



# Enhance Driving Safety with DMS and ADAS Fusion

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# Background & Motivation

# Background & Motivation – Driver Engagement

## 1.4.3.1 Forward Support Sensitivity

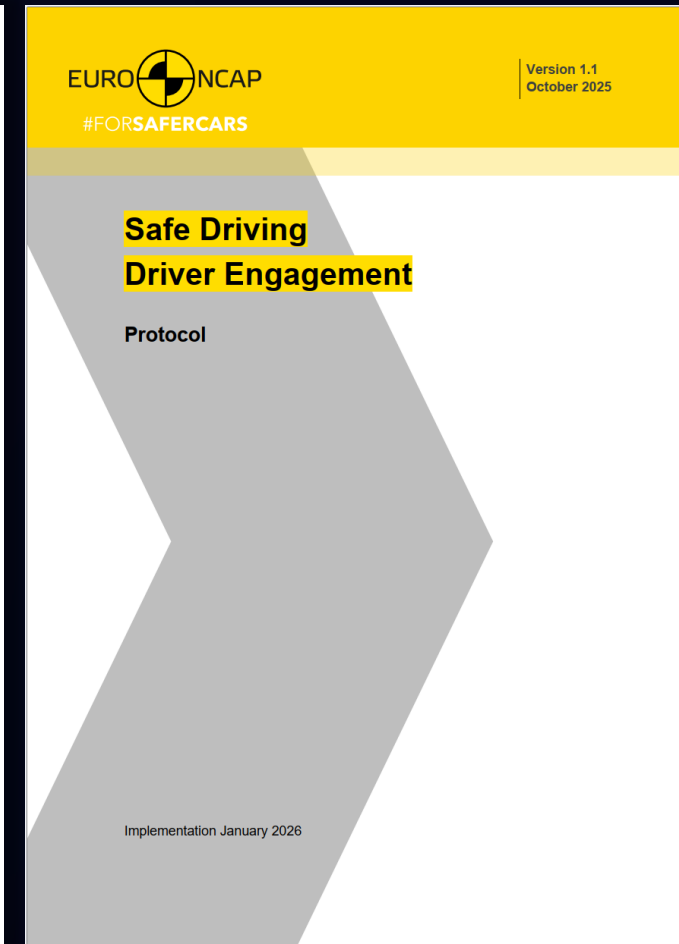
As a minimum requirement, FCW and/or AEB systems shall differ at least 200ms between a distracted and/or impaired driver and an attentive driver, to account for longer driver reaction times. The performance of the more sensitive FCW and/or AEB system shall be awarded in Crash Avoidance.

## 1.4.3.2 Lane Support Sensitivity

As a minimum requirement, Lane Support Systems (LSS) shall be coupled to the driver state so that warning and/or intervention are always active (i.e., not suppressed) for distracted and/or impaired drivers and sensitivity is reduced (down to warning and/or intervention suppression) for attentive and unimpaired drivers.

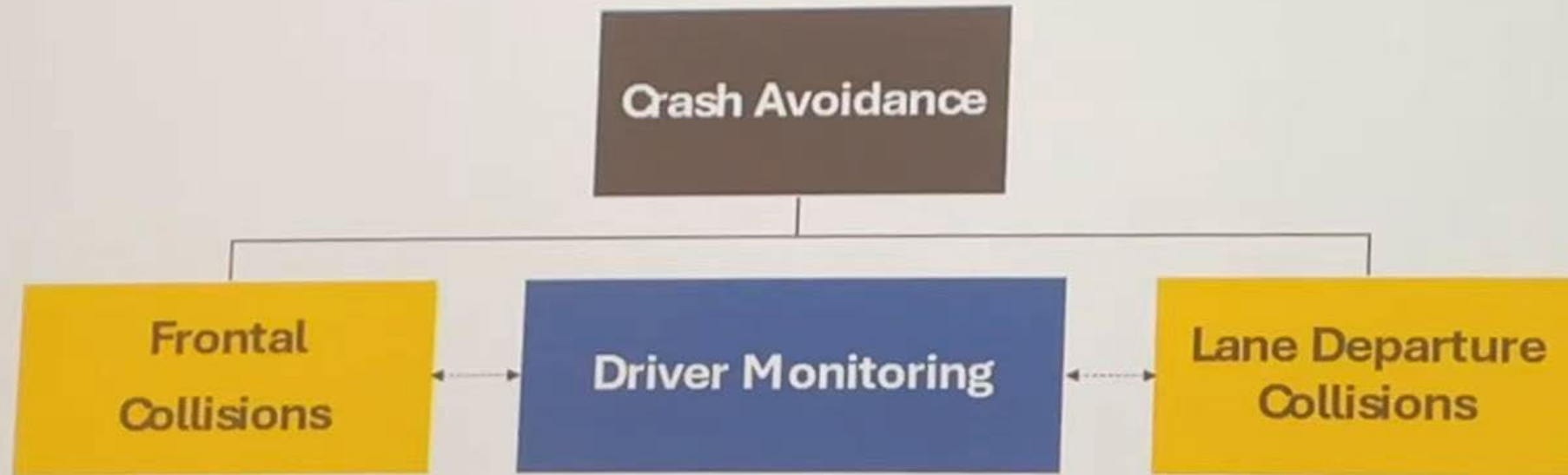
## 1.4.3.3 Emergency Function

The EF intervention shall start soon enough so that the vehicle is engaged into Assisted Mode, and no later than 5 seconds after the distinct warning phase has started.



## Links to Driver State (2026)

## Euro NCAP 2026



Facilitating OEMs to incorporate driver state **context** in Crash Avoidance scenarios:

- Maximizing performance in ADAS track tests
- Minimizing driver acceptance issues in real world

# Background & Motivation – Crash Avoidance



## Frontal Collisions

### Links to Driver State

May implement a sensitivity change strategy for FCW and/or AEB according to the state of the driver detected by the, provided that following conditions are met:

- The DSM shall offer minimum performance across different driver states:
  - Transient states: >50% of total score in Forward Support Sensitivity intervention
  - Non-transient states: Forward Support Sensitivity intervention on Drowsiness and Sleep
- The sensitivity change shall be set back to the nominal setting < 1 second after the DSM system is in degraded mode, non-functional or turned off.

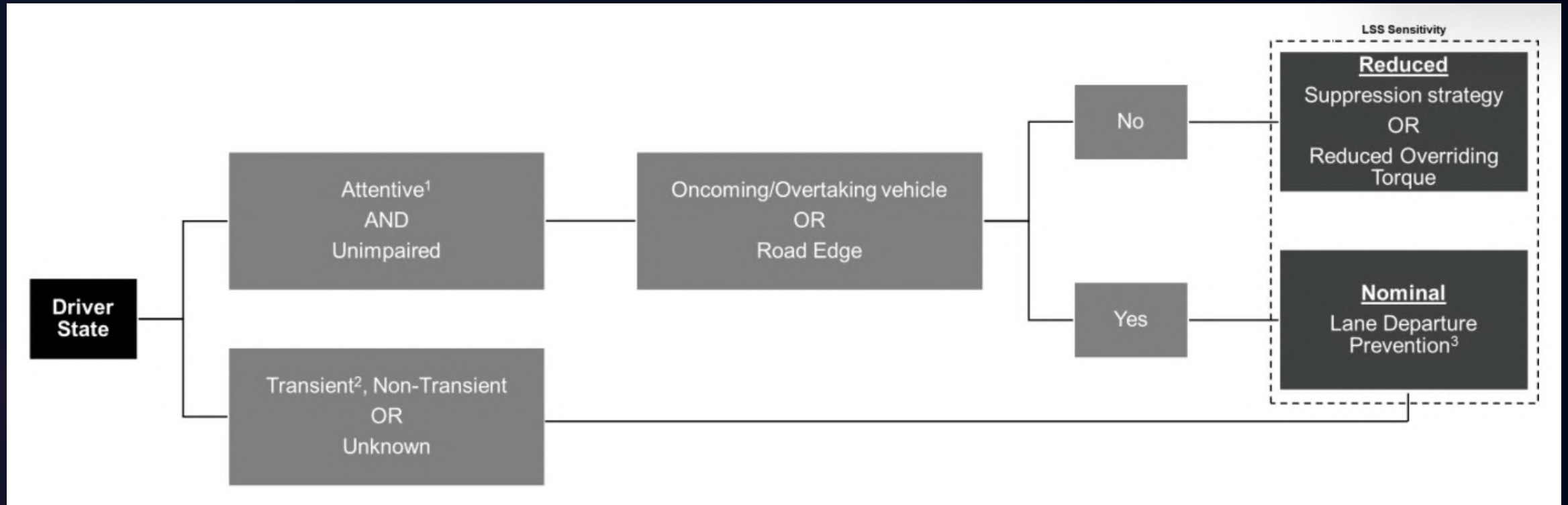
		FCW and/or AEB Sensitivity Change		
Impact location ranges		Standard Range <b>not</b> adjacent to Extended Range	Standard Range adjacent to Extended Range	Extended Range
Applicable Scenarios		CCRs, CMRs CCRm	CCRs, CMRs CCRm	CCRs, CMRs CCRm CPLA, CBLA CPNA, CPFA, CBNA, CBFA CPTA, CBTA CCCscp, CMCscp CCFhos, CCFhol
Acceptance Criteria	Attentive driver state	Performance according to prediction (FCW can be later)	Any colour (≠red)	Any colour OR suppression (no performance requirements)
	Unknown driver state**	Performance according to prediction	Performance according to prediction	Any colour (≠red)
	Distracted driver state	Performance according to prediction or better*	Performance according to prediction	Performance according to prediction

\* May be used to verify DSM requirements for increased sensitivity (1.4.3.1. FCW and/or AEB 200ms earlier distracted driver state relative to unknown driver state).

\*\* DSM switched off and/or system degraded or not available

For the scenarios where the Vehicle Manufacturer claimed usage of the Driver State Link, verification tests shall be performed with a test driver that is classified as distracted.

# Background & Motivation – Crash Avoidance



*1 For a Degraded DSM System (e.g., when eye gaze determination is not possible and driver attentiveness is estimated only via head pose), Reduced LSS Sensitivity may continue enabled by a standalone (indirect) DIM, provided that the driver is informed of a Degraded DSM System as if the system is “Non-functional”.*

*2 For any continuous off-road glance shorter in duration than Transient Driver State, Nominal LSS Sensitivity shall be effective soon enough to ensure Lane Departure performance<sup>3</sup>.*

*3 Lane Departure performance = 2023 LSS performance criteria. For systems separating ELK and ELK+LKA mode, in the ELK mode the LKA dashed line intervention does not need to be re-activated for degraded or unknown DSM*

# Background & Motivation – Crash Avoidance

## Lane Departure Collisions

Single Vehicle	Standard	Extended	Robustness	TOTAL
<b>Driver Acceptance</b>	<b>5</b>	-	-	<b>5</b>
Driveability	2	-	-	2
Driver State Link	3	-	-	3
<b>Lane Departure</b>	<b>4</b>	<b>0.5</b>	<b>0.5</b>	<b>5</b>
ELK Road edge*	4	0.5	0.5	5

\* Half points awarded with LDW in Extended Range cases

**Driver State Link (DSL)** – refers to a vehicle system strategy that uses the detection of driver state (via Driver Status Monitoring system) to alter the Active Safety system response settings with respect to the levels of driver engagement. System sensitivity can be increased, or decreased, based on the detected driver state.

# Background & Motivation – Crash Avoidance

## Lane Departure Collisions

To be able to score points in Driver State Link, the following conditions shall be met:

- Lane Support sensitivity changes shall ensure LKA and LDW availability when the driver state is unknown or classified as inattentive.
- Lane Support sensitivity or steering overriding torque can be reduced, or the vehicle can implement an intervention suppression strategy when the driver is classified as attentive (eyes on road) and not impaired. The strategy shall be described by the Vehicle Manufacturer to Euro NCAP.
- The DSM shall offer minimum Intervention score in Lane Support Sensitivity across different driver states, as described in the Euro NCAP Driver Engagement Protocol:
  - Transient states: >50% of total intervention score in Lane Support Sensitivity
  - Non-transient states: Intervention score in Lane Support Sensitivity for Drowsiness and Sleep\*
- The sensitivity change shall be set back to the nominal setting < 1 second after the DSM detects its performance is degraded, or the system is non-functional or turned off.

*\* Sleep only applicable for systems with Lane Support Sensitivity as intervention type*

# Background & Motivation – Crash Avoidance

## Lane Departure Collisions

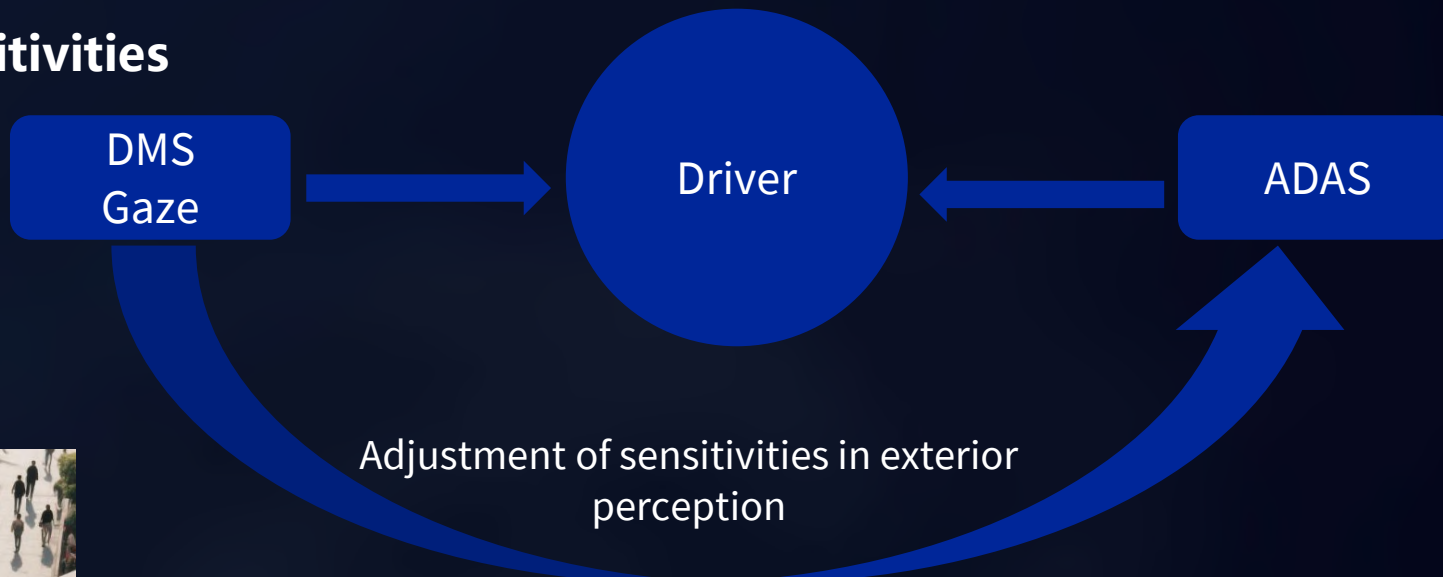
The Vehicle Manufacturer may implement specific Lane Support sensitivity / performance changes:

- Gaze monitoring: specific Lane Support Sensitivity dependent on the driver's gaze direction, e.g.:
  - Gaze towards central, downward regions: Forward Support Sensitivity change for a vehicle drifting to either left or right side lane boundaries (e.g., in-vehicle infotainment system)
  - Gaze toward right regions: Lane Support Sensitivity change for a vehicle drifting to left-side lane boundaries (e.g., passenger side mirror)
  - Gaze toward left regions: Lane Support Sensitivity change for a vehicle drifting to right-side lane boundaries (e.g., driver's window)
- The use of a turn signal while the vehicle has determined a Transient, Non-Transient or Unknown state can assume driver intent and suppress the lane support system.
- To avoid any unintentional override of the LSS response; if the vehicle determines that the driver is in a higher-risk state (i.e. sleep), the vehicle manufacturer can implement an increase system sensitivity and overriding torque via the Driver State Link.

# DMS & ADAS Fusion

# DMS assists ADAS

## Adjust ADAS sensitivities

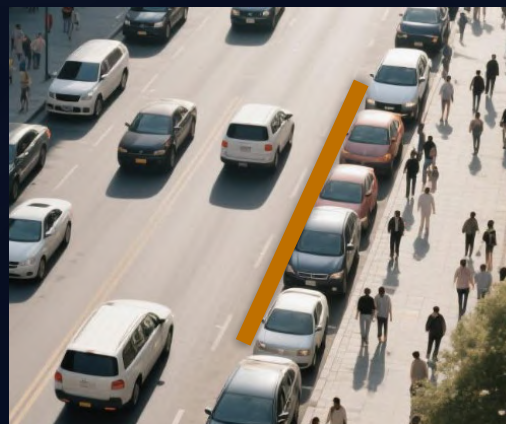


Enhance target confidence in key perception areas:

1. Shorten the confirmation time when a CPNCO event occurs to ensure safety
2. Especially in critical pedestrian situations, use deceleration instead of emergency braking to reduce false AEB triggers, improving comfort while ensuring braking distance



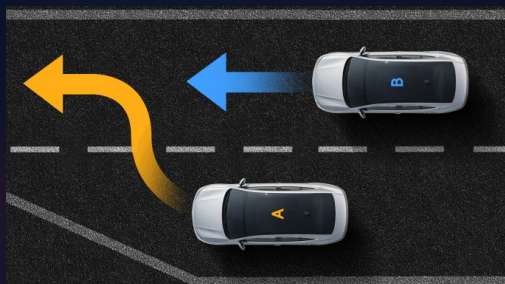
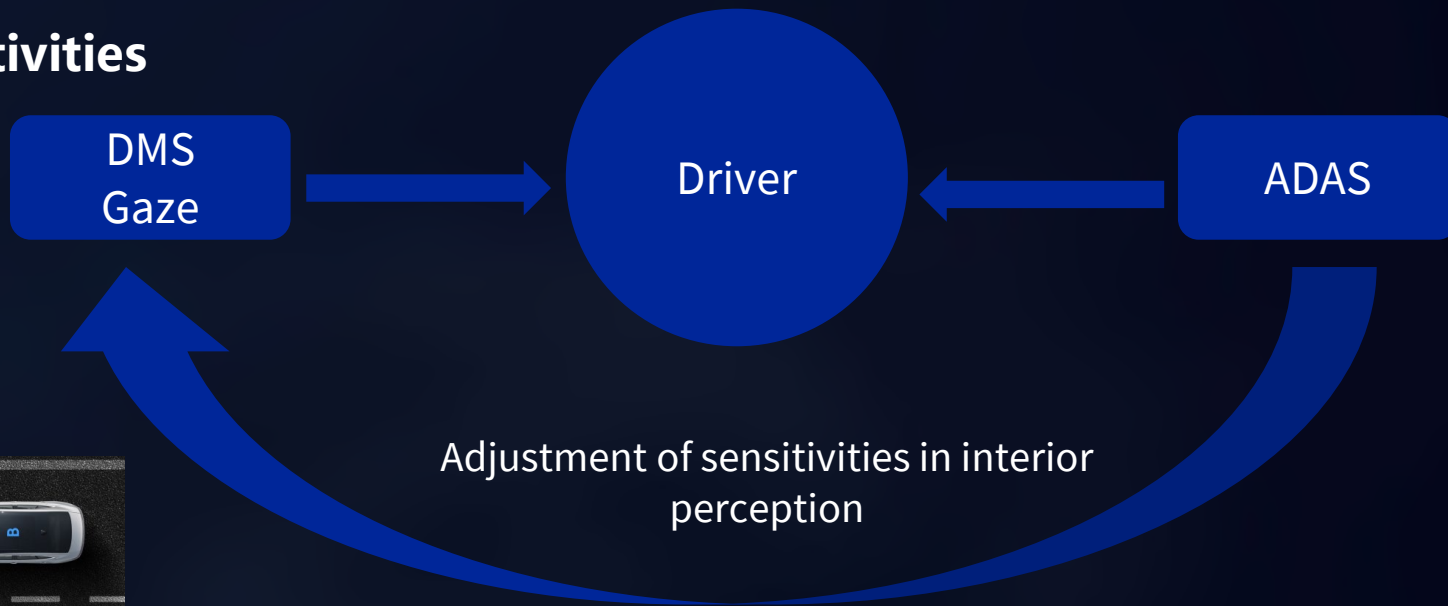
When the gaze frequently focuses on a specific roadside area



Pedestrian CPNCO (Car-to-Pedestrian Nearside Child Obstructed) / pedestrian crossing blind spots – increased probability

# ADAS assists DMS

## Adjust DMS sensitivities



Left-side cut-in scenario

1. Alert driver for “Distraction” if left-side cut in.
2. No warning necessary if no cut-in.

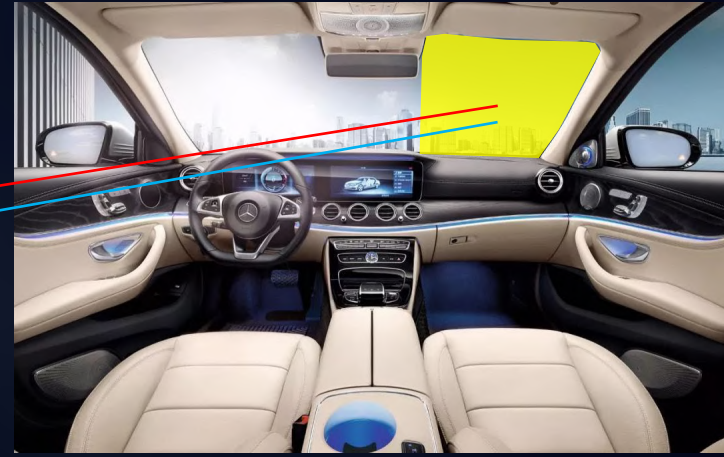


Normal driving scenario

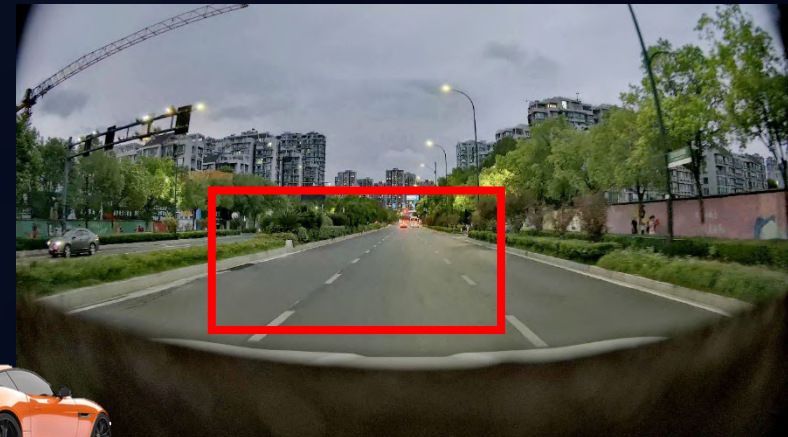


When the gaze not focusing on front/left side of road for short time ( not short-distraction yet)

# Perception Fusion of DMS and ADAS



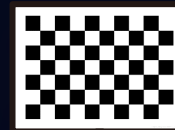
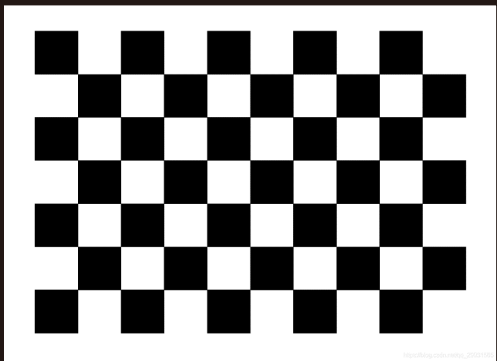
Safe, no alarm



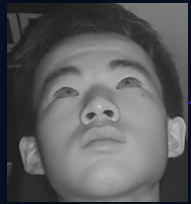
Danger! Alarm required!



# Integrated in-cabin and exterior calibration



# DMS and ADAS Fusion



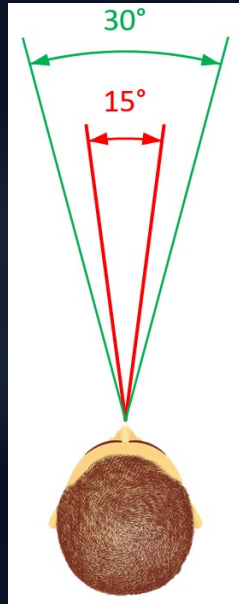
GazeNet



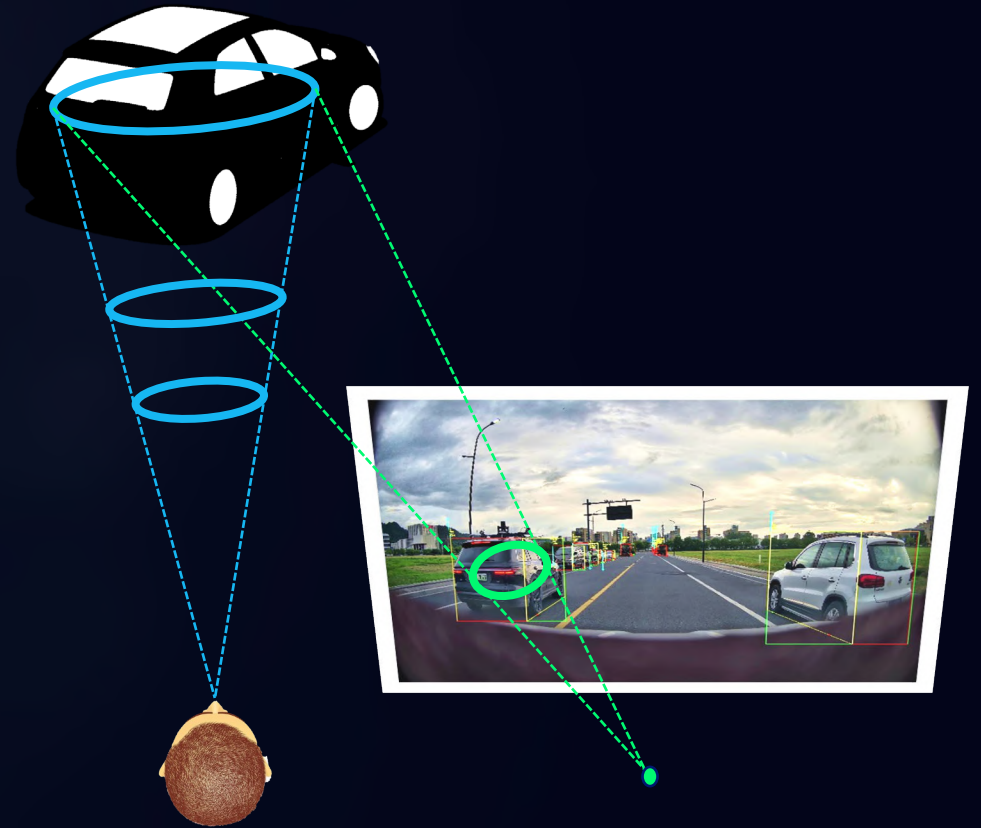
Input Image



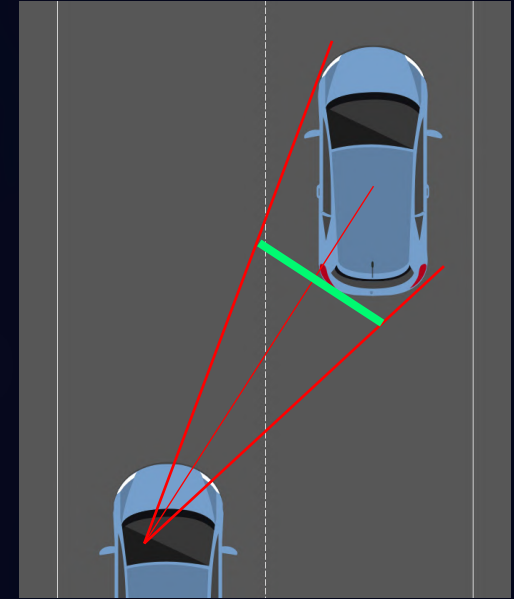
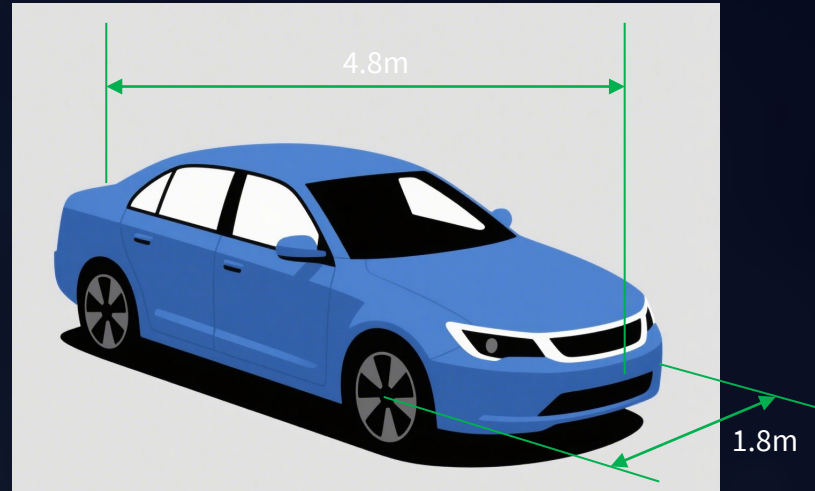
Distinguish field of view



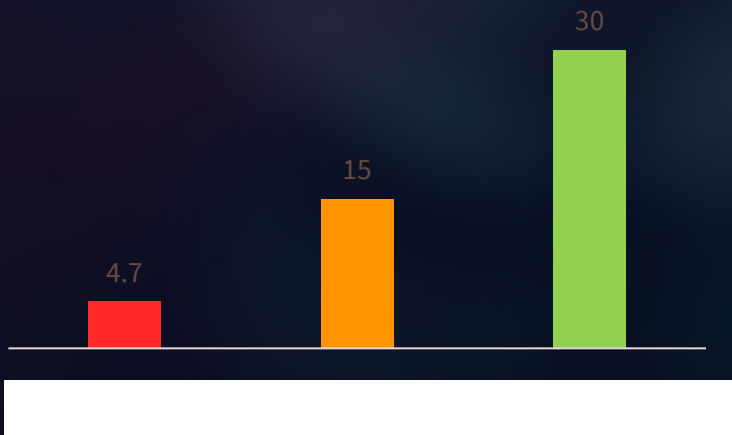
Effective field of view



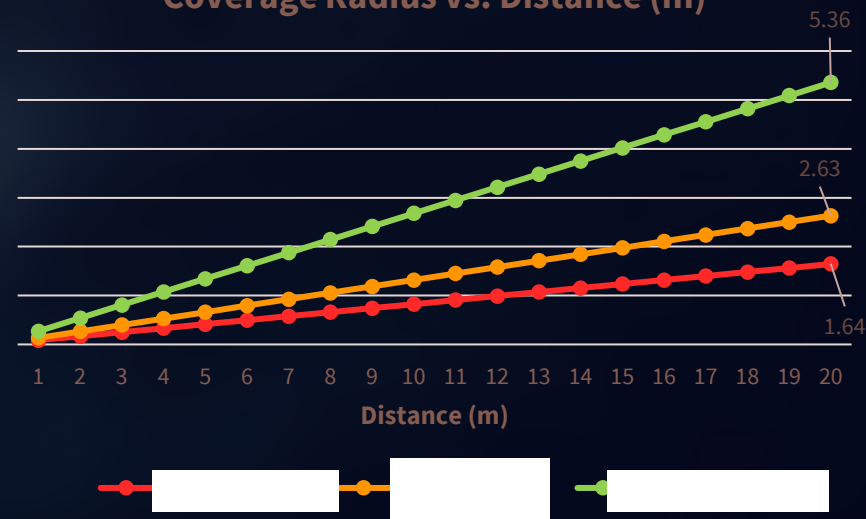
# DMS and ADAS Fusion



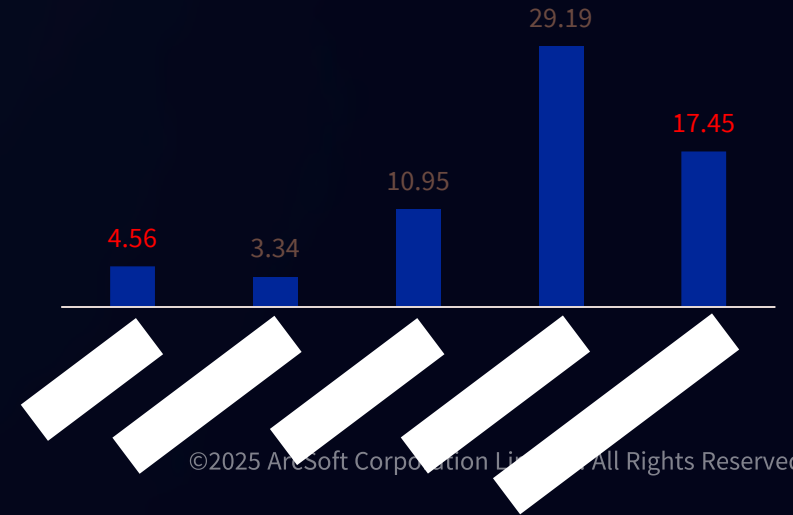
FOV Comparison (°)



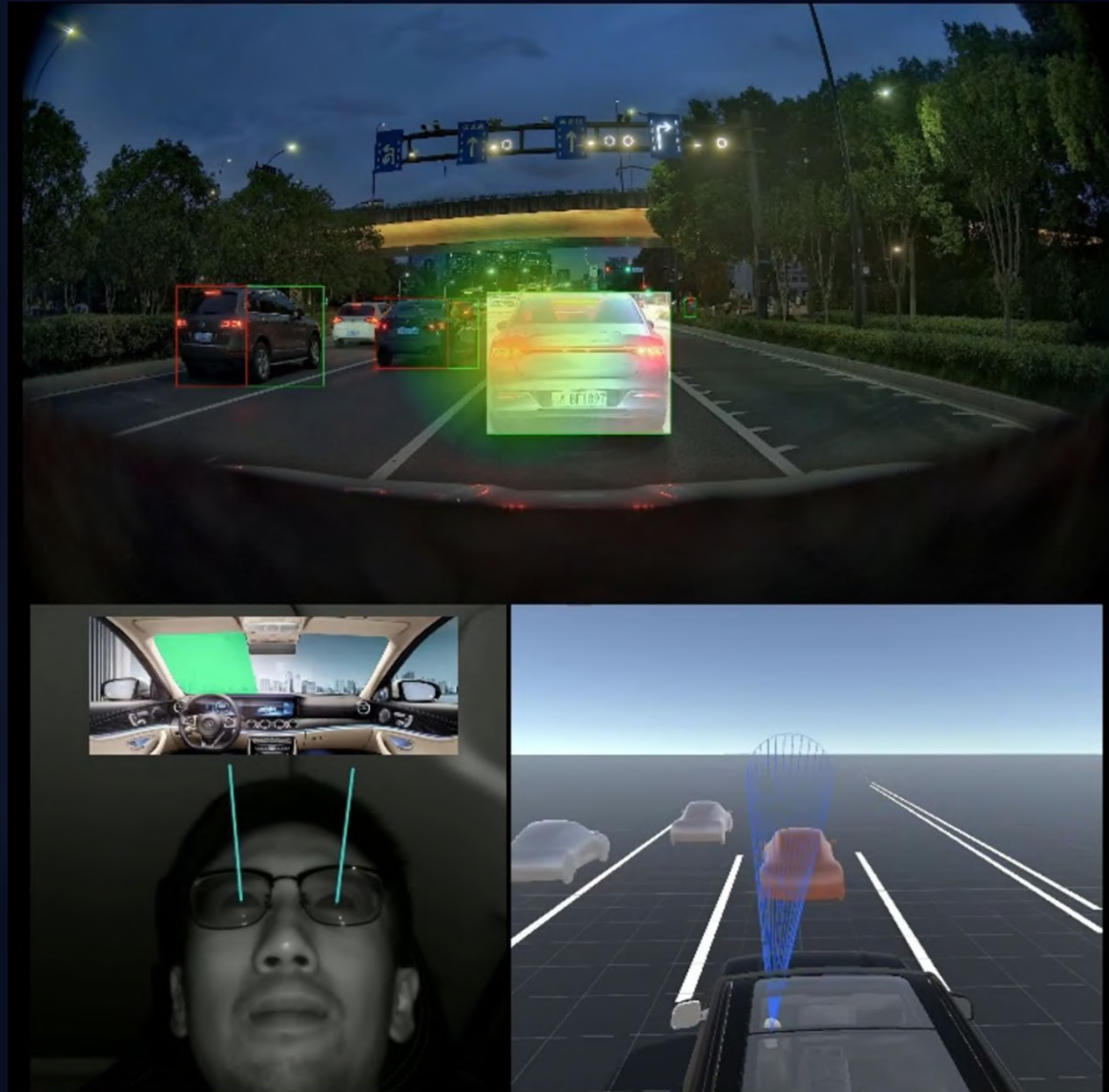
Coverage Radius vs. Distance (m)



Maximum Targeting Distance (m)



# DMS and ADAS Fusion: examples



# About ArcSoft

# Innovative leader in computer vision technologies

Founded in 1994 in the silicon valley USA



**30**  
YEARS

Automotive since 2017.  
30 years of visual AI expertise — now tailored to meet GSR, ENCAP, and software-defined vehicle demands.

**5**  
MILLION

Over 5 million vehicles on the road with ArcSoft in-cabin and ADAS solutions.

**10**  
SITES

1600+ employees globally, with dedicated automotive teams in Germany, China, Korea, and the US.

**40+**  
OEMs, Tier1s

Active collaborations with 40+ OEMs and Tier1 suppliers.

# DMS Solutions

## Regulation Package

- ENCAP24/26 Compliance
- DDAW Compliance
- ADDW Compliance
- ANCAP Compliance
- CNCAP Compliance
- CIASI Compliance
- IVISTA Compliance

## Cabin Safety Package

- Eyes On Road
- Hands-On Detection (Rear-View Mirror-Based)
- Seatbelt Detection
- Fatigue State Prediction
- Disengagement Detection
- Abnormal Posture Detection
- Spoofing Detection
- Impaired Driving non-drowsy

## Additional Package

- Gaze-Based Center Console Wake-Up
- Gaze Selection of Side Mirrors
- Gaze Selection of Windows
- AR-HUD
- Driver Vital Signs Detection
- Driver Emotion Detection
- Cognitive Stress

# OMS Solutions

## OMS Package

- Occupant Detection
- Stature Classification
- Child Detection
- Seatbelt Detection
- Out of Position Detection
- CRS Detection
- Hand Gesture Recognition

## DOMS Package

- Fatigue
- Eyes On Road
- Automatic Gaze Calibration
- Hands Off
- Distraction
- Face ID
- Occupant Detection
- Stature Classification
- Child Detection
- Seatbelt Detection
- Out of Position Detection
- CRS Detection

# ADAS Solutions

## Driving Package

- Target Sensing
  - Target structured sensing
  - Target behavior detection
  - Visual AEB Flag
- Road Sensing
  - Lane line sensing
  - Road boundary sensing
  - Road sign sensing
  - Lane topology sensing
  - Freespace sensing
- Traffic Sign Recognition
  - Speed limit sign
  - Prohibition, warning signs
- Traffic Light Recognition
  - Traffic light recognition
  - Traffic light reminder
- Light Source Sensing
  - Headlight detection
  - Ambient light source detection

# Proven Compatibility Across Leading Automotive SoC Platforms

Supports and adapts to different platform SoCs to meet OEM customization needs for software-defined vehicles.

**IVI / ECU / Domain Controller / HPC**

**VISDRIVE**  
Inside  
**TEXAS INSTRUMENTS**

TDA4  
AM62x  
...

**VISDRIVE**  
Inside  
**Qualcomm**

SA8155P SA8650P  
SA8295P SA8775P  
SA8255P ...  
SA8620P

**VISDRIVE**  
Inside  
**MEDIATEK**

MT8666 MT2715  
MT8675 ...  
MT8678  
MT2712

**VISDRIVE**  
InsideN  
**NVIDIA**

Orin  
Xavier  
...

**VISDRIVE**  
InsideN  
**OMNIVISION**

OAX 8000  
OAX 4600

## Supports

### ■ SoC Platforms

**Qualcomm**

SA8155P, SA8295P, SA8620P, SA8775P, etc

**MEDIATEK**

MT8666, MT8675, MT2715 etc

**NVIDIA**

Xavier, Orin

**TEXAS INSTRUMENTS**

TDA4, AM62x, etc

**OMNIVISION®**

OAX8000, OAX4600

**ORITEK**

LQ560 V100, LQ560 V200

### ■ DMS/OMS/IMS

#### Camera locations

- A-Pillar
- Steering Column
- Dashboard
- InCabin Rearview Mirror
- Overhead Roof Area

### ■ Sensors

- All sensors from 1M to 8M are supported, including
- IR sensors for DMS functions
- RGB/IR sensors for OMS functions
- RGB/Thermal sensors for ADAS functions

# Key OEM Customer Examples

## Chinese OEMs

## Emerging OEMs



## Joint Venture and Global OEMs

Algorithms released in more than

100 models &

5 million cars



Thank You!

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