Segmentation of clusters by template rotation expectation maximization.

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Details

Abstract

To solve the task of segmenting clusters of nearly identical objects we here present the template rotation expectation maximization (TREM) approach which is based on a generative model. We explore both a general purpose optimization approach for maximizing the log-likelihood and a modification of the standard expectation maximization (EM) algorithm. The general purpose approach is strict template matching, while TREM allows for a more deformable model. As benchmarking we compare TREM with standard EM for a two dimensional Gaussian mixture model (GMM) as well as direct maximization of the log-likelihood using general purpose optimization. We find that the EM based algorithms, TREM and standard GMM, are faster than the general purpose optimizer algorithms without any loss of segmentation accuracy. When applying TREM and GMM to a synthetic data set consisting of pairs of almost parallel objects we find that the TREM is better at segmenting those than an unconstrained GMM. Finally we demonstrate that this advantage for TREM over GMM gives significant improvement in segmentation of microscopy images of the motile unicellular alga *Seminavis robusta*.

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