Monitoring the driver

HARMAN’s advanced driver monitoring solution uses camera sensors to capture the driver’s most important first-order biometric features, such as gaze, head position and pupil diameter, among many other key facial features. It detects minute fluctuations in pupil diameter and calculates brain activity levels, especially high cognitive load.

Workload & emotion

Besides supporting NCAP driver monitoring safety requirements, the breakthrough for Driver Monitoring Systems (DMS) was to add emotion to cognitive workload, resulting in a combined system that is better than either of the parts in terms of performance and value criteria. It measures facial and voice cues to calculate emotional status, in particular high emotional load (in addition to fatigue, drowsiness, gaze, head orientation, etc.) and combines this input to generate highly reliable signals relating to engagement and attention.

Key highlights

Senses brain activity, emotion and facial features, and combines this to provide highly reliable signals relating to engagement and attention

Measures minute fluctuations in pupil diameter and calculates cognitive load

Measures facial and voice cues to calculate emotional status, in particular high emotional load

For AV hand-off events, dynamic ADAS parameters (increase warning times), adaptive/personalized HMI, etc.
Advanced DSP and AI usage

The HARMAN system can also analyze the auditory content and heart/breathing rate of the occupant. It then uses proprietary and patented algorithms that combine the most cutting-edge DSP and AI to provide insights into second-order biometric signals such as emotional activity and cognitive load. The system is currently under further development to provide truly novel third-order signals, such as driver engagement and attention, critical to paving a successful pathway for the Level 3 and autonomous handoff of the future. The HARMAN system is extended by the DMS/OMS documentation to also support additional in-cabin monitoring features, including detection of driver identity, gender, age or number of child seats.

Solve the driver understanding gap

Identify the driver – measure what they are doing – measure how they are thinking

Driver-facing IR camera → AI compute

- Driver security signals
  - Driver identification
- Driver behavior signals
  - Gaze direction
  - Texting detection
- Driver understanding signals
  - Emotion detection
  - Workload detection
  - Drowsiness detection

Targeted reaction

AI means highly accurate, fast and personalized results. It takes advantage of modern compute platforms coming to today’s vehicles. The goal is to ensure driver engagement at all times. DMS responses are emotion-based playlists, customized alerts or cognition-based lighting. For future scenarios, the system facilitates the difficult hand-over process for autonomous driving at Level 3 and above.

HARMAN

More than 50 million automobiles on the road today are equipped with HARMAN audio and connected car systems. Our software services power billions of mobile devices and systems that are connected, integrated and secure across all platforms, from work and home to car and mobile. HARMAN’s latest innovations leverage Samsung’s connected lifestyle and hardware expertise, allowing automakers to create an ecosystem of unique, smart, enhanced and rich in-vehicle experiences. Together HARMAN and Samsung are architects of experience, designing the most intuitive and immersive interactions with in-vehicle technology. HARMAN is a wholly-owned subsidiary of Samsung Electronics Co., Ltd.

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