Objective Workload Evaluation with Lane Keeping Assistance System
Using Physiological Signal and Driving Performance

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INTRODUCTION

The existing Advanced Driver Assistance System (ADAS) is supposed to assist driving tasks (e.g., adaptive cruise control) under driver’s supervision. The Lane Keeping Assistance System (LKAS), for example, has been shown to reduce physical workload [1], yet it has also been found to reduce subjective driving pleasure in our pilot study due to unexpected system drop-off and inconsistent feedback [2]. Therefore, this present work aimed to understand the driver-LKAS interaction from the objective point of view. The question we tried to answer is: "Objectively, does LKAS really assist the driver?"

METHODS

The experiment was carried out
- With N = 16 participants
- Driving 2 laps with/without LKAS
- In 4 real-world scenarios (Fig. 1)

The mental workload was measured by
- Heart Rate (HR)
- Skin Conductance Response (SCR)

The driving performance was evaluated from
- Steering Reversal Rate (SRR)
- S.D. Lateral Position (SDLP)
- Steering Effort (SE)

RESULTS

- SE was greatly reduced with LKAS (Fig. 2L)
- However, counter steering was necessary (Fig. 2R)

CONCLUSION

Overall, LKAS has reduced physical effort significantly in all scenarios. However, additional mental effort was necessary to monitor LKAS and to perform counter steering. The associated mental workload can be observed from physiological data. To conclude, LKAS has still room for improvement

REFERENCE
