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Partial Shape Matching for Scale invariant and Deformation Tolerant images By Using Encludeian Distance

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Abstract: The Partial shape matching for scale invariant and deformation tolerant images. Shape matching is a fundamental problem in computer vision and pattern recognition. Scale invariance is a feature of objects or laws that do not change if scales of length, energy, or other variables, are multiplied by a common factor. Deformation tolerance means tolerating a change in the volume and/or shape of object. The main idea is to develop a computationally inexpensive and transformation invariant measure of a shape boundary that can be used in shape recognition. Shape is an important cue as it captures a prominent element of an object . Shape matching amounts to developing computational methods for comparing shapes that agree as much as possible with the human notion of shape similarity. Shapes are represented as binary images depicting foreground objects over their background and developing a shape descriptor for a sampled boundary point of any shape

Keywords : Input binary image , Edge extraction of image, Traversed the image in predefined order, Perform sub-sampling of the extracted edge, Compute a point of an open, concave contour, Match the outer edge of source with the target image.

I. Introduction

The matching method operates on 2D images. Shapes are represented as binary images depicting foreground objects over their background [3]. We assume that the shapes have already been extracted from images and are represented by their bounding contours. The basic idea behind our approach is to represent each shape by a sequence of convex and concave segments and to allow the matching of merged sequences of small segments in a noisy shape with larger segments in the other shape [4]. A variety of shape matching algorithms are available to address the 2D shape matching problem such as, **Smith Waterman Algorithm,** Dynamic Time Warping algorithm, wedge wave feature extraction algorithm, Dynamic alignment matching algorithm, genetic algorithm etc.

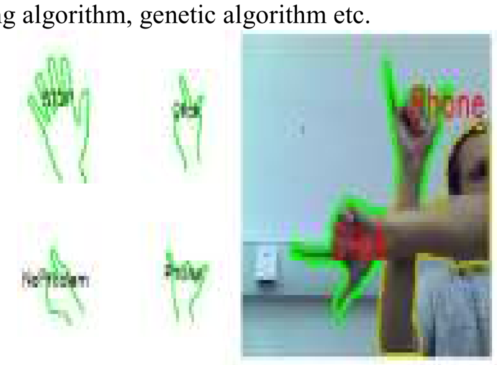

Fig 1: The four prototype parts in (a), need to be matched with the yellow, closed contour in (b). In (b), it is shown which of the four prototypes matched with parts of the closed contour and at which positions the best matches were achieved, based on the proposed partial shape matching method.

1.1 Pattern Recognition:

A pattern is an entity, vaguely defined, that could be given a name, e.g., fingerprint mage, handwritten word, human face, speech signal, DNA sequence etc. Pattern recognition is the study of how machines can observe the environment, learn to distinguish patterns of interest, make sound and reasonable decisions about the categories of the patterns. Pattern recognition techniques find applications in many areas: machine learning, statistics, mathematics, computer science, biology, etc.

Pattern recognition is the scientific discipline whose goal is the classification of objects into a number of categories or classes. Depending on the application, these objects can be images or signal waveforms or any type of measurements that need to be classified.

I.2 Partial Shape Matching:

Shape matching is an important ingredient in shape retrieval, recognition and classification, alignment and registration, and approximation and simplification. Partial shape matching is an essential process for image retrieval and computer vision. Its basic requirements are location-free, size-free, orientation-free, and noise-tolerance. We often treat image as shape. For example, image retrieval is a process searching similar shape from large amount of image data. Many shape matching methods have been proposed, but most of them can recognize only whole shape's similarity. For smarter search in image retrieval and recognizing occluded shape, partial similarity is quite important [2].

Shape matching is of central importance in a number of computer vision problems such as shape classification, retrieval, recognition, and simplification. The aim of this problem is to compute the resemblance of shapes using some similarity measure. Shape matching also deals with transforming a shape, and measuring the resemblance with another one. The quality of the shape matching process depends on whether its final outcome agrees with human judgment [3]. The Fig 1 shows some of the example of 2D shape matching and the process of shape matching is shown as Title no.3

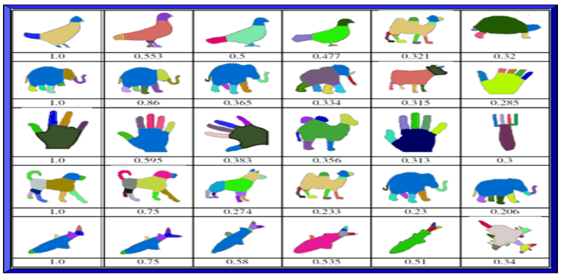

Fig2 : Examples of 2D shape matching

The process of shape matching :-

1. Input the test image

2. Extract edges of target image

3.Measure the similarity between source image and target image using any fast strategy/technique

4. Output the matching result.

3. Existing System

Shape matching is a problem that has been the focus of a lot of research. Three different classifications which adopted are Shape matching methods can be boundary depending on whether they exploit only the outline of image or also the interior of the shapes. A second classification is based on whether the shape matching method computes a similarity measure between the compared shapes or an alignment of the shapes. Shape matching methods can also be information preserving or not, depending on whether the used representations permit the recovery of the original shape [5]. A number of shape present matching techniques are based on some kind of shape skeletonization. Image skeletons are computed at multiple scales and use them to detect salient points on the contour of the shape [6] [7]. Sebastian et al. present a technique which that is based on the notion of shock graphs. Each shape can be considered as the resulting disturbance of a set of singularities (shocks) inside a fluid. Shapes that possess the same shock graph topology are considered equivalent. This is verified through a polynomial time, global optimization algorithm that performs graph comparison/matching [8]. Instead of relying on shape skeletal points, some other global methods are based on the representation and the properties of all interior points of a certain shape. Gorelick et al. propose the characterization of each interior point of the shape by the average distance that a random walker will travel before reaching it, assuming a starting point located on the shape's silhouette [9]. Wu et al. [10] employ genetic algorithms to search over the space of affine transformations. They describe representation and resampling schemas suitable for the specific application, and propose variations to improve the speed and accuracy of shape matching. Felzenszwalb et al. [10] represent each silhouette as a tree, with each level representing a different description level. The root of the tree represents a properly selected cut on the curve while the left and right children represent cuts on the occurring sub-curves.

The overview of all the mentioned algorithm which can be used for partial shape matching .

A. Wedge wave feature extraction algorithm:

Wedge wave feature extraction for partial shape matching is an essential algorithm for image retrieval and computer vision. This can recognize partial similarity with location-free, size-free, orientation-free and noise tolerant. Basic idea of this matching method is classifying convexity of shape's contour with wedge wave, the base of convexity, and detecting correspondences of convexities between two shapes. This method is also based on model of human visual information processing, in which shape matching consists of four phases: 1) image input, 2) shape description, 3) feature extraction, and 4) correspondence detection. Input image is black and white image and the shape is described as a set of discrete points.

Feature extraction is not just a process to extract features but also a process to classify feature. The best feature for shape matching is convexity, classification of a convexity as a feature consists of four factors.

- Location on the contour
- Direction facing contour
- Scale of convexity
- Class of convexity (sharp or dull)

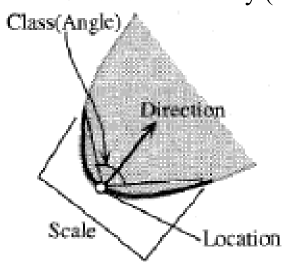

Fig 3: Convexity classification

Above figure shows what these classifications actually indicate concerning the contour**.** Wedge wave that consists of two line segments is a unit wave to express convexity, the size of basic wedge wave is calculated from the size of shape so that size independent classification can be performed. To utilize convexity as feature, this method is used [2].

B. **Genetic algorithm:**

The genetic algorithm (GA) is such a search and optimization method, which has developed to stimulate the mechanism of natural evolution and is powerful in finding the global or near global optimal solution of optimization problems. The genetic algorithm has found kinds of applications successfully and has shown to be of great promising. The genetic algorithm is adopted to get higher speed, better quality, and stronger self-adaptive ability [10]

C. **Dynamic Time Warping:**

Dynamic time warping (DTW) is an algorithm for measuring similarity between two sequences which may vary in time or speed. For instance, similarities in walking patterns would be detected, even if in one video the person was walking slowly and if in another he or she were walking more quickly, or even if there were accelerations and decelerations during the course of one observation. DTW has been applied to video, audio, and graphics — indeed, any data which can be turned into a linear representation can be analyzed with DTW.

A feature of DTW that is useful for the field of handwriting recognition is it being able to handle curves of unequal length i.e., curves that consist of a different number of points. This allows comparison without re-sampling. Because re-sampling usually deletes information or adds \false" information, it is better not to use it [3]

4. Proposed System Planning

System Development plan is given below :-

1. Input binary image
2. Edge extraction of image
3. Traversed the image in predefined order
4. Perform sub-sampling of the extracted edge
5. Compute a point of an open, concave contour.
6. Match the outer edge of source with the target image. by using Encludeain distance(Image template from database).

A. Shape representation:

The proposed descriptor is defined on open contour, i.e., the external contour of each input shape. At a first step, a given edge of image is uniformly sampled and one descriptor is computed on each point sample.

B. Contour extraction and pre-processing:

The input to the proposed method is a binary image containing a foreground object. The open contour of this object is extracted and traversed in some predefined order. Both shape description and matching require consistency with respect to this order. We proceed by performing a fixed sub-sampling of the extracted edge.

C. The proposed local shape descriptor:

The fundamental idea behind the proposed descriptor lies on measuring the distance of a certain open contour from the closest contour of the same image, along properly defined directions. An important issue is related to how the "inner" part of a shape is defined for an open contour. In practice, this is handled by defining open contours as parts of some closed contour, for which the inner part is unambiguously defined.

D. Shape matching:

Matching open contours against parts of closed contours i.e., the extracted edge of source image is then matched with that of the target image. And the matching is carried out by applying some sort of algorithm.

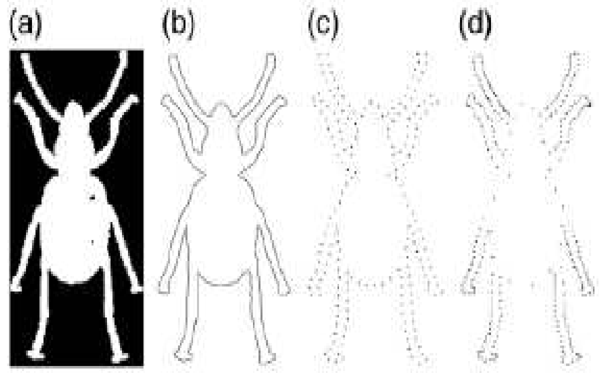

Fig 4: Shape pre-processing steps. An example input binary image is shown in (a) and the smoothed contour in (b). The fixed-rate and non-uniformly sub-sampled silhouettes are shown in (c) and (d), respectively.

5. Conclusion:

The above work presented a solution to the problem of partial shape matching. The key idea and main contributions of this work lie in the proposed shape descriptor, the scale dependent sampling, and the cost assignment for descriptor matching. The shape descriptor is robust under significant deformations due to articulation, efficient to compute and captures sufficient information to enable high performance. The problem of matching closed-to-closed contours is naturally treated as a special case. This work will prove to be most efficient for the problem of establishing the best match between an open contour and a part of a closed contour. As compared with other similar matching methods, this model can be used for image recognition and matching in practice.

We have future plans as follows for more sophisticated shape matching:

- Applying other matching technique
- Utilizing scale space (for roughly matching)
- Developing other applications
- Shape with multiple contour

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References

[1] S.Belongie, J.Malik and J. Puzicha. "*Shape and object recognition using shape contexts*", IEEE Trans. Pattern Analysis and Machine Intell. _ 24 (4): 509-522, April 2002.

[2] Koichi Mori, Masakazu Ohira, Motoko Obata, Koichi Wada, Kazuo Toraichi, "A Partial Shape Matching Using Wedge Wave Feature Extraction", Institute of Information Sciences and Electronics, University of Tsukuba Tsukuba, Ibaraki, Japan 305.

[3] Damien Michel, Iasonas Oikonomidis, Antonis Argyros, "Scale invariant and deformation tolerant partial shape matching", Image and Vision Computing 29 (2011) 459–469.

[4] Euripides G.M. Petrakis, Aristeidis Diplaros, and Evangelos Milios, "Matching and Retrieval of Distorted and Occluded Shapes Using Dynamic *Programming",* IEEE Transactions On Pattern Analysis And Machine Intelligence, Vol. 24, No. 11, November 2002.

[5] S. Loncaric, "A survey of shape analysis techniques",Pattern Recognition 31 (1998) 983–1001.

[6] R. da S. Torres, A.X. Falcão, "Contour salience descriptors for effective image retrieval and analysis", Image and Vision Computing Journal 25 (1) (2007) 3–13.

[7] R. da S. Torres, A.X. Falcão, L. da Fa Costa, "A graph-based approach for multiscale shape analysis", Pattern Recognition 37 (2004) 1163–1174.

[8] T.B. Sebastian, P.N. Klein, B.B. Kimia, "Recognition of shapes by editing shock graphs", IEEE International Conference on Computer Vision, 2001, pp. 755–762.

[9] L. Gorelick, M. Galun, E. Sharon, R. Basri, A. Brandt, "Shape representation and classification using the poisson equation", IEEE Transactions on Pattern Analysis and Machine Intelligence 28 (12) (2006) 1991–2005.

[10] A. Wu, P.W.M. Tsang, T.Y.F. Yuen, L.F. Yeung, "Affine invariant object shape matching using genetic algorithm with multi-parent orthogonal recombination and migrant principle", Applied Soft Computing 9 (1) (2009) 282–289.