

On the Stability of Signature-based Distance Functions for Content-based Image Retrieval

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Retrieving similar images from large image databases is a challenging task for today's content-based retrieval systems. Aiming at high retrieval performance, these systems frequently capture the user's notion of similarity through expressive image models and adaptive similarity measures. On the query side, image models can significantly differ in quality compared to those stored on the database side. Thus, similarity measures have to be robust against these individual quality changes in order to maintain high retrieval performance.

In this paper, we investigate the robustness of the family of signature-based distance functions in the context of content-based image retrieval. To this end, we investigate the generic concept of average precision stability, which measures the stability of a similarity measure with respect to changes in quality between the query and database side. In addition to the mathematical definition of average precision stability, we include a performance evaluation of the major signature-based distance functions focusing on their stability with respect to querying image databases by examples of varying quality. Our performance evaluation on recent benchmark image databases reveals that the highest retrieval performance does not necessarily coincide with the highest stability.

This is a resubmission of previously published papers by Beecks et al. [1, 2].

Keywords: Content-based image retrieval, Distance-based similarity measure, Evaluation measure, Average precision stability

References

1. C. Beecks, S. Kirchhoff, and T. Seidl. On stability of signature-based similarity measures for content-based image retrieval. *Multimedia Tools Appl.*, 71(1):349–362, 2014.
2. C. Beecks and T. Seidl. On stability of adaptive similarity measures for content-based image retrieval. In *Proceedings of the International Conference on Multimedia Modeling*, pages 346–357, 2012.

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