Lab 06-Textons and classifiers

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1 Description of the database

The database[1] contains 1000 gray scale in JPG format, all of them have a standard 640x480 pixels resolution. Images are close ups of a given object surface, thus, containing textures found in different objects. There is a total of 17 clases [1], each contains between 30 to 90 sample images in the train set and between 10 to 30 image sin the test set. Finally, there is a plain text file which specifies the naming convention for the images.

2 Methodlogy

Overall the mothodology used in this laboratory is presneten in figure ....

The original first step in the pipeline was the construction of a texton dictionary from the subset 'train'. However, due to hardware constrains, it was not possible to build this dictionary with the complete train set (750 images). Creating a texton dictionary with a set of 40 images already requires about 45 GB of RAM memory (At peak), and about 3 hours CPU time. For the experiments, a single 115GB RAM machine was availabe. As it was not possible to crate a dictionary with the ful trainign set, it was reduced to 85 images (5 images per class).

There is not a clear way to subsample the original training set while retaining the original data variability, in other words, it is expected that this sub samplig process should create some bias in the dictionary. However the nature of the dataset might help to mitigate this issue: textures are essentially local patterns repeated, with some variability, at the global level. Thus it can be assumed that each image contains several instances of these local patters, that already contain some of the variability of the texture.

To further test this hypotesis...

btreve experimento con 4 histogramas T1,5Imagenes T1n30I mages, T2n5Imagens,T2n30Image distancia chi-cuadrado

[1] The object clases are: Bark Wood, Water, Granite, Marble, Floors, Pebbles, Wall Brick, Glass, Carpet, Upholstery, Wallpaper, Fur, Knit, Corduroy & Plaid

2.1 Textons

After selecting the initial number of training images, there remains one final parameter for the construction of the texton dictionary, namely the K for the K means. For this matter we use a number of textons given by $K = c32$ ($c = 1, 2, 3$). The explanation behind this choice is that we expected the local patterns to closely match the shape of the filter bank; This is the case of c=1 $\rightarrow$ K=32. However, not every local pattern will match perfectly one of the textons on the filterbank. This is the case of $K = 2, 3$ where the resulting clusters might contain the response infomation of several fillters. No further values for c are explored mostly, due to time constrains.

The final setup for the texton dictionary construction is the following:

- Filter Bank: default filterbank provide in the implementatios 16 orientaions, 2 scales
- Number of training images: 85 (5 per each class)
- Number of clusters (N): 32, 64, 96

2.2 Texton Calculation on Test Set

With the 3 Texton dicionaries built we then calculate response of every image in the tets set filtered with the obtained textons. for each image we obtain 3 responses (3 dictionaries) wich are the repseneted by menas of an histogram where th number of nins depends on the value of K used for the construcction of the dictionary.

2.3 Classification

There are two methdos selectd for the classfication of the textures

Nearest Neighborg []

Random Forest []

References

[1] S. Lazebnik, C. Schmid, and J. Ponce. A sparse texture representation using local affine regions. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 27(8):1265–1278, Aug 2005.