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Abstract

In this paper, a novel feature-descriptor post-processing method, called *feature histogram equalization* (FHE), is proposed for enhancing the *feature contrast* inherited in the generated feature descriptors. The fundamental idea of the FHE is in line with the well-known *image histogram equalization* (IHE); however, their application objectives are completely different. While the IHE is exploited to increase the visibility of image contents by altering the pixel-intensity values, the FHE aims to increase the discrimination among the generated feature descriptors by modifying their vector-component values through an equalization process. Unlike the IHE that operates on *scalar* data, the FHE deals with *vector* data. In our approach, the developed equalization operation will be conducted for each feature-vector dimension (denoted as a *feature slice*), independently. With equalization, the vector distances among the *equalized* feature descriptors will be increased to facilitate the pattern-discrimination process. Consequently, their associated feature points become more distinct among themselves for benefiting any pattern recognition oriented application. To demonstrate the potential and usage of the FHE, a robust equalization algorithm has been derived and exploited for a chosen image processing application—i.e., point-to-point correspondence between two images under matching. Extensive simulation results have shown that, with the use of our proposed FHE method, more accurate point-to-point correspondence links have been established. Lastly, it should be pointed out that the FHE is only effective to those images with low feature contrast in their image contents (e.g., with strong *self-similarity*) but achieving less or even no gain to those images that are inherited with high feature contrast already.

Index Terms

Feature histogram equalization, feature contrast, feature slice, SIFT, feature descriptors, feature correspondence, image matching, image histogram equalization, mismatch removal.

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