

On the Need for Driver Attention Support Systems

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Appeared in Journal of Traffic Medicine (2000) Vol. 28, No. 25

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Introduction: Driver inattention is the most prevalent primary cause of collisions, accounting for an estimated 25-56%. Among the Inattention causes, Distraction and Looked-but-did-not-see are more frequently reported factors in crashes than Sleepy/fell asleep (e.g. Wang et al, 1996). Important crash types involving inattention have are rear-end, intersection, lane change/merge, road departure, and single vehicle crashes. Changes in visual scanning patterns, gaze fixations (number and length), and percentage eye closure are promising ocular-based indicators of attention and alertness, and can potentially be integrated in future in-vehicle attention support systems. The present research aims at improving driver attention with feedback and providing vehicle systems with real-time knowledge of driver visual behavior.

Methods: Volvo developed a novel computer-vision based head pose- and gazetracker with the Australian National University. This system, integrated in real-time with vehicle performance data from the CAN bus, and driving support systems (e.g. lanetracking) provides the opportunity for the development of in-vehicle attention support systems.

Results: Preliminary road tests show that the system robustly tracks head pose, gaze, and eye closure in real-time, in real vehicle environments. A literature review and focus group discussions investigated the potential need for attention support, and identified situations in which inattention occurs. There was concern that new interior distractors (e.g. cellphones, navigation systems, collision warning systems) divert attention and cause high workload, however classical sources remain as large contributors, e.g. driver status, loose objects, interactions with other passengers, and instrumentation. Real-time vehicle- and visual performance feedback could enable driver self-observation and management of attentive behavior in addition to threshold warnings. This type of attention support systems should have a very positive impact on road safety.