Integrated Speed Limit Detection and Recognition from Real-Time Video

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Motivation
Drivers are often not aware of temporary speed restrictions. We aim to register the current speed restriction from an on-vehicle camera for real-time onboard display.

Speed-limit signs detection
Our system follows a two stage approach: hypothesis generation and verification (Fig.1). For numerical speed type signs, RANSAC-based [1] shape detection is utilized on the red chroma image channel (Fig.2). For national limit signs we propose a novel detection method of diagonal stripe detection with circular shape verification via RANSAC (Fig. 3). The candidate sign is then normalized, the centre part is extracted and passed to a trained Neural Network for final type and numerical speed recognition.

Turn Detection
Automatic turn detection - activated by the turn indicator - is carried out to detect junction turns where speed limits are often cancelled.

Optic flow is calculated between successive video image frames using the pyramidal implementation of [2]. Temporal behaviour of the average frame flow vector determines whether the turn is detected or not (Fig.4)

Results
A 97% initial detection ratio has been achieved on the detection stage with only 0.2% subsequent incorrect classifications from the neural network at the recognition stage. This outperforms other approaches [3,4] proposed in this area. We present exemplary results over varying weather conditions in Fig. 5.

References