

# Driver Assistance Systems and Vehicle Environment Sensing

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## IAV Automotive Engineering

IAV provides vehicle manufacturers and ancillary suppliers with independent support in developing their functions and systems. With IAV's expertise, projects can be realized from the drawing board and initial prototype right through to the start of production. Doing so, we gear ourselves closely to the wishes of our clients and apply our expertise in projects on a systematic basis.

We address each individual activity in the development process as a team. IAV's flexible structures make it possible to include specialists in the project team quickly and effectively for specific development activities. This provides our customers with IAV's full range of competencies.

## Our Expertise: Your Edge on the Market

IAV has been working intensively on the subject of driver assistance systems for more than ten years. Starting with our own research projects, we now have over 35 engineers and technicians attending to projects from all areas of driver assistance and active safety. The fields we cover range from the concept definition, description, algorithm, software and system development through to system integration and testing. One main focus rests on quickly realizing algorithms with Rapid Prototyping, providing production-ready software, supporting the customer in the development and integration process as well as on functional validation. Applying targeted solutions developed in-house and supported by intensive cooperation with universities, we constantly widen our expertise in the interest of our clients.

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# Functions and Vehicle Environment Sensing

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## Vehicle environment sensing

- Long and short-range radar
- CMOS and infrared camera
- LIDAR multi-channel and scanning
- Positioning and motion

## Functions

- Adaptive cruise control
- Stop & go
- Blind spot recognition
- Lane departure warning
- Lane keeping
- Lane change assistant
- Front, side and rear view
- Parking assistant
- Night vision
- Pre-crash
- Pedestrian recognition

## Calibration/integration

- Package/installation
- Distributed functions
- Calibration
- Validation/testing

## Algorithm development

- Object-tracking
- Image processing for lane detection
- Image processing for object recognition
- Sensor fusion
- Longitudinal and transversal control

## Realisation of functions

- Functional description/requirements specifications
- Functional testing (situation analysis etc.)
- Rapid prototyping (Simulink® ASCET etc.)
- Software development
- Project management

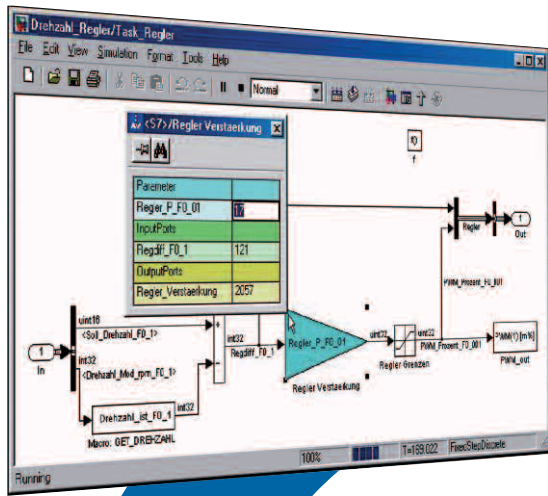
# Function Development

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IAV has been developing vehicle functions using rapid prototyping for more than ten years. In addition to giving us a start-to-finish tool chain for developing algorithms, this process also provides a ready-to-use modular hardware platform. This allows us to concentrate on realizing your application straight away. IAV's Universal Control Unit (UCU) prototype series makes it possible to meet widely ranging I/O requirements with the necessary controller performance in a very short time. Instantly available and also universally applicable, the MATLAB®/Simulink®/ Stateflow®-based development environment makes it possible to start work on urgent customer inquiries without delay.

Using this tool and the associated mode of procedure, we can realize your function in the vehicle quickly, flexibly and professionally. IAV's prototyping department makes this possible not only for the electronic parts of the algorithm but also for overall performance.

It is on this basis that we develop all-encompassing control unit software ready for use in production. This means we are responsible both for the application, and thus the actual algorithms, as well as for the basic software, such as for communication or diagnostics. In this case, the algorithms are developed with MATLAB®/Simulink® and implemented in the overall software by means of automatic code generation.



# System Testing and Validation

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## Roof node cluster

Infrared sensor plus camera

- Lane-departure warning
- Traffic-sign recognition
- ACC with stop & go
- Parking assistant (extended)
- CV sensing (extended)
- Emergency-brake assistant (extended)

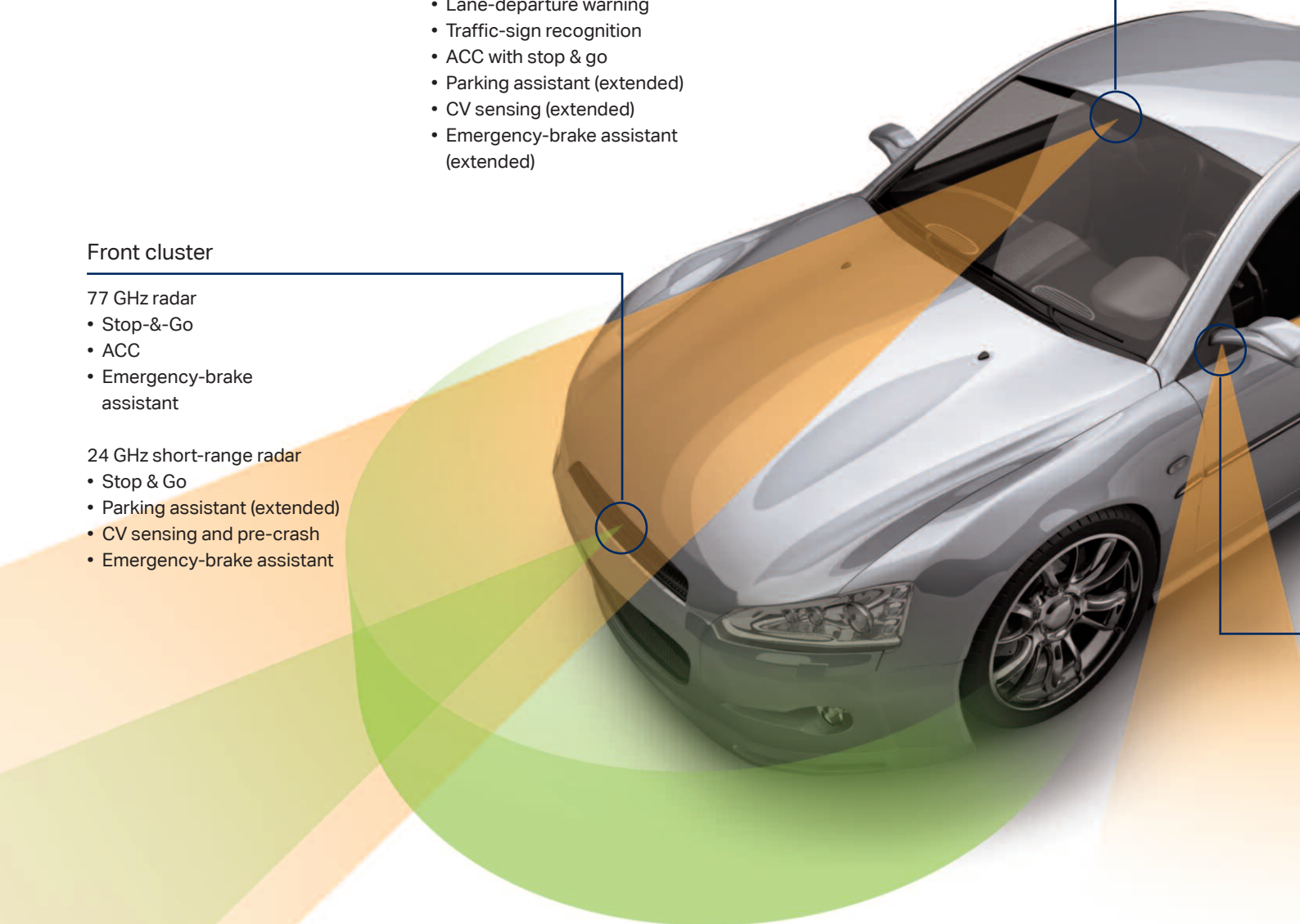
## Front cluster

77 GHz radar

- Stop-&-Go
- ACC
- Emergency-brake assistant

24 GHz short-range radar

- Stop & Go
- Parking assistant (extended)
- CV sensing and pre-crash
- Emergency-brake assistant



AV can offer you comprehensive expertise in testing and validating distributed driver assistance systems based on environmental sensors. Here, we attach particular importance to using efficient test design methods, testing procedures and testing tools that are geared specifically to the particular test objective concerned. Partially or fully automatic solutions are used for larger-scale or frequently recurring test activities. Flexibly configurable HiL simulators are available for this purpose. All activities are supported by a comprehensive system of requirement, test and problem management. This way, the development

process remains transparent for you as the customer from the requirement to the test result.

#### System testing

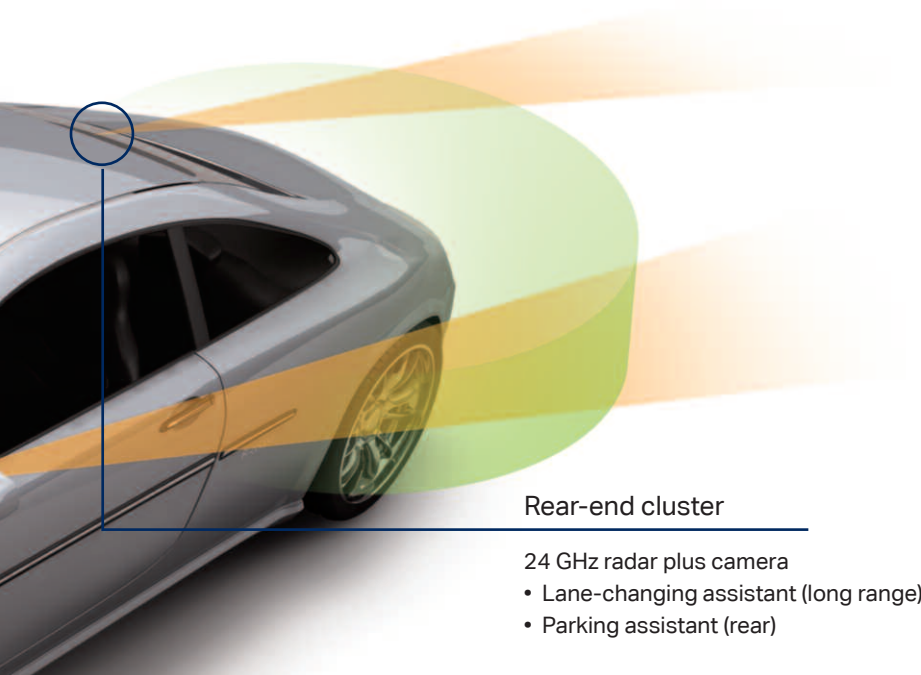
- Environmental sensing
- Closed-loop control strategy
- Warning strategy
- Competitor analysis

#### Overall and sub-system testing

- Target function
- Fault reaction
- Monitoring
- Self-diagnosis

#### Experience

- More than 2 million kilometers of test driving
- Testing on four continents
- Hot and cold-climate regions
- Radar, LIDAR and camera
- Longitudinal and transversal control
- Driver warning



#### Rear-end cluster

- 24 GHz radar plus camera
- Lane-changing assistant (long range)
  - Parking assistant (rear)

#### Side cluster

- Active IR sensor plus camera (PMD)
- Lane-departure warning
  - Blind angle monitoring
  - Lane changing (short range)
  - Parking assistant (parallel)





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