

Fuzzy encoding with hybrid pooling for visual dictionary in food recognition

ABSTRACT

Tremendous number of food images in the social media services can be exploited by using food recognition for healthcare benefits and food industry marketing. The main challenges in food recognition are the large variability of food appearance that often generates a highly diverse and ambiguous descriptions of local feature. Ironically, the ambiguous descriptions of local feature have triggered information loss in visual dictionary constructions from the hard assignment practices. The current method based on hard assignment and Fisher vector approach to construct visual dictionary have unexpectedly cause errors from the uncertainty problem during visual word assignation. This research proposes a method of combination in soft assignment technique by using fuzzy encoding approach and maximum pooling technique to aggregate the features to produce a highly discriminative and robust visual dictionary across various local features and machine learning classifiers. The local features by using MSER detector with SURF descriptor was encoded by using fuzzy encoding approach. Support vector machine (SVM) with linear kernel was employed to evaluate the effect of fuzzy encoding. The results of the experiments have demonstrated a noteworthy classification performance of fuzzy encoding approach compared to the traditional approach based on hard assignment and Fisher vector technique. The effects of uncertainty and plausibility were minimized along with more discriminative and compact visual dictionary representation.