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SYMMETRY INCORPORATED REGION GROWING BY SYMMETRY AFFINITY MATRIX

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Abstract

In this paper we present a symmetry incorporated region growing for color image segmentation. A set of characteristic points are determined using SURF operator. These key points are extracted from distinctive location from the images such as edges, blobs, corner etc., Itis a rotationally invariant method, that detects distinctive points with good repeatability. Next a feature descriptor is generated for each feature point. Then characteristic points were matched using descriptor. Then the symmetry axis is detected by means of characteristic points. Symmetry axis is used to find the symmetry affinity matrix. This matrix will give the symmetry level of the image. This symmetry level is integrated into region growing and segmentation has performed. This integrated region growing improves the performance of segmentation than ordinary region growing.

Key words: characteristic points, SURF, Symmetry, Affinity, Symmetry level

1.INTRODUCTION

Image segmentation entices a great attention in computer vision and pattern recognition. The segmentation is based on measurements taken from the image or from grey level, colour, texture, gradient, depth or motion .Although regions with coherences like color, intensity, shape and texture are segmentation successfully, most methods fail to achieve appropriate segmentation due to the unavailability of higher level features. Our project integrates the refined symmetry characteristics into the low-level characteristics like color, texture in region-based image segmentation to improve the performance of segmentation.Symmetry is an inherent observable fact in the world around us, stirring both naturally and in objects and architecture.Tuytelaars et al [18] detected consistent repetitions of planar patterns under perceptionusing a geometric framework. This approach perceived all planar homologies and findsreplications about a point, periodicities, and mirror symmetries.Abhinav Gupta, V. Shiv Naga Prasad and Larry S. Davis [15] projected amethod for extending the segmentation algorithm to discover symmetric regions present in natural images.T. Wan, N.Canagarajah, and A. Achim [9] projected a new numerical image segmentation algorithm, in which the texture partsbeformed with symmetric Alpha-stable deliveries.Michael M. Bronstein [7] proposed the difficulty of finding intrinsic symmetries of non-rigid shapes and proposed an effective method for their calculation. The homework of symmetric shapes became a keystone of crystallography. Detection of tumors in medical images can be founded by the deviancies from symmetric body structures and tissues.These methodologies are inspiring to use symmetry characteristic in image segmentation. So that the performanceof segmentation can be improved.

2 RELATED WORKS

Gareth LoyandJan-OlofEklundh [12] proposed a simple and effective method for grouping symmetric constellations of features and detecting symmetry in the image plane. Contemporary feature-based methods are habited to create pairs of symmetric point stints from which either two-sided symmetry axes or middles of rotational symmetry can be rationally determined. These symmetry pairs are grouped into symmetric groups of characteristics about mutual symmetry facts, recognizing the foremost symmetries and a set of characters associated with each point.Joachim S. Stahl and Song Wang [13] proposed a new grouping cost function that can mix the clues of closure, proximity, continuity, and symmetry. This alignment cost function be governed by boundary and region information to preserve away

fromconceivablepartialities towards the shorter boundaries. Robin Hennessy [8] find the problem of approximating automatically the symmetry plane of bilateral objects (having efficient or deficient mirror symmetry) in point clouds is retraced.This new algorithm, plow intoprocess byusing a multiscale, multiresolution system. It willbeprojected based onthe accuracy, robustness and speed on ground truth data, and real data.Alexander M. Bronstein [4] proposed a frame work for symmetries with elastic shapes and delivers the difficulties of full and partial symmetry discovery and organization. It allowed us to find estimate intrinsic symmetries that are impervious to bending of the shapes and detect and enumerate asymmetric distortions.

3 PROPSED SEGMENTATION METHOD

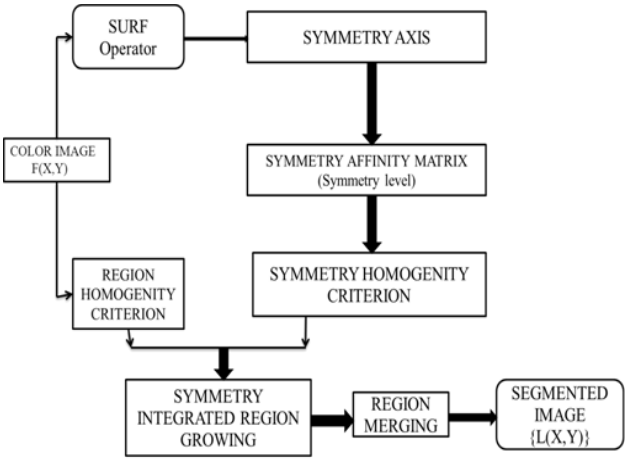

Fig (1) Block diagram for proposed system

The Fig(1) shows the block diagram for symmetry integrated region growing

3.1 *Feature point detection using SURF*

Each feature can be represent by a point vector describing its location coordinates. In our proposed method,Feature points are detected using SURF operator. SURF is based on amounts of 2D Haar wavelet responses and makes an efficient use of integral images. It make use of an integer estimation to find out the Hessianblob detector then it extremely computed in the integral image with three integer operations. It services the sum ofHaar wavelet response about the point of interest. These taskscan be computed with the support of the integral image. Feature detector iscreated on Hessian matrix because Hessian matrix deliversgood performance and accuracy.SURF algorithm is grounded on multi-scale space theory and the feature detector is based on Hessian matrix.

By using integral images SURF filters are using box filter approximation of second order Gaussian partial derivatives, meanwhile integral images allow the calculation of rectangular box filters in immediatepersistent time.

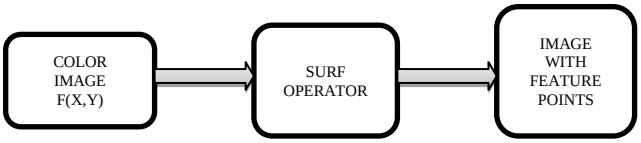

Fig (2) Feature point detection using SURF

SURF operator is directly applied to the color image, which detects the characteristic points existing in the image. These assemblies can be found at edges of images, but also at locations where the replication of light on specula exteriors is maximal that is light flecks. The SURF detector algorithm can thus be summarized by the following steps:

1. Form the scale-space response by convolving the source image using DoH filters with different σ
2. Search for local maxima across neighboring pixels and adjacent scales within different octaves
3. Interpolate the location of each local maxima found
4. For each point of interest(x, y, σ) the DoH magnitude, and the Laplacian's sign

3.2 Finding symmetry affinity matrix

Next step is computing symmetry affinity matrix.Vector distance is calculated for matching the similar feature points. This matching will give the symmetry pairs of the image. Symmetry affinity matrix is computed from these feature pairs.

3.3 *Symmetry level*

The symmetry matrix is used to calculate the symmetry affinity matrix. Each pixel has a symmetry

affinity value among 0 and 1. Affinity matrix computed by the Curvature of Gradient Vector Flow(CGVF).

3.4 *Integrated region growing*

Our method adds the high-level symmetry into the low-level region-based image segmentation method. It is impervious to the initial growing. We merging the Region homogeneity principle with the Symmetry homogeneity principle to complete the Symmetry Integrated Region growing Segmentation. The region homogeneity principle is the combination of color and texture. If both the pixel and its neighboring region are symmetric with their complements then both consumes low symmetry affinities and they will decrease the symmetry principle by which the pixel will more likely to be grown into the region to form a incorporated symmetric.

3.5 Region merging

In the course of Region merging adjacent regions are merged using merging principle.A region consuming high symmetry values with its symmetric complement region is added likely to be merged into adjacent region.Here we are usually seeing the adjacent pixels. These adjacent pixels are merged composed with respect to the seed pixel.

4 RESULTS AND DISCUSSION

In thisproject color image is taken as input image. Then SURF operator is applied to the input image. Feature points were detected using SURF operator.

(a) (b)

Fig (3) Feature point detection

SURF operator is directly working on color images.Fig 3 shows the output for feature point detection Fig (a) is input image and (b) shows the output for feature point detection using SURF operator

Fig 4 Feature point matching

Fig 4 shows the output for matching of same feature points in two images

(a) (b)

Fig 5 Segmentation

Fig 5 shows the segmentation result of the image based on the region growing with symmetry.

5. CONCLUSION

In this paper, a new symmetry integrated scheme is projected for region-based image segmentation to increase the performance. We accomplish this goal by incorporating symmetry into the region growing segmentation, in terms of the symmetry affinity matrix. The higher the symmetry presents in an image, the higher is the improvement for symmetry-integrated image segmentation. The overall segmentation performance is improved compared to the regular region growing, and the improvement is

achieved by the incorporation of symmetry by means of initial seed point. It will be very useful in medical application image processing, recognition techniques, tracking systems and multimedia applications.

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