

Title: Global localization with non-quantized local image features

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Abstract: In the field of appearance-based robot localization, the mainstream approach uses a quantized representation of local image features. An alternative strategy is the exploitation of raw feature descriptors, thus avoiding approximations due to quantization. In this work, the quantized and non-quantized representations are compared with respect to their discriminativity, in the context of the robot global localization problem. Having demonstrated the advantages of the non-quantized representation, the paper proposes mechanisms to reduce the computational burden this approach would carry, when applied in its simplest form. This reduction is achieved through a hierarchical strategy which gradually discards candidate locations and by exploring two simplifying assumptions about the training data. The potential of the non-quantized representation is exploited by resorting to the entropy-discriminativity relation. The idea behind this approach is that the non-quantized representation facilitates the assessment of the distinctiveness of features, through the entropy measure. Building on this finding, the robustness of the localization system is enhanced by modulating the importance of features according to the entropy measure. Experimental results support the effectiveness of this approach, as well as the validity of the proposed computation reduction methods. (C) 2012 Elsevier B.V. All rights reserved.

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