Robust Multiple Objects Tracking: Particle Filter with ePSO

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Abstract:

The detection and tracking of multiple objects in the video sequence has become an important issue in many computer vision applications, such as objects tracking in radar video, robot location, or face tracking [1]. In recent years, several tracking algorithms based on particle filter [2] have been proposed for multiple objects tracking, because of its simplicity of implementation and generality. Compared to Kalman filter [3], particle filter can be applied for nonlinear and non-Gaussian model of moving objects. However, because of the inaccuracy of model for object occlusion and the insufficient descriptor of targets, current methods fail to track multiple objects in long-term period, specifically in complex scenario and low SNR of video. To overcome this drawback, in this paper we present one new particle filter approach combined with epsilon greedy particle swarm optimization (ePSO) which can robustly track multiple objects.

In our method, a modified particle filter approach has been used for tracking multiple objects [4], in which the multi-modality for multiple objects is maintained over the tracking time. To improve the accuracy of the estimated likelihood, the ePSO is used to update the likelihood recursively at each frame. A new scheme to update the velocity and position of the particles is also embedded into our method to make these particles jump out the local minimum and search a global minimum. Both the framework and pseudo-code of our method are presented in this paper. To verify the effectiveness of our tracking method, we apply our method into the real complex application: cars tracking in simulated video data from stationary nadir radar sensor. The tracking results show that our tracking method can successfully track multiple objects in long-term period compared to these tracking methods without ePSO.

References:

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