ISSN: 2278 – 1323
International Journal of Advanced Research in Computer Engineering & Technology
Volume 1, Issue 3, May2012

Image Cataloging and Partitioning using Hierarchical Conditional Random Field Model

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ABSTRACT—:

The partitioning (Segmenting) and cataloging (labeling) images is a fundamental problem in Computer Vision. The hierarchical Conditional Random Field model deal with the problem of labeling images by object. When labeling a new image, select the cluster and use the associated CRF model to label this image. Given a test image, one first use the CRF model to obtain initial labels then find the cluster of the image. Finally, relabel the image by the CRF model associated with this cluster. To effectively compare and extract similar images, introduce a new image descriptor, the label-based descriptor which summarizes the semantic information of a labeled image. In this paper, labeling and segmentation results are shown for specific images.

Index Terms— CRF, Label Descriptor, position, appearance, structural

I. INTRDUCTION

Segmentation is the decomposition of an image into these objects and regions by associating every point with the object that it corresponds to. Most humans can easily segment an image. Computer automated segmentation is a difficult problem.

labeling identifies an object record of an information based on the labeling of object elements within an object record and labels object elements based on the identification of an object record that contains the object elements.

Simultaneous segmenting and labeling images is a fundamental problem in computer vision. The understanding of image and object identification is the core technology.

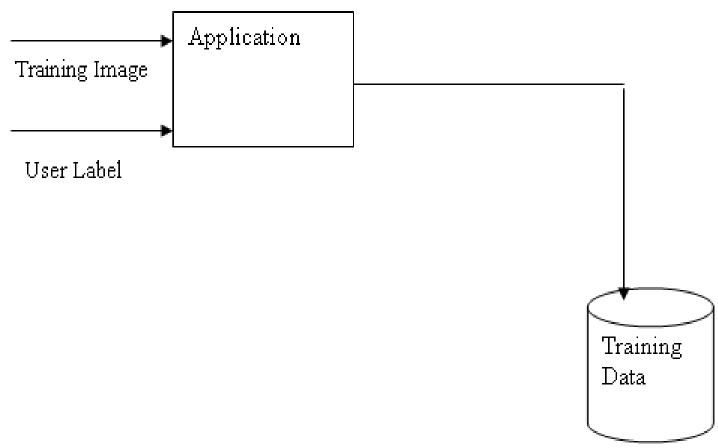

Figure1: Training Data Generation

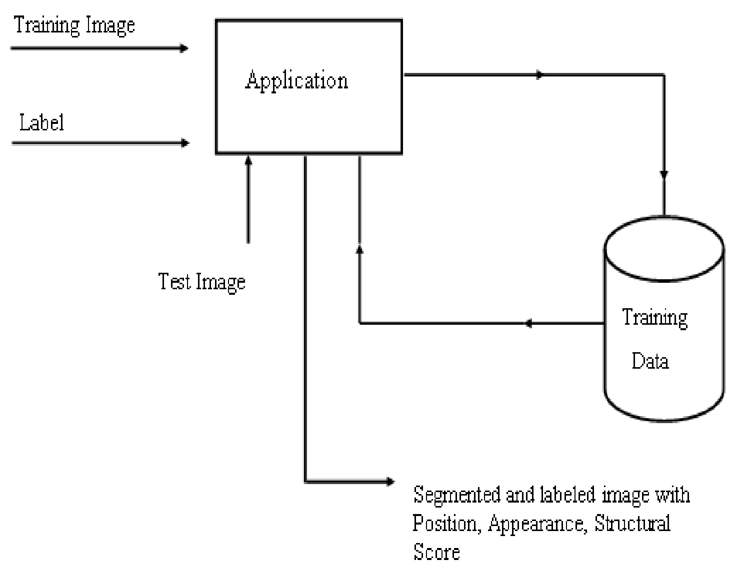

Figure2: Comparison of trained data and Test image

Firstly the training of image carried out then according to the test image type, the CRF tries to matches input image with trained image on the basis of probability.

II. MODELING METHODS

A. Positional information

To calculate position score is important factor to label and segment image in this paper. Let us consider hair portion of Human face. Hair Portion gets divided into 4 clusters say cluster1, cluster2, cluster3 and cluster4.Considering position for cluster1 say P1 = 1

Position for cluster2 say P2 = 0.9

Position for cluster3 say P3 = 0.8

Position for cluster4 say P4 = 1

So the position score (PS1) for Hair portion can be calculated by summation of P1, P2, P3 and P4. Let us consider there are two more portion in Human Face as Eye and Mouth. Following the same procedure as that of for Hair, Calculate the position score for Eye and Mouth portion. Then the mean position score for Human face calculated as

$$(PS1 + PS2 + PS3) / 3$$

B. Appearance Score

The appearance score calculated on the basis of LUV[15] points. Say There are 4 clusters in the Hair portion of Human Face. Each cluster having LUV points. Cluster1 having l1u1v1 points, Cluster2 having l2u2v2 points, Cluster3 having l3u3v3 points and Cluster4 having l4u4v4 points.

The LScore for cluster1 calculated as

$$1- (L – L1) / L$$

where L is Lpoints of trained image and L1 is L1Points of test image

The UScore for cluster1 calculated as

$$1-(U – U1) / U$$

where U is Upoints of trained image and U1 is U1Points of test image

The VScore for cluster1 calculated as

$$1-(V – V1) / V$$

where V is Lpoints of trained image and V1 is V1Points of test image

Then the total LUV score

$$= (LScore + UScore+ VScore) / 3$$

This calculated LUVScore represents appearance score for cluster1 say A1.Similarly For cluster2 say appearance score is A2, For cluster3 say appearance score is A3 and For cluster4 say appearance score is A4. The selection of maximum appearance score say A1 gives appearance score for Hair portion.

Similarly for Mouth selection of maximum appearance score say A5 gives appearance score for Mouth portion. And total mean appearance score for Face is (A1+A5) / 2

The implementation is as follows.

```
public double matchScore(AppearanceFeature testAppearanceFeature)

{

LUVModel testLUV =
testAppearanceFeature.getLuvModel();

System.out.println("luvModel = " + luvModel);

System.out.println("testLUV = " + testLUV);

double lScore=1-
error(luvModel.getL(),testLUV.getL());

double uScore=1-
error(luvModel.getU(),testLUV.getU());

double vScore=1-
error(luvModel.getV(),testLUV.getV());

double score=(lScore+uScore+vScore)/3;

return score;
```

}

C. Structural Score

Structural score means calculating the distance between two parts of the same object.

Consider the distance(d) between Hair and Skin is 10 units of trained image. The distance(d1) between Hair and Skin is 8 units of test image.

Then the structural score = 1-(d-d1)/d

=1-(10-8)/10

=0.8

Say 0.8 is the structural score1 for Hair and Skin.

Similarly Say 0.9 is the structural score2 for Hair and Nose and Say 0.7 is the structural score3 for Nose and Skin. Then Structural score for Human Face =

(structural score1 + structural score2+ structural score3) / 3

The implementation is as follows.

```
public findDistance(PositionFeature sourcePosition, PositionFeature targetPosition)

{

GridCell sourceCentroid =
sourcePosition.getCentroid();

GridCell targetCentroid =
targetPosition.getCentroid();

int dx = targetCentroid.getGridX() -
sourceCentroid.getGridX();

int dy = targetCentroid.getGridY() -
sourceCentroid.getGridY();

double distance = Math.sqrt(dx * dx + dy * dy);

return distance;

}
```

III. SEGMENTATION

Segmentation of images is a major task of image processing. There is no general segmentation procedure that can deal with all sorts of images, and the correct solution will always to a certain degree depend on subjectivity.

Segmentation refers to the practice of partition a various parts. The objective of segmentation is to simplify and/or modify the depiction of an image into something that is more significant and easier to analyze. Image segmentation is used to locate objects and boundaries in images. In this paper, image segmentation is done on the basis of clustering. The entire image having background white gets divided into clusters. At the time of training, the clusters are put according to identity parts of the image finally which generate label based descriptor.

After completion of successful training, the test image gets compared with the trained image. If it matches, it shows position score, appearance score and structural score according to image characteristics. When we select desired label that obtained at the time of testing, then that part gets segmented. The result of image segmentation is a collection of segments that the entire image. The results are shown as follows.

The above figures show the segmented and labeled results of the desired images.

IV CONCLUSION

In this paper, presents an approach to segment the image according to label generated during testing process. The trained image gets compared with the test image. If it matches, it shows position score, appearance score and structural score according to image. When we select desired label that obtained at the time of testing, then that part of the image gets segmented. This result is helpful to distinguish different parts of the image on the basis of label.

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