Generic Object Recognition

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The object recognition problem has challenged the computer vision community for long time due to the huge change in the scale, occlusion and lighting conditions which have a great effect on the appearance of the objects. The problem of generic object recognition (GOR) has the previously mentioned difficulties in addition to the intra-class and inter-class variability problems. Despite the difficulties of the generic object recognition problem many approaches appeared trying to provide a solution to this problem.

1 Recognition of 2D Generic Objects

We proposed and presented a recognition model for generic 2D objects. The model uses a combination of intensity (SIFT) and color (Opponent angles) features for object description. Learning is performed using boosting, namely the AdaBoost algorithm. Our model yields good performance using famous and difficult object category recognition benchmarks and has a performance similar to the state-of-the-art generic object recognition approaches (if not superior in some case). More details are presented in [1].
The GLOH features (Gradient Location Orientation Histograms) are extension to SIFT and have a very good performance in the context of image matching and retrieval. Replacing the SIFT features with the GLOH in our model was a step to test its performance and robustness in the context of GOR. The model using a combination of the GLOH with color features yields also good performance (see [2]).

2 Boosting Algorithms: Performance Analysis on GOR

We presented a performance analysis and evaluation of two boosting algorithms, namely AdaBoost and SoftBoost algorithms, on GOR. AdaBoost is one of the most popular boosting algorithms which is used successfully in many pattern recognition applications and has some advantages like producing a large hard margin. It has also some disadvantages like over-fitting with training data of high degree of noise. SoftBoost is a newly presented boosting algorithm which implements the soft margin idea in a practical boosting algorithm. The performance analysis of both algorithm on GOR is performed using our previously mentioned GOR model [1]. An assessment with respect to different degrees of label noise as well as a comparison between the two algorithms is performed. The obtained

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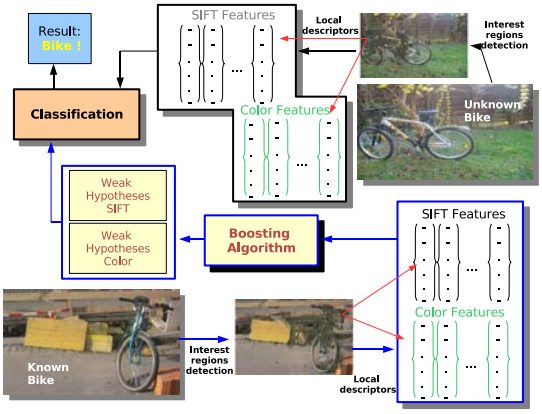

Fig. 1. Our model for generic 2D object recognition.

results reveal that SoftBoost is encouraged to be used in cases when the training data is known to have a high degree of noise. Otherwise, using Adaboost can achieve better performance. More details are found in [3].

3 Recognition of 3D Generic Objects

We presented our model for generic recognition of 3D objects from Time-of-Flight (TOF) images as well as our 2D/3D object category dataset. Our model describes the objects as a set of local shape specific features. These features are computed from interest regions detected and extracted using a suitable interest point detector. Learning is performed in a weakly supervised manner using Real-AdaBoost algorithm. The main idea of our approach has previously been applied to 2D images, and, up to our knowledge, has never been applied to range images for the task of generic object recognition. Experimental evaluation of the performance of the proposed recognition model is carried out using the our dataset and promising results are obtained.

References

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