FACT SHEET

EFFECTIVENESS OF DRIVER MONITORING SYSTEMS

Background

Active driving assistance (ADA) systems are becoming increasingly popular and sometimes marketed under confusing names, leading consumers to overestimate system capabilities. Currently, available ADA systems are classified by SAE International®[1] as a Level 2 partial driving automation feature, meaning that constant driver supervision is required. In vehicles equipped with ADA technology, a driver monitoring component is utilized to prevent misuse of these systems. Within this work, driver monitoring systems are classified as either direct or indirect. Direct systems integrate a driver-facing camera to detect distraction or disengagement, while indirect systems only utilize steering wheel input.

Four popular vehicles equipped with an ADA system were evaluated via simulated driver disengagement (common behaviors such as texting, reading, watching videos, or general manipulation of a mobile device) to assess the performance of driver monitoring systems in a real-world highway environment.

Research Questions:

1. How effective are driver monitoring systems at mitigating typical driver disengagement modes in the daytime and nighttime lighting conditions?
   a. Driver looking down with head facing forward and hands off the steering wheel
   b. Driver facing away from the roadway with hands off the steering wheel

2. Can drivers consistently circumvent driver monitoring systems?
   a. Daytime and nighttime lighting conditions.

Key Findings:

1. Direct driver monitoring systems were significantly more effective at mitigating driver disengagement than indirect driver monitoring systems in all lighting conditions. On average, the percent of time drivers were engaged was approximately five times greater for direct systems than indirect systems.
   a. On average, evaluated direct systems issued an alert 50 seconds sooner than indirect systems for both lighting conditions.
   b. On average, evaluated direct systems issued an alert 51 seconds sooner than indirect systems for both lighting conditions.

2. Both system types were susceptible to active circumvention attempts. On average, the evaluated indirect and direct systems allowed over 5 and 2 minutes of simulated disengagement, respectively. At 65 mph, this translates to approximately six miles of disengagement for indirect and two miles for direct systems.
   a. Lighting condition was not a significant factor for evaluated driver monitoring systems.

1. Society of Automotive Engineers

Recommendations

- ADA systems should include a direct driver monitoring component to mitigate system misuse effectively.
- Disablement of the ADA system should occur after some initial driver monitoring alerts are issued within a defined period.
- Automakers should continually refine the direct driver monitoring system functionality to minimize distraction to the greatest extent possible when using an ADA system.

Methodology

AAA conducted naturalistic driving evaluations on a 24-mile loop limited access toll road in southern California. The testing used four popular makes and models paired with a leading safety spotter vehicle. All test drivers and spotters were AAA researchers. Each simulated driver distraction test ran ten minutes and used three methods:

1. Hands off the steering wheel, head up facing the road but gazing down.
2. Hands off the wheel, head and gaze aimed down to the right toward the center console.
3. Active circumvention or attempting to "beat the system" through a variation of gaze/head placement and periodic steering wheel input.

AAA selected four vehicles for testing, choosing two of each driver monitoring design type, camera-equipped, and input from the steering wheel. The vehicles were:

- 2021 Cadillac Escalade with "Super Cruise™" using a driver-facing infrared camera
- 2021 Subaru Forester with "EyeSight®" and Driver Focus using a driver-facing infrared camera
- 2021 Hyundai Santa Fe with "Highway Driving Assist" (steering wheel)
- 2020 Tesla Model 3 with Autopilot (steering wheel).

The vehicles were procured directly from the manufacturer or specialty rental fleets. AAA chose a route due to its consistent traffic volume moving at or near the posted speed limit of 65mph to make the testing as safe as possible. Please refer to the full report for methodology details, including specific testing equipment and the driving route.