curves.

This algorithm is fast and invariant to several kinds of transformation. Since silhouettes do not have holes or internal markings, the associated boundaries are conveniently represented by a single closed curve which can be parameterized by arc length.

Silhouettes are limited as shape descriptors for general objects as they ignore internal contours and are difficult to extract from real images.

There have been several approaches to shape recognition based on spatial configurations of a small number of landmarks. Amit *et* al. [1] train decision trees for recognition by learning discriminative spatial configurations of key points.

Brightness based approach

Brightness or appearance based methods offer a totally opposite view to feature-based methods. Instead of focusing on the shape of the contour or other extracted features, these approaches make direct use of the gray values within the visible portion of the object. One can use brightness information in one of two frameworks.

In the first case, we have the methods that explicitly find correspondences using gray scale values. Yuille presents a very flexible approach in that invariance to certain kinds of transformations can be built into the measure of model similarity, but it suffers from the need for human designed templates and the sensitivity to initialization when searching through gradient descent. Lades et al. [11] use elastic graph matching, an approach that involves both geometry and photometric features in the form of local descriptors based on Gaussian derivative jets. Vetter *et* al. and Cootes *et* al. [13] compare brightness values but first attempt to warp the images onto one another using a dense correspondence field.

The second category includes those which work without explicitly finding correspondences. Several authors have used discriminative classification methods in the appearance based shape matching framework. Some examples are the LeNet classifier [14], a convolutional

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neural network for handwritten digit recognition and the Support Vector Machine (SVM) based methods for discriminating between templates of pedestrians based on 2D wavelet coefficients and for handwritten digit recognition.We treat our object as a point set. Practically, a shape is represented by a discrete set of points sampled from the internal or external contours on the object. These are obtained as locations of edge pixels by an edge detector.For each point on the first shape, we have to find the best matching point on the second shape. This is a correspondence problem. But matching is easier by the use of local descriptor. Rich descriptors reduce the ambiguity in matching. A novel descriptor, the shape context is used that could play such a role in shape matching. Consider the set of vectors originating from a point to all other sample points on a shape. These vectors express the configuration of the entire shape relative to the reference point.

4 PROPOSED TECHNIQUE

The work on shape correspondence is presented by Gold *et* al. [15] and Chui and Rangarajan [17] in which they developed an iterative optimization algorithm to determine point correspondences and image transformations, where some generic transformation class is assumed like affine or thin plate splines. The cost function that is being minimized is the sum of Euclidean distances between a point on the first shape and the transformed second shape. The distances make sense only when there is at least a rough alignment of shape. Joint estimation of correspondences and shape transformation leads to a non convex optimization problem, which is solved using deterministic annealing [15]. The shape context is a very discriminative point descriptor, providing easy and robust correspondence recovery by incorporating global shape information into a local descriptor. In this work, the relationships between points and tangent lines in a shape are used for recovering correspondences.

By a finite set of correspondences between points on two shapes, one can proceed to estimate a plane transformation that may be used to map arbitrary points from one shape to the other. Affine model is used with some matrix and a translational offset vector parameterizing the set of all allowed transformations. We use the thin plate spline (TPS) model which is used for representing flexible coordinate transformations. Bookstein [7] found it to be highly effective for modelling changes in biological forms. The regularization parameter λ, controls the amount of smoothing; the limiting case of λ=0 reduces to exact interpolation. It is interesting to note that the highly regularized TPS model degenerates to the least-squares affine model.

5 EVALUATION AND RESULTS

In our proposed technique there are three methods to measure robustness to deformation, noise, and outliers. In each test, the model point is set to one of the above distortions to create a target point set. Proposed algorithm is used to find the best warping between the model and the target. Finally, the performance is measured by computing the average distance between the coordinates of the warped model and those of the target. But in practice, we will need robustness to segmentation errors which can be explored only in the context of a complete recognition system. The results shown are the comparison of different sample pixel values, using more samples we get a much better shape recognition. We have used 10, 100 and 200 samples for comparison to show the result.

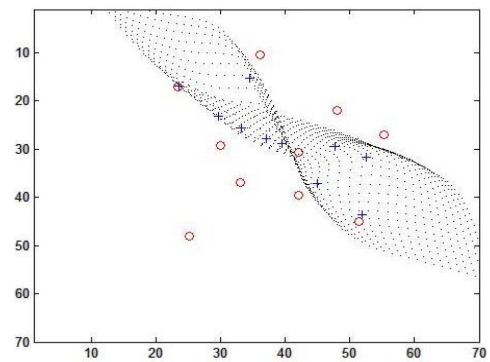

Fig. 1: 10 sample pixel values

Fig. 1 shows a graph which has 10 sample pixel values to represent two digit images. Figure shows that the sample values are not sufficient for the similarity of two images.

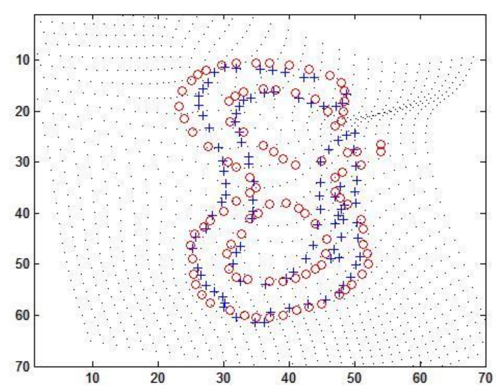

Fig. 2: 100 sample pixel values

Fig. 2 shows a graph which has 100 sample pixel values to represent two digit images. Figure shows that the sample values are little better for the similarity of two images.

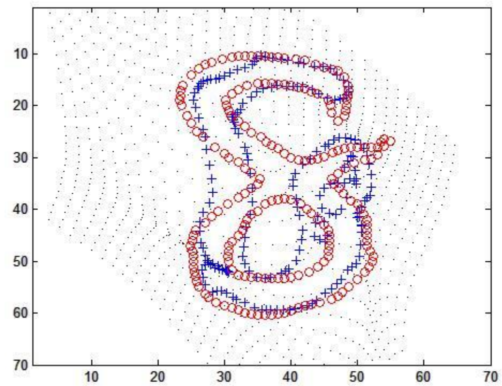

Fig. 3: 200 sample pixel values

Fig. 3 shows a graph which has 200 sample pixel values to represent two digit images. Here the sample values shows the much better approximation for the similarity of two images.

6 CONCLUSION

After analysing the energy, contour points and the edges, we can exactly identify the blurred, noisy image. As we can see in the figures above (Fig. 1, Fig. 2, and Fig. 3) that more the number of samples of pixels the better is the approximation of shape identification. This methodology can be used for identification of the tumour detection, cancer detection and other medical images to identify the exact location of that particular disease. This methodology can be used for other still images and identification of UFO's images.

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