

A Review of Codebook Models in Patch-Based Visual Object Recognition

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Abstract

The codebook model-based approach, while ignoring any structural aspect in vision, nonetheless provides state-of-the-art performances on current datasets. The key role of a visual codebook is to provide a way to map the low-level features into a fixed-length vector in histogram space to which standard classifiers can be directly applied. The discriminative power of such a visual codebook determines the quality of the codebook model, whereas the size of the codebook controls the complexity of the model. Thus, the construction of a codebook is an important step which is usually done by cluster analysis. However, clustering is a process that retains regions of high density in a distribution and it follows that the resulting codebook need not have discriminant properties. This is also recognised as a computational bottleneck of such systems. In our recent work, we proposed a resource-allocating codebook, to constructing a discriminant codebook in a one-pass design procedure that slightly outperforms more traditional approaches at drastically reduced computing times. In this review we survey several approaches that have been proposed over the last decade with their use of feature detectors, descriptors, codebook construction schemes, choice of classifiers in recognising objects, and datasets that were used in evaluating the proposed methods.

Author keywords

Bag-of-features; Cluster analysis; Object recognition; SIFT; Visual codebook