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Robust decentralized multi-model adaptive template tracking.

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Summary: In this paper, a robust and efficient visual tracking method through the fusion of several distributed adaptive templates is proposed. It is assumed that the target object is initially localized either manually or by an object detector at the first frame. The object region is then partitioned into several non-overlapping subregions. The new location of each subregion is found by an EM-like gradient-based optimization algorithm. The proposed localization algorithm is capable of simultaneously optimizing several possible solutions in a probabilistic framework. Each possible solution is an initializing point for the optimization algorithm which improves the accuracy and reliability of the proposed gradient-based localization method to the local extrema. Moreover, each subregion is defined by two adaptive templates named immediate and delayed templates to solve the "drift" problem. The immediate template is updated by short-term appearance changes whereas the delayed template models the long-term appearance variations. Therefore, the combination of short-term and long-term appearance modeling can solve the template tracking drift problem. At each tracking step, the new location of an object is estimated by fusing the tracking result of each subregion. This fusion method is based on the local and global properties of the object motion to increase the robustness of the proposed tracking method against outliers, shape variations, and scale changes. The accuracy and robustness of the proposed tracking method is verified by several experimental results. The results also show the superior efficiency of the proposed method by comparing it to several state-of-the-art trackers as well as the manually labeled "ground truth" data.

Keywords: non-rigid object; robust fusion; EM algorithm; mixture of Gaussian; decentralized object localization
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