

Fuzzy color histogram-based image search technique

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Abstract: This study proposes a novel image retrieval technique based on fuzzy color histograms to address the limitations of traditional histogram-based methods, which often suffer from sensitivity to quantization errors and illumination variations. Unlike conventional crisp histograms, the fuzzy histogram approach assigns each pixel's color contribution to multiple bins using membership functions, thereby capturing color ambiguity and perceptual similarity more effectively. The method involves extracting fuzzy histograms in a perceptually uniform color space, followed by similarity measurement using a fuzzy matching distance. Experimental evaluations on standard image databases demonstrate that the proposed technique significantly improves retrieval precision and recall compared to classical color histogram methods. Furthermore, the approach exhibits robust performance under varying lighting conditions and image compression artifacts. The results confirm that fuzzy color histograms provide a more accurate and flexible representation of image content, making them a viable solution for content-based image retrieval systems requiring high perceptual relevance.

Keywords: fuzzy color histogram, image retrieval, color-based search, fuzzy logic