Practice 7: BSDS Benchmark

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Abstract

There are many methods to segment images. These methods are based on the characteristics of the image, in this way the pixels corresponding to each group can be clustering. Therefore, in this practice it is proposed to make a function to segment an image. This function has the objective of cluster pixels with similar characteristics. The algorithms that will be used to clustering the pixels are kmeans and gmm over yhe segmentation database BSDS500 of the University of Berkley will be used. In the same way, the results of the segmentation between the two methods and the UCM method are compared. All were compared with the presicion and coverage curves, with the results obtained, it was observed that the UCM method obtained the best results in F max and the area under the curve.

1. Introduction

The image's segmentation is the process that divide an image in different regions. One of the regions represent an object in the image or instance with different characteristics. For the study of segmentation, there are different methods based on parameters such as color, texture, shape, luminance, among others. So, the goal of this practice is to evaluate and compare the methods of segmentation by Clustering, from Kmeans and GMM's models, applicated in a color's space (Lab). Moreover, the results will be compare with UCM (ulta contorn maps) and to propose which of three is better on the consolidation of images presented in the BSDS500 database. Additionally, it is sought to compare the results obtained through the segmentation with these methods with ultra-metric contour map (UCM), .

2. Methodology

2.1. Materials - BSDS500 Database

This base data is composed by 500 images with their annotations. The data are divided in three subsets: training, validation and testing. For the development of this laboratory, the segmentation process was carried out on each of the images in the testing section. That images was natural images, the annotations made by humans for each image.

2.2. Materials - Benchmarks folder

the benchmarks folder had the codes that evaluated the results for the segmentation methods. The function All bench fast allowed to compare the annotations with the segmentations to different Clusters. The plot eval function allowed to graphic the curves with precision and coverage. This activity helped to compare between the inputs

2.3. Methodology

In this practice, two methods of clustering were used. The first, K-means, is a form of unsupervised grouping where a quantity of data in this case intensity of pixels, are ordered in number K of groups, where they approach the average value, forming groups with the same intensity. On the other hand, GMM was used, it corresponds to the mix of probabilistic distributions that in this case is a Gaussian. Through this method centroids or means of the same distribution are established, the limits between clusters is the variance of them that is calculated empirically, the groups are defined by the maximum probability of belonging to that group. For this laboratory, no improvement was applied to the previously performed method.

Finally, each function receives as parameters the number of groups desired, in the laboratory 7 random clusters were performed (3, 5, 8, 12, 15, 18, 20). These represent the groups that must be formed in the image by the similarity of intensities; additionally, these clusters are random, do not have a specification or method with which to predict the number of clusters needed or with better results. Finally, For the evaluation methods, the precision and coverage curves were used, exposing the relationship between the precision and coverage parameters for each segmentation method with each determined k value. For this case, the measures of interest were the F-max and the area under the curve. The coverage and precision curve informs

us how accurate segmentation methods are in the sense of how accurate the methods are compared to what is expected, evaluating the pixels that belong and correct, false positives or true positives. On the other hand, the curves have the expected route 1, which means that the result is perfect, it should be noted that for this database, all information above 80

3. Results

Next, the graphs of presicion - Recall.

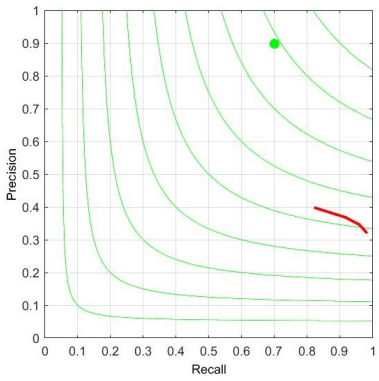

Figure 1: Results using K means, PR = 0.07 and best = 0.47

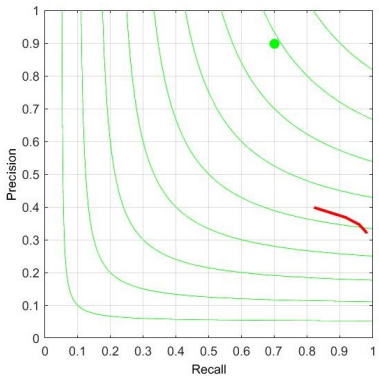

Figure 2: Results using gmm, PR = 0.49 and best = 0.4

4. Discussion

It was not possible to beat Pablo, according to the results, the area under the curve is greater in Pablo's method, in the case of the best method by us it was 0.1. It should be noted that the UCM method is based on first detecting the edges of the image and then focusing the regions of the image. In the case of clustering segmentation, the regions are first defined by the color intensities. Then, the edges are extracted according to the regions formed. In this way, when groupings are carried out, it can be noted that they are based

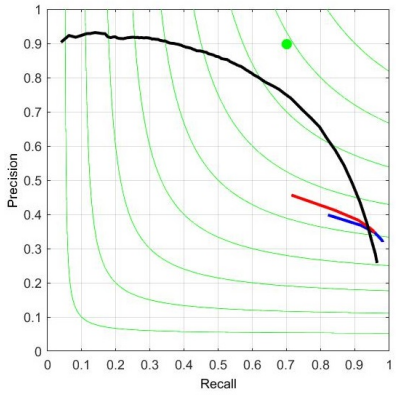

Figure 3: Segmentation obtained

on the color intensities; therefore, it only works with very noticeable changes. The second best method was GMM in the Lab space, the space of color is the same but change the method.

5. Conclusions

It was observed that the clustering methods are not very effective at the time of segmentation due to lack of labels, processing times and, in addition, they are very difficult to evaluate.

References