

## A Practical and Efficient Evaluation Function for 3D Model Based Vehicle Matching

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**Abstract :** 3D model-based vehicle matching provides a new way for vehicle recognition, localization and tracking. Its key is to construct an evaluation function, also called fitness function, to measure the degree of vehicle matching. The existing fitness functions often poorly perform when the clutter and occlusion exist in traffic scenarios. In this paper, we present a practical and efficient fitness function. Unlike the existing evaluation functions, the proposed fitness function is to study the vehicle matching problem from both local and global perspectives, which exploits the pixel gradient information as well as the silhouette information. In view of the discrepancy between 3D vehicle model and real vehicle, a weighting strategy is introduced to differently treat the fitting of the model's wireframes. Additionally, a normalization operation for the model's projection is performed to improve the accuracy of the matching. Experimental results on real traffic videos reveal that the proposed fitness function is efficient and robust to the cluttered background and partial occlusion.

**Keywords :** 3D-2D matching, fitness function, 3D vehicle model, local image gradient, silhouette information

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