Highway Scene Analysis in Hard Real-Time *

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ABSTRACT

A hard real-time vision system has been developed that analyses color videos taken from a car driving on German and American highways. The system uses a combination of color, edge, and motion information to recognize and track the road boundaries, lane markings and other vehicles on the road.

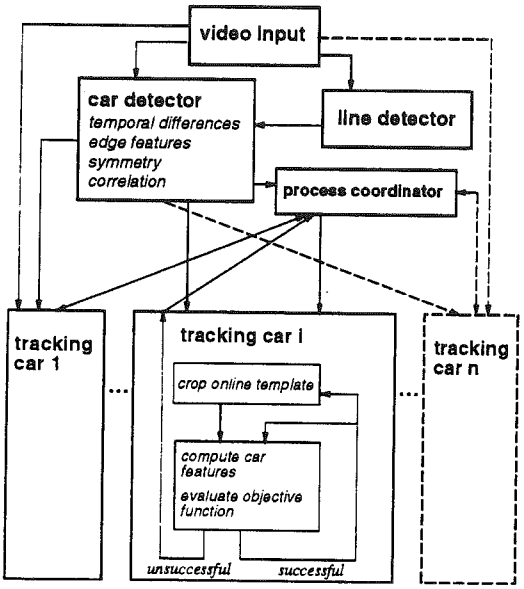

Figure 1: The real-time vision system.

Cars are recognized by matching templates that are cropped from the input data online, by detecting image features, and by evaluating image symmetry. Cars are also recognized by temporal differencing and by tracking motion parameters that are typical for cars. The system recognizes and tracks road boundaries and lane markings using a spatial recursive least squares filter. Experimental results demonstrate robust, real-time car recognition and tracking over thousands of image frames.

The main components of the system are shown in Figure 1. Figure 2 illustrates the results of modelling the road color.

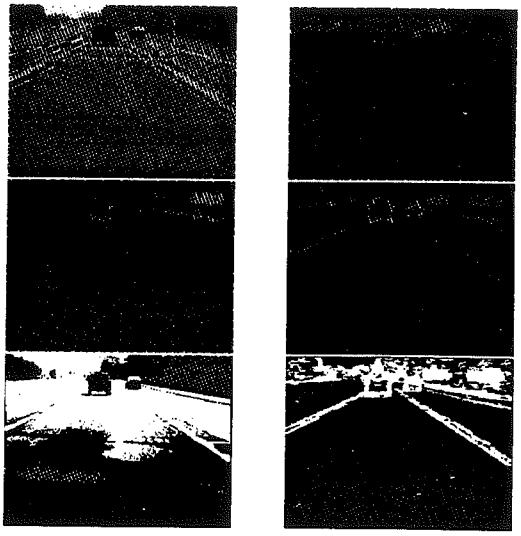

Figure 2: The black-bordered road region in the top left image is used to train road parameter models. The top right and middle images illustrate hue, saturation, and the composite image of the scene. Using the grayscale model, the pixels classified to belong to the road within the white-bordered region in the top left image are shown in black in the bottom left image (only 60% correct classification). Using the composite of hue, saturation and edge information, however, 96% of the pixels are classified correctly as shown in the bottom right image.

*The work was supported by ARPA, ONR, and the Philips Labs, grants N00014-95-1-0521, N6600195C8619, DASG-60-92-C-0055.

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CCC Code: 0-7803-4269-0/97/$10.00 1997 IEEE