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Content Based Image Retrieval Using Visual-Words Distribution Entropy

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Abstract. Bag-of-visual-words (BOVW) is a representation of images which is built using a large set of local features. To date, the experimental results presented in the literature have shown that this approach achieves high retrieval scores in several benchmarking image databases because of their ability to recognize objects and retrieve near-duplicate (to the query) images. In this paper, we propose a novel method that fuses the idea of inserting the spatial relationship of the visual words in an image with the conventional Visual Words method. Incorporating the visual distribution entropy leads to a robust scale invariant descriptor. The experimental results show that the proposed method demonstrates better performance than the classic Visual Words approach, while it also outperforms several other descriptors from the literature.

1 Introduction

Over the years, a great number of approaches have been introduced in the field of content-based image retrieval (CBIR). Multiple features can be abstracted in order to obtain an efficient description of the visual content of an image. According to this approach, the visual content of the images is mapped into a new space named the feature space. Beginning with the so called global features, images can be described via a general single vector, conducting to a first rough classification. A feature is a set of characteristics of the image, such as color, texture and shape.

Trying to achieve successful content-based image retrieval exclusively via global features often proves to be rather challenging since the output depends on the image queries. CBIR with global features is notoriously noisy for image queries of low generality, i.e. the fraction of relevant images in a collection. In contrast to text retrieval where documents matching no query keyword are not retrieved, CBIR methods typically rank the whole collection via some distance measure [2]. If, for example, a query image depicts the plan of a white plate on a black background, due to the common features (round-shaped white foreground towards black background) that are met in a great number of images, the early ranked results may be dominated by non-plate depicting images.

Local-feature approaches provide a slightly better retrieval effectiveness than global features [1]. They represent images with multiple points of interest in a feature space