CS365 Project
Indoor scene classification

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Abstract

Scene classification has now became an active area of research. A lot of work has been done on classifying images into outdoor and indoor catagories however, current approaches for scene recognition show a significant drop in performance for the case of indoor scenes. Classifying indoor scenes is a challenging task due to the large variation across different examples within each class.Besides spacial properties indoor classification requires us to see the objects they contain for a good accuracy. In this project we will try to exploit this idea to come up with a good accuracy classifier.

1 Introduction

One of the distinct features of humans is the ability to differentiate between things i.e. to be able to identify them and to link them with some prior information about the same. Similar is the concept of classification in artificial intelligence.Learning algorithms give us a method to find features and parameters which would be able to identify and classify different objects.
We consider here a similar basic classification problem.It is quite trivial for us to classify an image of an indoor scene but it is not the same for computers to do so. The problem of indoor classification has come up strongly in the last decade and it is still an open problem. Scene classification is an important task in navigation systems.The use of this classifier could also be in mobile robots which still lack the ability of understanding their surrounding place.

2 Related Work

There are many ways in which previous works have approached this problem.Earliest methods tried were by using global image features e.g. color,texture,etc.After which more reliable features like color histograms were used.Another model proposed was by using bag-of-words schemes. State-of-the-art techniques like Torralba's Gist features show a good performance on categorizing outdoor scenes but have problems in categorizing indoor scenes. In another recent work by Toralba and Quattoni region of interests are extracted from images and compared.As such they do not use objects in their approach but they do mention that some indoor scenes are better classified by the objects they contain.

3 Approach

In this project, we aim to achieve better indoor scene recognition through object recognition.What we propose to do in first phase is as follows. Based on the method in [2] first we associate low-level features to an object through object classifiers and using the sliding window method, compute the probability of the underlying scene using different windows. Next, we extract global and local information from other object classes and extract a Grayscale,Gabor and HOG features. Using these features, we learn models for each object using a strong classifier, AdaBoost. We extract information about the object and discard windows which contain inconsistent information. We compute the frequency of each object configuration in the images according to the tags and normalize them. Using this, we obtain the probability distribution of different scenes.
In the next phase we will try to incorporate the idea of using only the most informative object classifier because it is possible to recognize a scene by identifying only a few objects from the image and hence look only for informative objects and avoid searching the objects that are unlikely to be present in the scene.

References

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