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Vision

Advanced Driver Assistance: Modular Image Sensor Concept

Supplying value.

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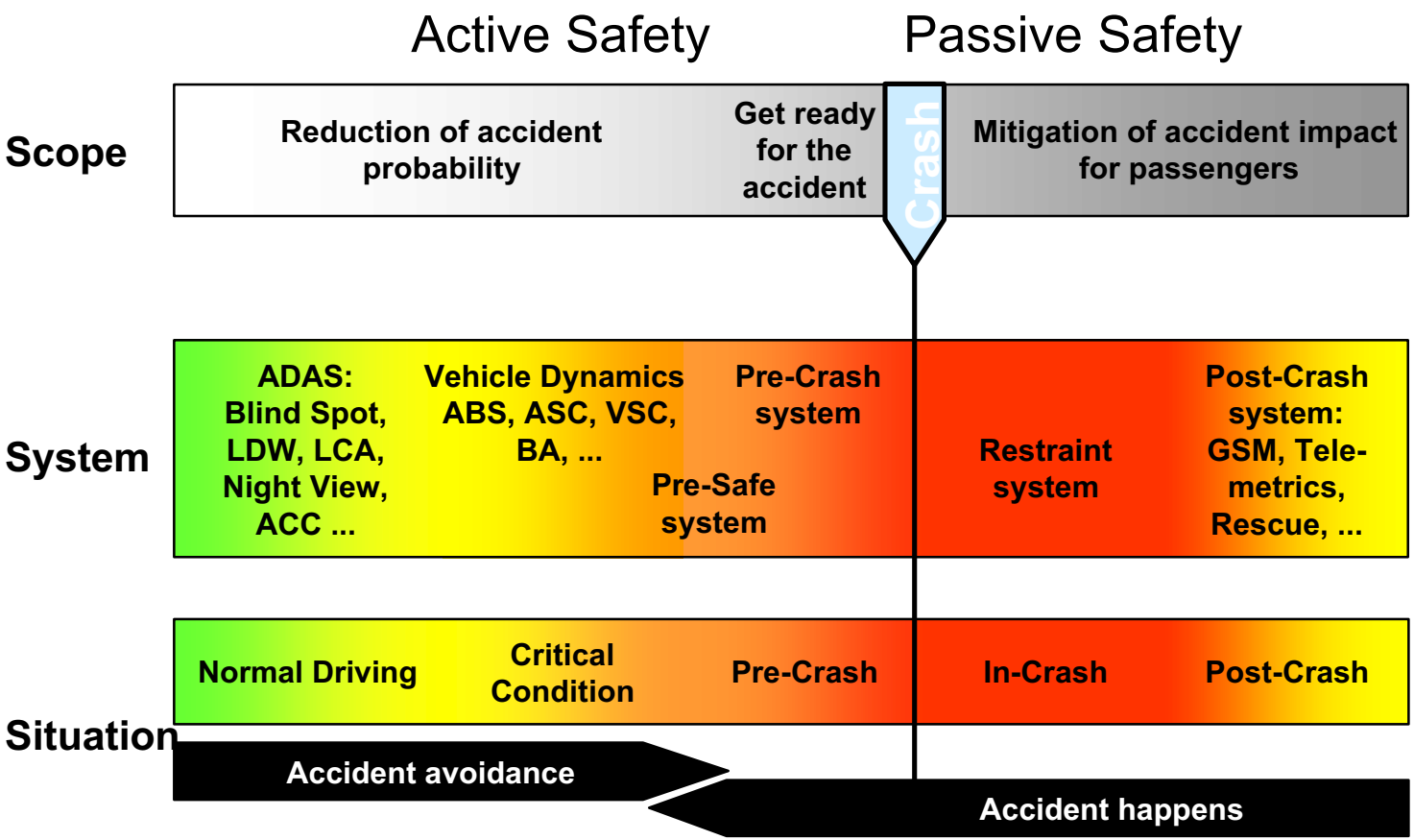
Integrated Passive and Active Safety Systems



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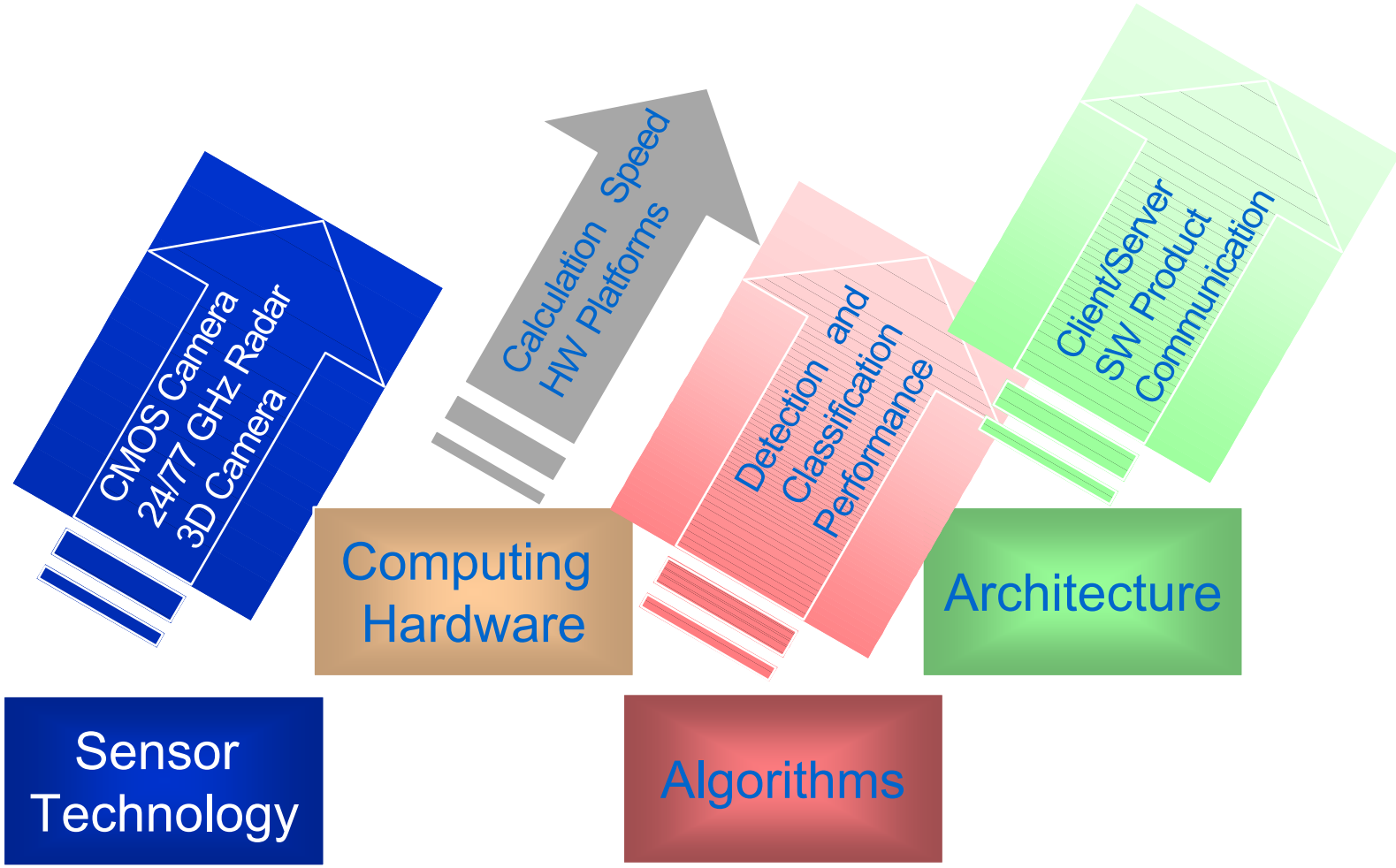
ADAS Technology Trends



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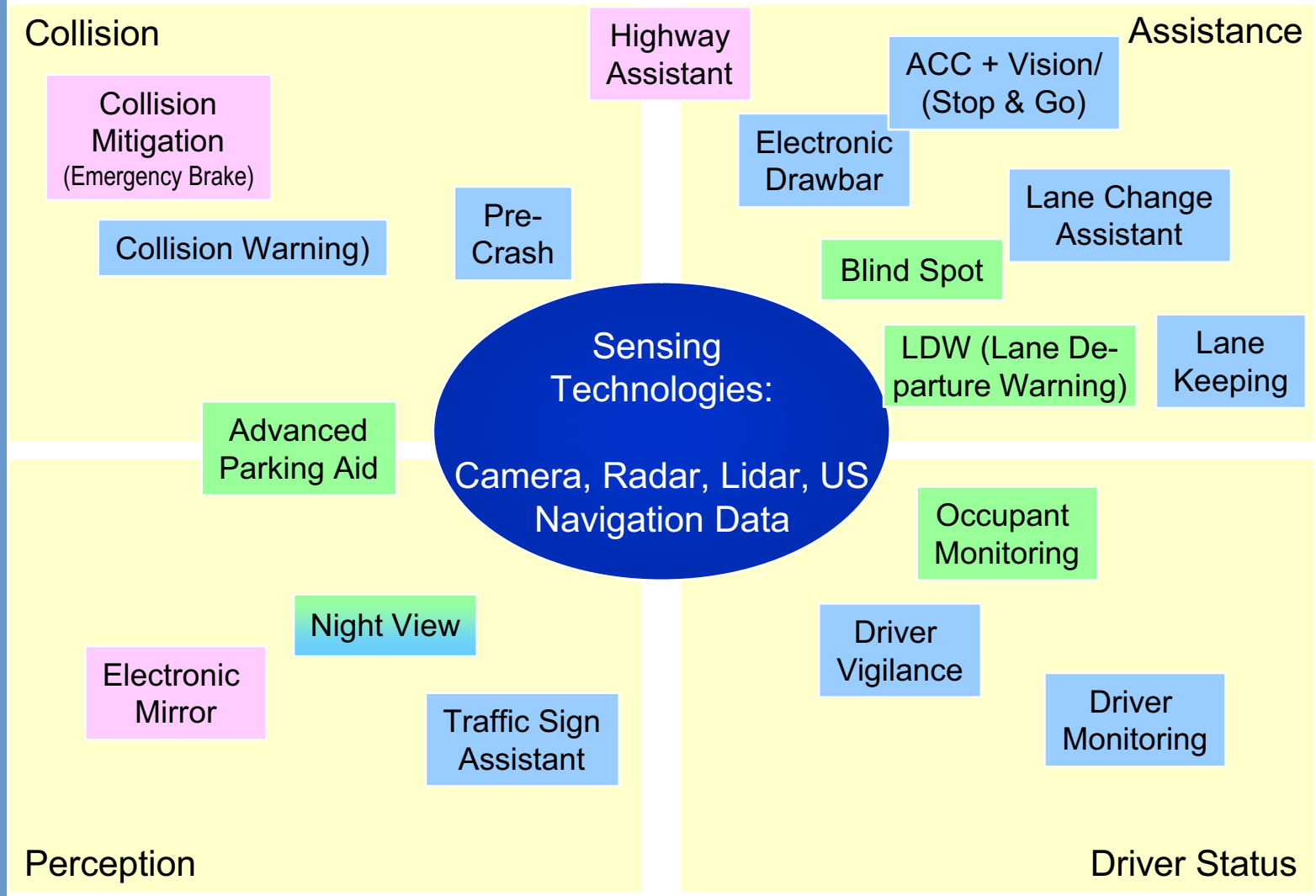
ADAS Overview



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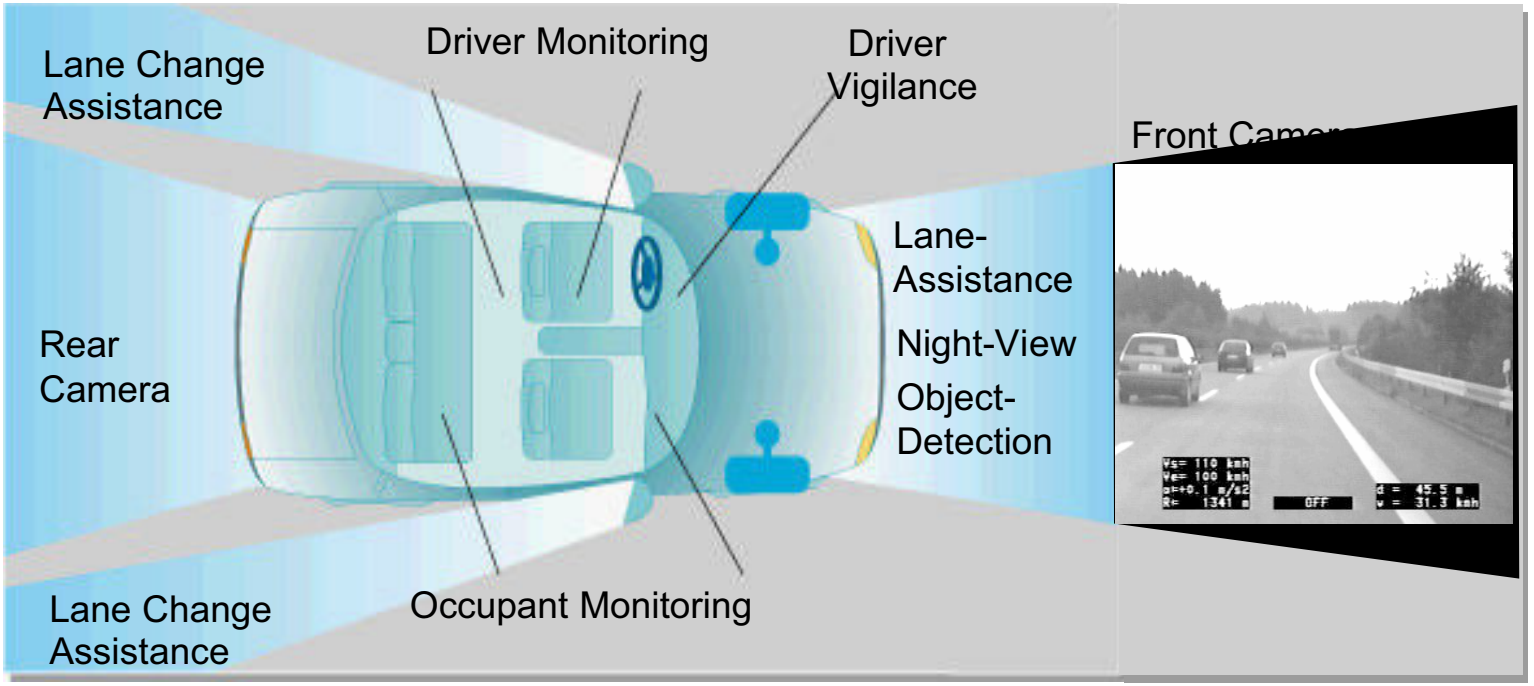
ADAS Camera Applications



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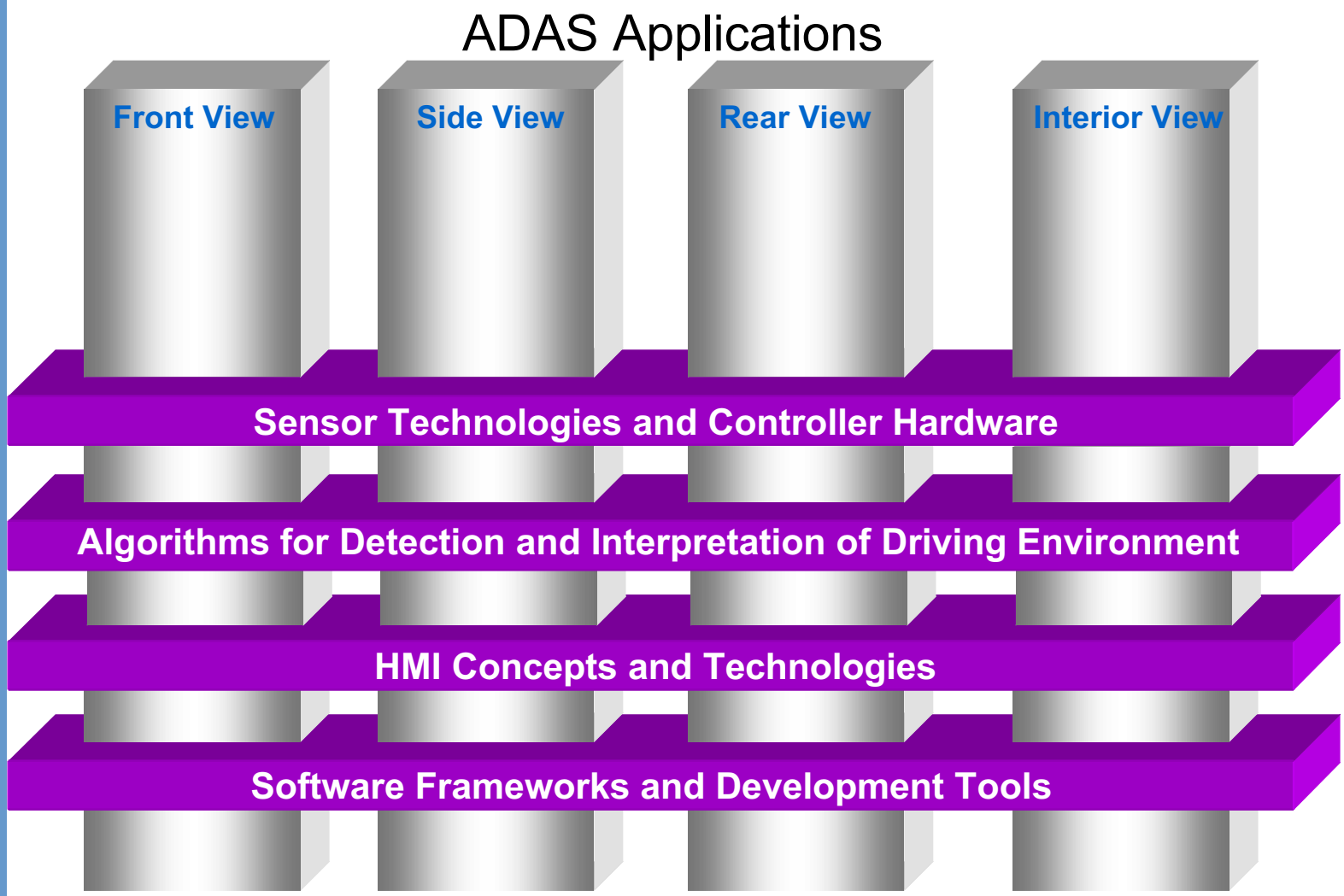
Modular ADAS Platform Concept



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Key Components for Advanced Driver Assistant Systems

Radar

- 77 GHz for far range
- 24 GHz for near range

Advantages

+ provides accurate range and velocity
+ resistant to dirt and rain, invisible mounting

Applications

- ACC, Pre Crash
- Near distance sensing

Video

- Monocular Vision
- Stereo Vision

Advantages

+ high angular resolution
+ emission free

Applications

- Occupant Monitoring
- Lane detection
- Object detection and classification

SIT

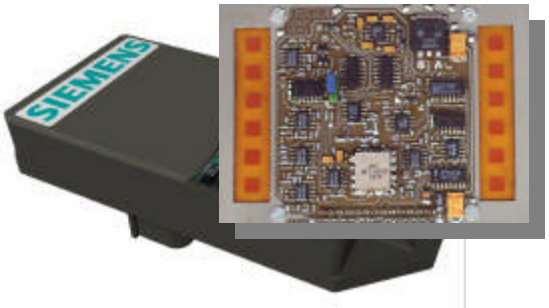
- based on Laser and CMOS technology

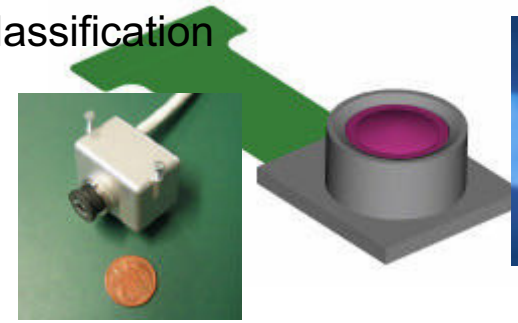
Advantages

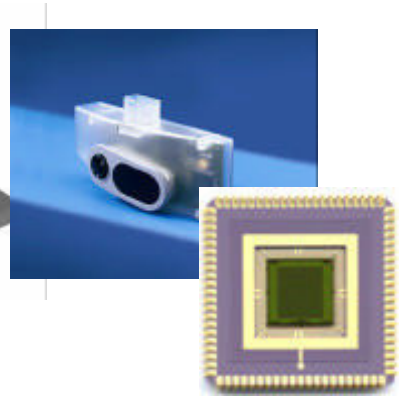
+ high range and angular resolution and accuracy

Applications

- Occupant Monitoring
- Object detection and classification







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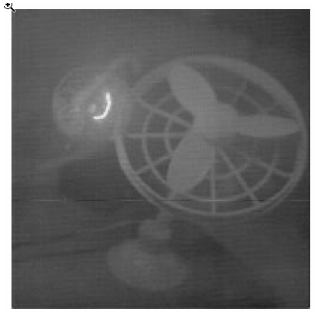
CMOS HDRC Camera



- CMOS technology is free of blooming and smearing
- High resolution (300,000 pixel) optimized for outdoor applications
- Synchronous shutter eliminates distortion on moving parts.
- High dynamic range (>120 dB) delivers excellent image quality in bright and dark areas
- High sensitivity allows night time operation

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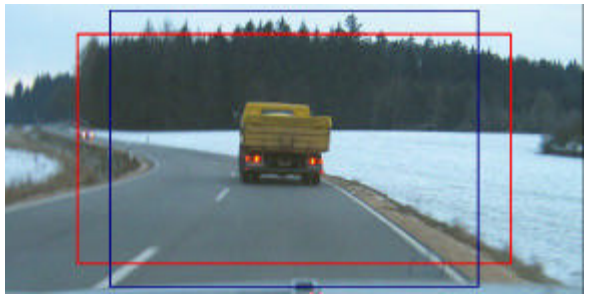
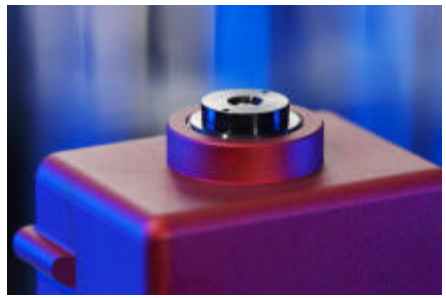
CMOS High Dynamic Range Camera (HDRC)

Resolution, Pixel Size	750x400, high fill-factor
Shutter Type	global, high shutter efficiency
Signal Response	up to 120dB, programmable Slopes
Data Interface	8 or 10 bit parallel
Configuration Interface	UART
Temperature Range	-40°C to +105°C (-40 F to 221 F)

Specials:

- low dark current
- fast readout
- High dynamic range,
- synchronous shutter,
- Configurable Region of Interest, Subsampling
- Bad/Hot Pixel Replacement





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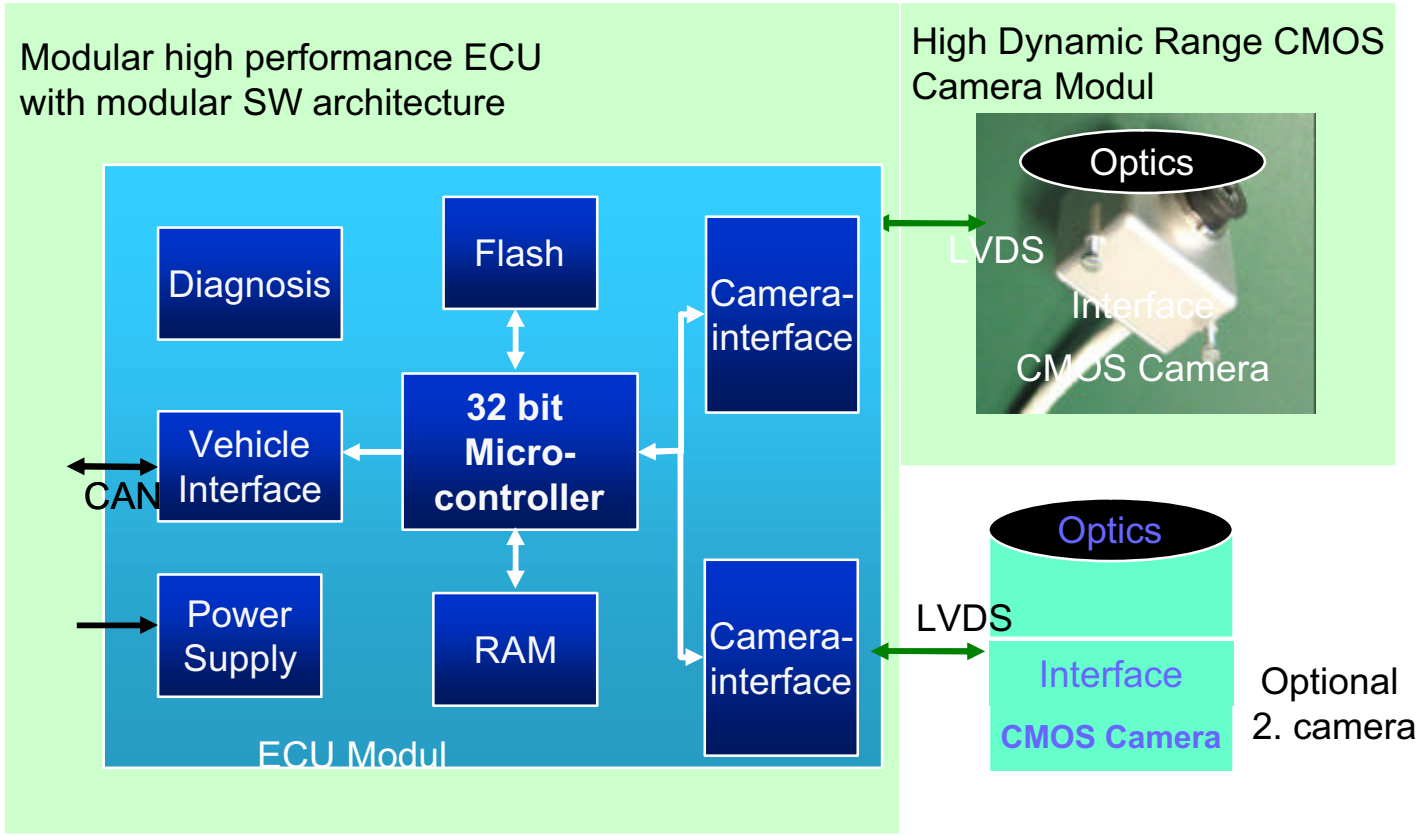
Modular Camera System Architecture for Advanced Driver Assistant Systems

Advantage: Reusability by flexible HW and SW moduls:

- Synergies between multiple applications
- Fast development of new applications
- Cost reduction



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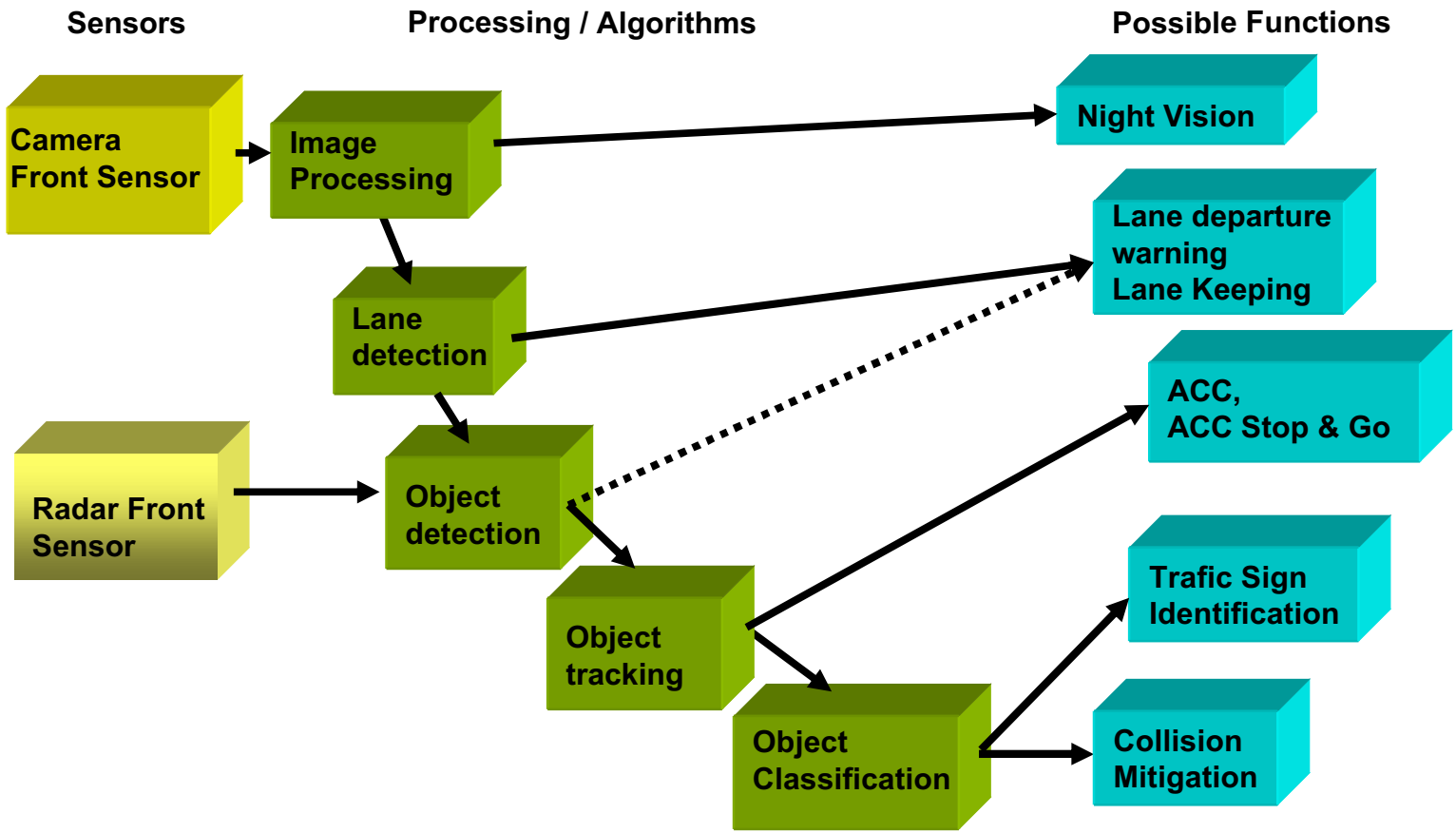
Multi Function Approach

Algorithms for Detection and Interpretation of Driving Environment



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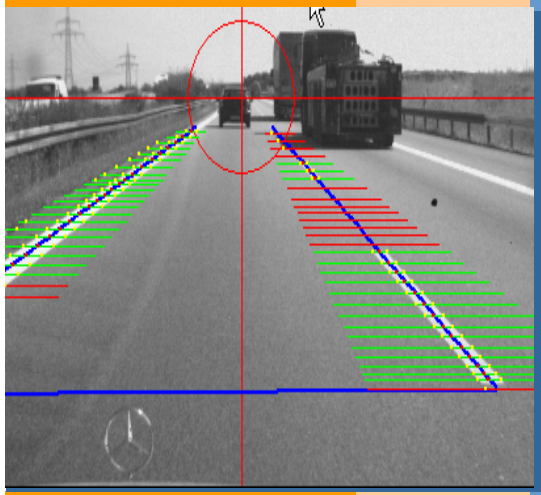

Application Examples: Lane Departure Warning Object Detection

Supplying value.

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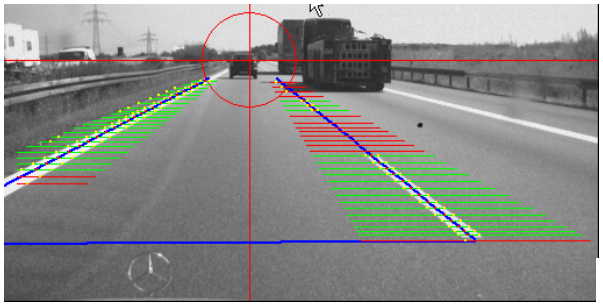
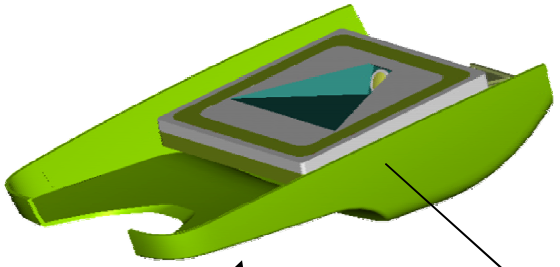
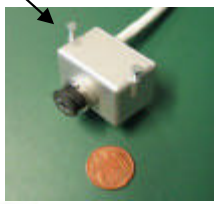
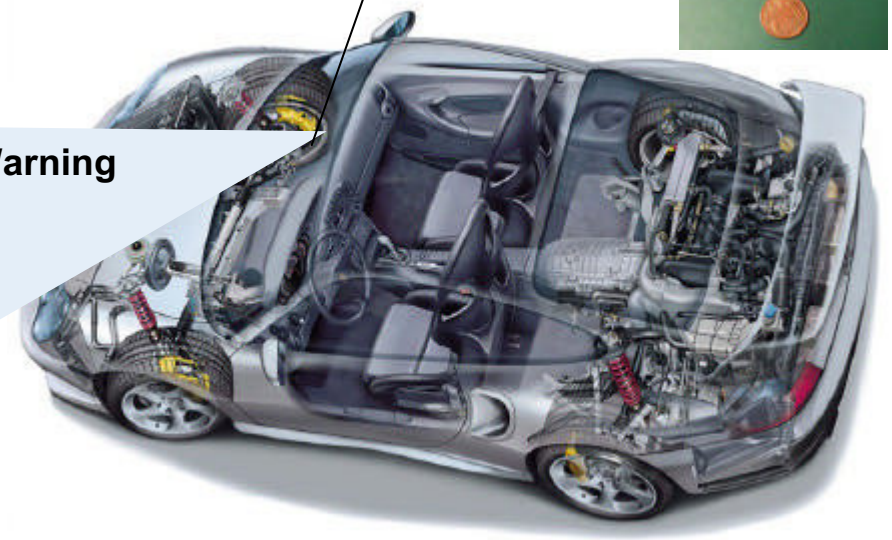
Advanced Driver Assistant Systems
Front Camera

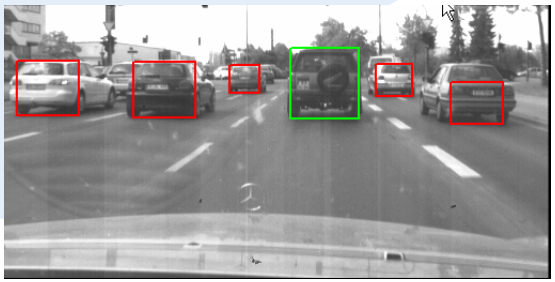








Lane Departure Warning
Lane Keeping
Night Vision
ACC + Camera



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What is "Lane Departure Warning" about?

- Lane departure is the single largest cause of automotive highway fatalities in the United States.
- "The main focus of LDW Systems is to help the driver keep the vehicle in the lane on highways and highway-like roads. Accordingly, a warning is issued to alert the driver in case of lane departure caused e.g. by inattention." *
- "LDWS are not intended to issue warnings with respect to collisions with other vehicles or control vehicle motions." *

*ISO Draft Standard ISO/TC204/WG14/N123.32 – Nov 01, 2002

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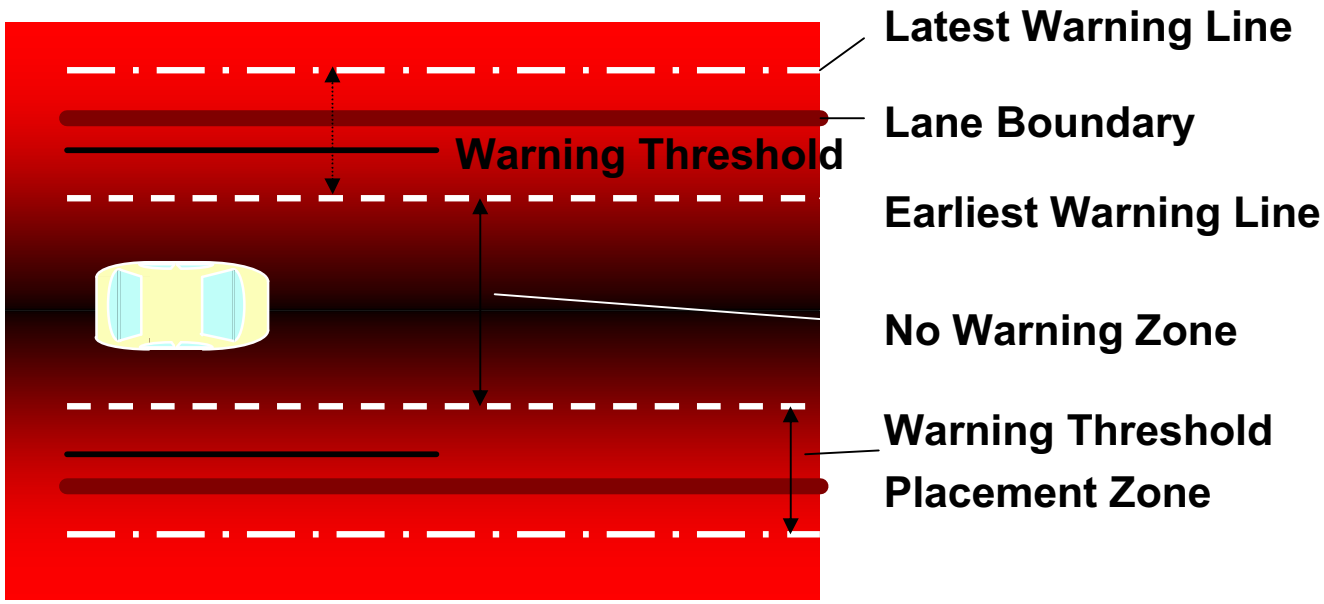
LDWS: definitions (according to NP17361 © ISO)



- Time to line crossing (TTLC): Calculated time to cross the lane boundary.
- Warning Threshold: The location on the road in which the warning shall be issued (depending on TTLC).
- Latest/Earliest Warning Line: The outermost/innermost limit of the warning threshold.

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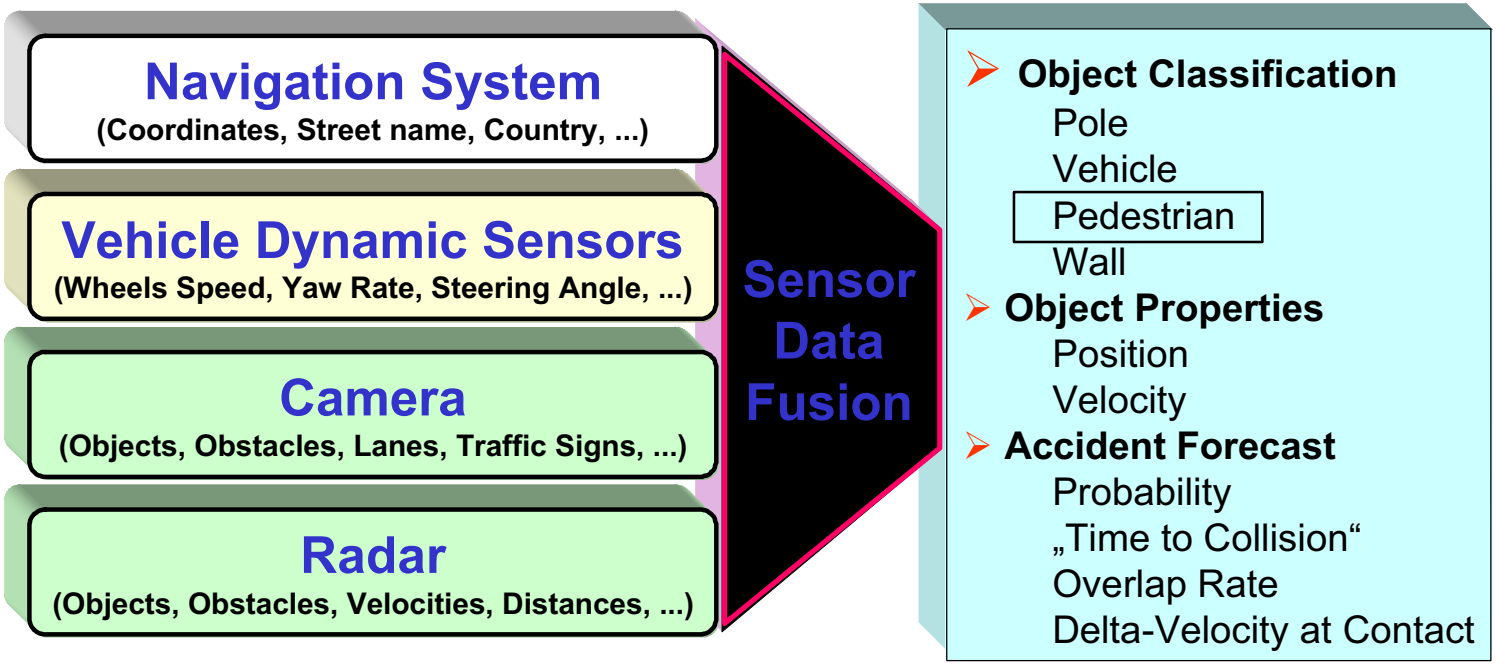
Sensor Data Fusion



Applications: Pre Crash, Pedestrian Detection, Collision Warning, Collision Mitigation

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Summary

Modular Image Sensing System for ADAS:

- ❑ Flexible HDR CMOS Camera Modules with Optics
- ❑ Image Processing ECU with high Computing Power
- ❑ Modular Interfaces & Communication
- ❑ Modular Architecture and Layer model for ECU - SW Framework
- ❑ Coherent Development Rules, Quality Concept and Guidelines

- ➢ Cost Optimization on Core Technologies
- ➢ Flexible Response to changing requirements
- ➢ Short development times