Reduction of Fuel Consumption by Early Anticipation and Assistance of Deceleration Phases

Abstract:
This work deals with the investigation of advanced driver assistance system (ADAS) which helps the driver to perform phases of deceleration in an efficient and safe manner. The concept of the assistance system is supported by early recognition of deceleration situations with the help of new sources of traffic information such as GPS based systems, car-to-car, and car-to-infrastructure communication. The system presents visual information to the drivers in order to enhance their anticipation. Together with the representation of emerging situation, the assistance suggests coasting a vehicle from the currently driven speed to the upcoming lower goal speed in order to reduce fuel consumption. If coasting does not suffice, the system will suggest moderate braking. It is left to the driver’s consideration to accept the system’s advice. The analysis of the estimated fuel consumption and the acceptance of the assistance system are done using situational, driving, visual, and subjective data which were collected during the experiment drives in the fixed-base simulator. Twenty six test subjects took part in the experiment; their average age was thirty four years. After a simulator training, they had to complete three experiment drives in the permuted order each lasting between seventeen and twenty minutes: one drive without any assistance (baseline condition), one with the innovative visual assistance using a bird’s eye-view perspective on the emerging deceleration situation, and one with an iconic representation of it. Visual concepts are displayed in the digital instrument cluster. Each drive consists of thirteen deceleration situations which occur on rural, highway, and city roads. This work presents the results regarding the influence of the system on the driving behavior. The analysis data of two assisted drives are compared to the baseline
condition. The results show the significant reduction of the estimated fuel consumption in particular situations (up to 50

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