Research on fast image retrieval method using spectral clustering

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Abstract: This study proposes a novel method for fast image retrieval utilizing spectral clustering to address the computational inefficiencies of traditional content-based image retrieval systems. The approach first extracts low-level visual features from images, such as color histograms and texture descriptors. To overcome the limitations of conventional clustering algorithms in handling high-dimensional, non-convex data distributions, spectral clustering is employed to partition the image database into semantically meaningful groups. By leveraging the spectral decomposition of a similarity matrix, the method effectively captures the intrinsic manifold structure of the data. During the retrieval phase, a query image is first assigned to the nearest cluster, and similarity search is performed exclusively within that cluster, significantly reducing the search space and computational time. Experimental results on standard benchmark datasets demonstrate that the proposed method achieves a substantial reduction in retrieval latency while maintaining competitive accuracy compared to exhaustive search and other clustering-based approaches. The findings confirm that spectral clustering provides a robust and efficient foundation for scalable image retrieval systems.

Keywords: spectral clustering, image retrieval, fast image, retrieval method