

FUSION OF TEXTURE AND CONTOUR BASED METHODS FOR OBJECT RECOGNITION

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ABSTRACT

In order to build driver assistance systems or autonomous vehicles one of the main tasks to be solved is the detection, tracking and classification of objects. This processing stage should end up in a representation of the vehicle's environment depending on the actual task to be performed.

In knowledge-based image processing systems it is necessary to combine texture- and contour-based methods on different processing levels in order to increase the performance, robustness and efficiency of the algorithms. Our work introduces a coupling structure based on a neural network which learns to combine the individual algorithms according to the performance of the complete system.

The approach chooses the pixel coordinate system as a common base for fusion. Its aim is to evaluate an object-background-separation of traffic scenes. In a preprocessing step information about contours and textures are determined by three methods: Local Orientation Coding (LOC), polygon approximations of edges, and local image entropy. Finally a feature vector is created for each pixel derived from the results of the preprocessing algorithms. A neural network learns the necessary coupling structure and how to combine the contributions of the individual methods. We apply the structure to the segmentation of images. Detected image parts can be interpreted as a map containing danger spots for the driver assistance system and are further processed by a classifier.

In this application a texture-based measurement was chosen for classification which is

rotation- and scaling invariant. Usually texture calculation is partitioned into structural and statistical methods. In the case of car and truck classification the statistical models have to be preferred because a structural description is not flexible enough to cover all different types of objects. The well known cooccurrence matrices introduced by Haralick are chosen as a feature vector for solving the classification task.

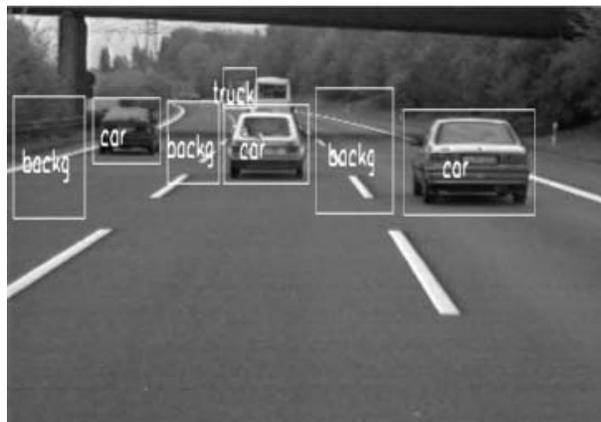


Figure 1: Results.

The proposed method combines two main aspects: initial segmentation and classification. The main part of the initial segmentation is done by the learnable coupling structure - a Kohonen map. The fusion of different types of data, textures and contours, provides a good measurement for objects. The final classification completes the application (figure 1). The combined approaches are able to cope with most of the possible arrangements of vehicles, so that an environmental representation can be provided.