Editorial

Köln DVN-I Think Tank: Sensing For HMI Systems

RADIANT IMAGE

The recent dual conference we report on in this week's DVN-I Newsletter highlighted the importance of in-cabin sensing for applications including safety (DMS-OMS, adaptive HMI…); security (face recognition…); convenience (mood detection…); comfort (HVAC and seat adjustment…) and more.

HMI will be a central topic at the DVN Interior Think Tank seminar to be held in Köln at the Pullman Hotel on 28-29 November. What I would call 'adaptive HMI', particularly, will be the topic of a keynote speech from Forvia.

As a rather new technology, automotive in-cabin sensing is really beginning to gain traction. As we show with a smile in this week's Coffee Corner, long ago it still would have been the best way to detect what drivers and occupants want and need, especially in terms of safety, as a primary input for adapting systems accordingly.

That's one of the dimensions the discussion in Köln. All DVN Interior members are invited; please watch for your personal invitation to arrive by email. Save the date: Nov 28, 29! We're looking forward to seeing you there!

Sincerely yours,

Philippe Aumont
General Editor, DVN-Interior

In Depth Interior Technology

Autosens/In-Cabin: Dual Conferences at Brussels

Organized by Sense Media, the Autosens conference was held at Brussels on 19-21 September. It gathered ADAS and AV specialists to shape the future of vehicle perception. In parallel, In-Cabin was organized for automotive in-cabin technology specialists—a new event and community from Sense Media, bringing together experts from across the supply chain to map out how applications for safety; comfort, and productivity will be enabled by sensors; processing hardware; AI software and algorithms; and HMI and UI design.

One of the conclusions of these two events is that ADAS must be connected to DMS/OMS for fully effective safety. Even if we don't yet have the software; the hardware, or protocols to tie these two elements together, it's an interesting and crucial area to watch for innovation and strategy.

It is particularly true as L^3 is back on the product roadmap, with transition between automated and manual driving: the system must check driver availability and vigilance before switching from automated to manual.

These following presentations confirmed how context is important to make DMS reliable. That's very true in term of lighting conditions, but also in respect of driver position and outfit (glasses, face mask…). In these capsule summaries of the lectures, you'll find links to related DVN coverage.

In-Cabin

Smart Eye
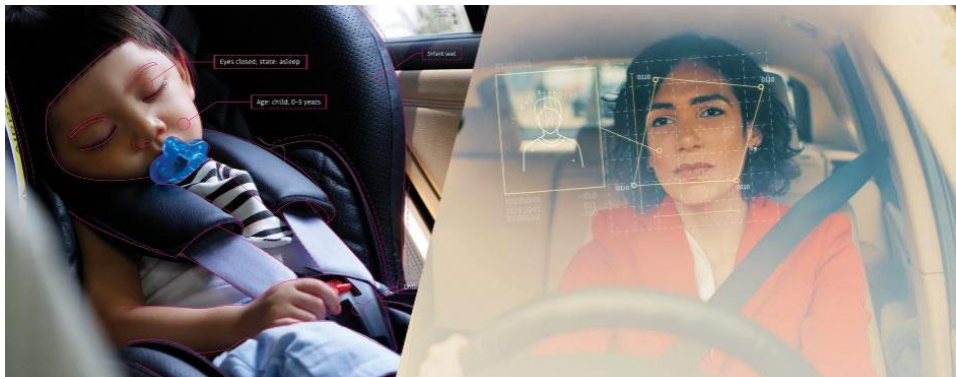
[Smart Eye](#) says their Human Insight AI technology 'understands'; supports, and predicts human behavior in complex environments. Their lecture was called Humanizing the In-Cabin Experience.

In this lecture Dr. Rana el Kaliouby explored how 'human-centric AI' delivers better automotive safety and more engaging mobility experiences that enhance comfort; wellness, and entertainment.

Omnivision
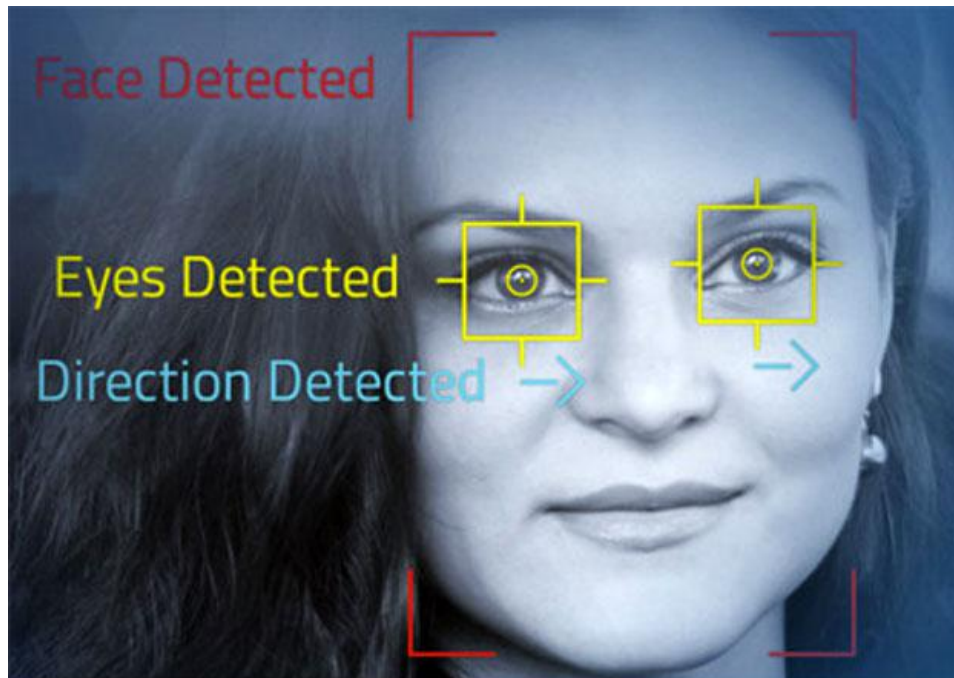
OMNIVISION IMAGE

[Omnivision](#) senior director Tomas Geurts talked about sensor simulation and closed-loop definitional requirements and definitions for DMS. The presentation introduced sensor simulation as an apposite tool, and proposed a framework to introduce physically consistent noise and other non-idealities to real-life or synthetic images. These images may be introduced in a system model to evaluate the impact of sensor noise; quantum efficiency, and modulation transfer functions on performance indicia as eye gaze detection accuracy.

Optalert

OPTALERT IMAGE

Optalert is an Australian business founded by sleep expert Dr. Murray Johns, who invented a personal safety device for transport workers to detect and prevent drowsy driving. Optalert presented their drowsiness monitoring solution and described how to validate the solution in terms of the EU requirements. Watch for detailed coverage on this interesting technology in a future issue of DVN-I.

Algolux

Riccardo Groppo, CTO and Founder of Sleep Advice Technologies, gave a lecture called Human Sensing Based on 122-GHz Radar Enabling a Paradigm Shift in Driver Monitoring. He presented key concepts and the preliminary results of Computer Vision Accuracy for All Conditions, a vision-based dense depth and object detection system able to precisely predict, in real-time, the onset of sleep by analyzing certain physiological parameters. It can run both on contact (wearable) and contactless (radar) systems.

Next2U

NEXT2U PSYCHO-DASHBOARD (NEXT2U IMAGE)

Next2U started in 2014 as an academic spinoff of the Italian G. d'Annunzio University's department of neurosciences; Imaging, and Clinical Sciences. Company founder Professor Arcangelo Merla presented a lecture called Driver Monitoring System Based on Thermal Infrared Imaging.

The possibility to assess human factors through non-contact technology makes thermal IR imaging perfectly suitable for in-cabin monitoring. By processing a large amount of data—including respiration rate and rhythm; perspiration activity; sympathetic dominance; engagement state; drowsiness level; stress; thermal comfort; speech; eyeglasses/sunglasses presence, head pose, Next2U has developed algorithms and software for psychophysiological assessment.

Infineon

INFINEON IMAGE

Martin Lass, Infineon's senior time-of-flight product marketing manager, talked about 3D time-of-flight and 60-GHz radar-based in-cabin monitoring systems. He explored their progress as complementary technologies addressing in-cabin use-

cases and being the enabler for differentiating features, like 3D face authentication added to standard DMS functionality or a highly optimized and affordable seat occupant detection solution including CPD and intrusion alert.

Imec

Imec, headquartered in Leuven, Belgium, performs research in nanoelectronics, leveraging its scientific knowledge with the innovative power of its global partnerships in ICT, healthcare and energy.

Dr. Li Huang, Imec's senior business development manager, presented a lecture called 140-GHz Radar for In-Cabin Sensing.

By using higher frequencies (140 GHz) and digital modulation, radar performance can be brought to new levels, and to smaller form factors. Besides better radars, imec is developing event-based sensor fusion between passive and active sensing modalities, paving the way to energy efficient and fast perception for improved safety.

Novelic

Novelic, based in Belgrade, Serbia, is an independent provider of millimeter-wave radar sensors and perception solutions, to develop custom products for automotive; autonomous driving; robotics, and other applications. Milan Stojanovich, a radar algorithms and software engineer for the company, presented a lecture: 60-GHz Frequency-Modulated Continuous Wave Radar Technology.

With multiple-input multiple-output (MIMO) mode, FMCW radars can detect and discern distance; angle of arrival, and velocity of multiple targets simultaneously, which is crucial for in-cabin applications. This lecture presented a sensor that performs the three safety functions using the compact Infineon BGT60ATR24C radar chip.

LG Electronics (LGE)
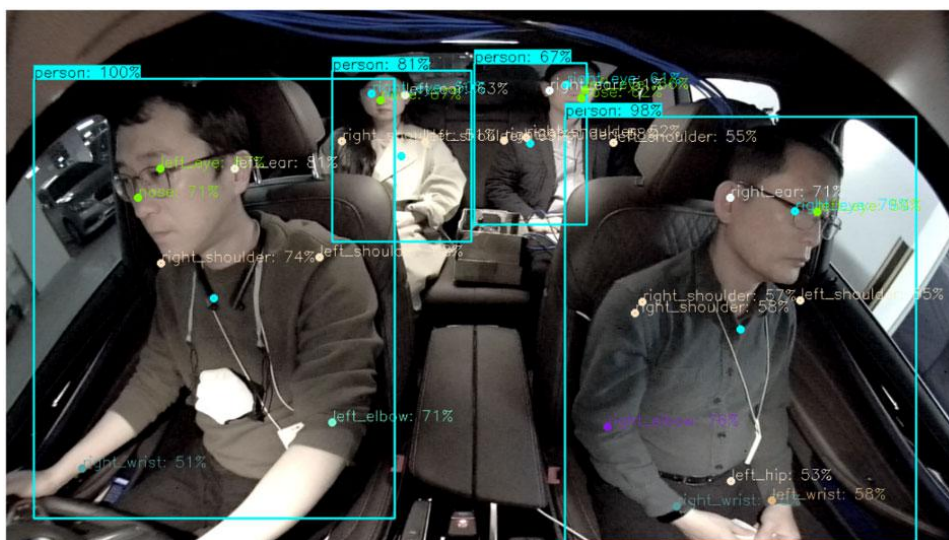
LG IMAGE

LG Electronics' director of automotive vision system development Youngkyung Park and machine learning engineer Jungyong Lee gave a presentation called In-Cabin Monitoring Solutions and AI Technology.

LGE has developed perception technologies and applications for interior monitoring solutions such as human body pose; seat belt status, and left-behind-object detection. They introduced the LGE interior monitoring solution and discussed attendant challenges.

LG's cabin system detects the occupants of a vehicle with a micro camera and AI to learn multiple drivers' behavior patterns and optimize the HMI. It can monitor and interpret the driver's face even if they are wearing a face mask.

Bosch

BOSCH IMAGES

Bosch's interior monitoring platform product manager Dr. Philippe Dreuw presented Key Challenges and Opportunities of AI-Based Development for In-Cabin Sensing.

The Bosch system can detect and alert on driver distraction; signs of drowsiness, and whether a child has been left behind in the vehicle. Safety systems, such as the seat belt alert, are further enhanced using information acquired from the vehicle interior. Besides the various safety-related applications, the solution also provides a range of innovative interaction options, like gesture control for distraction-free operation of the infotainment system.
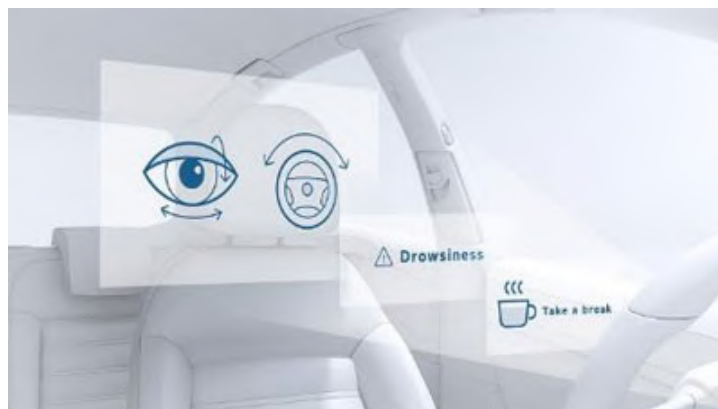
The driver drowsiness detection is based on an algorithm which analyzes the driver's steering behavior during the trip based on information from the steering-angle sensor. Based on the frequency of these movements and other parameters, among them the length of a trip, use of turn signals, and the time of day, the function calculates the driver's level of fatigue. If that level exceeds a certain value, an icon such as a coffee cup flashes on the instrument panel to warn drivers that they need a rest.

Sony

Sony'sautomotive business development manager Jan-Martin Juptner gave a lecture on Reliable In-Cabin Awareness for Cccupant Safety Via Multi-Sensor Fusion 2D & 3D.

Sony believes advanced occupant state and context awareness will be needed to improve safety. Such a system should detect individual seating positions (or out-of-positions); diverse occupant characteristics like body volume and size; age, and gender, as well as proximity to airbags; head restraints, and steering wheel. This information will enable personalized and situationally-aware safety systems to enhance safety for all kinds of occupants.

Current infrared DMS systems are expected to rely fully on 2D information. In Sony's opinion, that's not sufficient to achieve cabin-safety levels that will be expected in future. Instead, redundancy and several modalities are necessary.

Sony's ICMlib™ offers many in-cabin opportunities such as occupancy monitoring in order to differentiate between people and objects and track their movements. The WIOTS (What Is On The Seat) algorithm discerns people from items, and detects occupant size and position. Face authentication and out-of-position detection ensure greater security and safety.

Autosens

Autosens is an event bringing together ADAS and AV specialists to shape the future of vehicle perception. Focused on exterior sensor perception, the agenda covered 12 core themes including the changing face of the ADAS and automotive market to the approaches to sensor fusion in automotive perception and the architecture and data flow, AI, and machine 'learning' considerations for imaging.

DVN Interior reports here the highlights seen at Autosens. Adverse weather conditions are seen as the main obstacle to fast development of automated driving (and sensing!).

BMW Connecting sensor with the EE architecture

BMW GRAPHIC
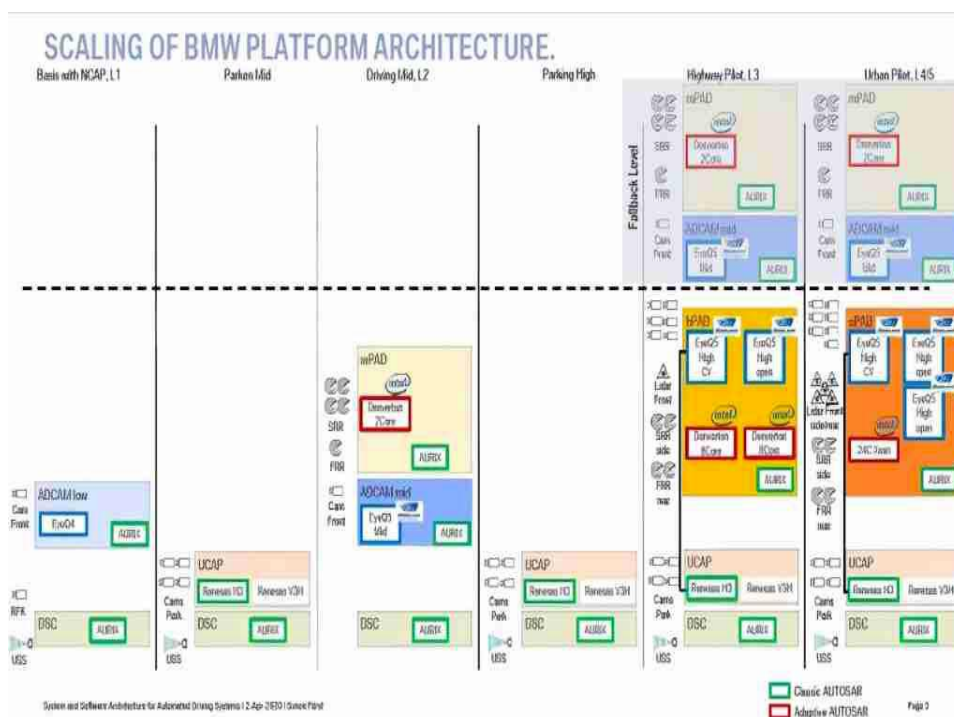
Valeo is working hard on behind-the-windshield sensor integration. The Valeo Comfort & Driving Assistance Systems business group focuses on solutions for intuitive controls; connectivity, and driving automation to make mobility safer and more enjoyable for everyone. Rain sensors and front cameras (with wide FoV for road-crossing scenarios) are both required to fully comply with regulations. They presented how to reduce the footprint of the sensors placed behind the windshield, and to go for an all-in-one integrated solution. This highly integrated solution offers cost savings and smaller footprint.

NXP is working on optimizing the transition between training and inference so as to avoid introducing systematic errors. NXP firmly believes in the integrity of AI development, and is investigating how to make hardware more robust to random faults.

Qualcomm presented an Integrated Approach to Creating Functionally Safe Automotive Sensor Systems. This presentation demonstrated how the MIPI Automotive SerDes Solutions (MASS[SM]) framework provides a standardized sensor-to-ECU solution for autonomous driving and ADAS with functional safety built into its core.

Samsung discussed their view of the long-term lidar outlook. SAIT (Samsung Advanced Institute of Technology) is a central research organization focusing on long-term research for Samsung semiconductor. Lidar is one of options under their consideration. The presentation was about technology pathfinding, not about products.

Elmos gave an interesting talk called ADAS Ultrasonic Bionic: Insect Hunting Bats are the Great Model and Inspiration.

Bats have a sophisticated echolocation system, which as a model for biomimicry could have a positive impact on standardization of simulation and testing. What's in mind includes:

- Broadband ultrasonic signal modulation with adapted pulses/frequencies and sound pressure level
- Possibility to change the beam direction on the fly
- Binaural echo evaluation: Two sensitive movable ears are giving horizontal and vertical spatial angles to the target
- Neuronal network adapted over long evolution time to have optimal target detection and environment suppression including Doppler compensation
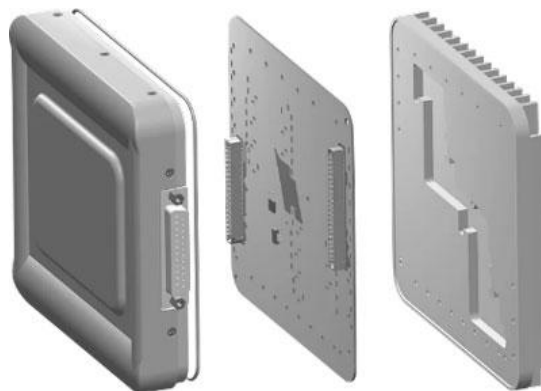
Radsee from Israel, founded in 2017, talked about their 4D Imaging Radar Cuatro-ATM solutions. They say RadSee provides a cost-effective solution that achieves higher angular resolution; wider FoV; higher reliability in dense urban environments, and can be provided as one platform to fit 360° sensing requirements. It is ready for ADAS and will support AV with an underhood radar deployment.
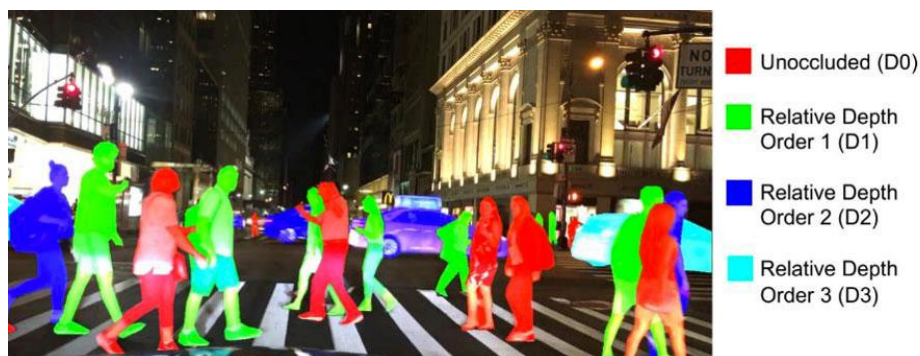
University of Freiburg, Germany presented [Amodal Panoptic Segmentation](#), to perceive the entire structure of traffic participants at all times, regardless of occlusions, to minimize the risk of accidents and extend the capabilities of autonomous robots

AVL, out of Graz, Austria, gave a lecture about Adverse Weather Conditions in the Validation of ADAS/AD Sensors. AVL is a partner for automakers and suppliers looking to provide L^3 and beyond, with expertise in engineering and simulation as well as testing toolchains. They presented their offerings including system design; testing; calibration and validation services; tailored software and controls development, and tools and methods for scenario-based (here adverse weather conditions) development and testing.

ZongMu described automotive ultrasonic sensors and their application fields. Founded in 2013, ZongMu is a provider of autonomous parking products, one of the first companies to have brought autonomous parking system into mass

production.

Valens, based in Israel, provides semiconductor products, They invented HDBaseT technology, the leading standard in the audiovisual market, and are an innovative automotive supplier of in-vehicle connectivity solutions.

St Gobain,the France-based glass company, presented the impact of optical quality of windshields on ADAS performance. They have developed an in-house simulation tool based on stochastic ray tracing to more accurately render optical characteristics' impact on ADAS camera images. In this simulation tool, the windshield and the camera lens are modelled separately, which facilitates modelling the entire optical system and understanding its impact on ADAS performance.

Baraja gave a talk called The Future of Lidar and Autonomous Driving—Lessons From the Past 5 Years Testing in Sensor Hell. Their conclusion: lidar needs invisible integration. Baraja is a US deep technology company who have developed lidar for self-driving vehicles. In 2021, Veoneer partnered with them to deliver Spectrum-Scan^{TM} lidar for the next market wave of L^{2+} through L^4 autonomous vehicles.

Analog Devices presented their talk, Enabling Enhanced Exterior Vehicle Perception in ADAS and AVs with Gigabit Multimedia Serial Link (GMSL).As the number of sensors is increasing, communication infrastructure needs to initiate ahead of time. Link-based security is preferred over protocol or application-based security. IEEE 802.ch and the ASAML fulfill the requirements for asymmetric and networked high-speed communication.

dSPACE's talk was called Digital, Signal, Processing, And, Control Engineering: How to Organize, Understand and Harness Collected Sensor Data. dSPACE offers comprehensive open and integrated development and test environment solutions and services for data-driven development, simulation, and validation—from data logging and production software development to homologation; sensor testing, and aftermarket.

Zendar lectured about radar project classification.

ZENDAR IMAGE

A British Indian company, Zendar described how current automotive radars are inadequate for ADAS, much less fully autonomous driving. Such systems demand high-resolution, robust sensing in all conditions, including inclement weather and bad lighting. Zendar's simple, inexpensive radar front-ends distributed around the vehicle, with AI and advanced signal processing, provide enhanced object detection; 10× better resolution; 2D velocity estimation, and full 360° coverage.

KPIT Path Partner, founded in 2006 and headquartered in Bengaluru, India, has about 500 employees. They're part of the KPIT Group since October 2021, and their lecture was about practical problems in sensor fusion. To meet the new GSR and NCAP requirements, or to provide L^{3+} autonomous capability, multi-sensor fusion is practically mandatory. The multimodal nature of heterogenous fusion data not only add new information, but also raises a lot of engineering issues to be handled

Onsemi presented a talk calledAutomotive Image Sensor Key Characteristics Impacting Sensing for ADAS and AV Systems. Takeaway points:

- Camera resolution (modulation transfer function) and signal:noise ratio across temperatures; integration times, and light levels define capabilities of ADAS and AV systems for object detection and recognition.
- Automotive HDR imaging cameras and sensors are different in their performance, some providing better stability and predictability across automotive conditions and some requiring more system training and workarounds.
- The latest super-exposure pixel sensors provide for improved safety-related metrics at a constant speed and enable autonomous driving at higher speeds, as well as reduce system development costs.

Xperi expounded on Effective Use of Longwave Infrared Technology for the Development and Optimization of Deep Learning-Based Intelligent Thermal Vision Systems for Smart Vehicular Applications. Their DTS Autosense product is a single-camera DMS-OMS which has won multiple awards over the last two years.

Sony Semiconductor Solutionsspoke onthe Challenges of Human and Computer Vision from a Single Automotive Camera. Key points:

SONY VEHICLE AT CES 2020 (DVN IMAGE)

- Automakers would like to utilize single cameras for multiple purposes.
- The Key image quality performance indicators are single-exposure dynamic range and knee-point signal:noise ratio. Optimization can be achieved by carefully design of HDR architecture and pixels.
- From the case study of camera system architecture, Dual-ISP architecture can realize versatile camera system configuration, BOM optimization, and best image quality for each purpose.

Interior News

Antolin's Smart Sliding Floor Console

GRUPO ANTOLIN IMAGES

Grupo Antolin presents a new 'smart' sliding floor console concept designed for specific needs but useful for all passengers. The power-slide center console concept moves softly to and fro, taking advantage of the flat floor of an EV; it can be operated safely by front and rear passengers at any level of autonomous driving.

The concept features several HMI solutions that improve in-vehicle comfort and convenience, while providing personalized experiences: the main infotainment display introduces a holographic assistant that can be controlled by voice commands or by a kinematic, nomadic knob that can sit even with the surface. There's a secondary. projection-type rear screen. Both displays make information processing and monitoring simple, intuitive, and dependable.

Enjoying cold or hot beverages, everywhere, all the time, is possible thanks to the double smart cupholders, which not only hold but also heats or cools a drink—and there's a hot water dispenser at the rear, perfect for a spot of tea on the go.

When the front seat has swivelled into conversation mode, the console can be synced and become a third infotainment display, or the passenger can just relax, take the fully integrated removable table on the side of the console with easy cleaning surface, attach it on the rear slot, and use it.

Functions light up to be used when they are needed or to communicate with the passengers. A light, activated through capacitive detection, enlightens the front lower part of the console for easy access to the wireless charger (multilocation

and multidevice) on a flexible wood surface that shows a backlit charging indicator. The dynamic light behind the upper aluminum trim changes its color to adapt to the driving modes or to provide guidelines of the vehicle status, and it follows the movement of the floor console when it slides.

Flexible storages can be found all around. The soft armrest can be moved forward or backward independently from the console, and has a lid that reveals an accessible box for electronic devices or any other small belongings. More storage areas are distributed ergonomically: purse space; rear drawer cabinet, paper bin, etc. They help to free up space elsewhere in the vehicle.

There's an integral IAQ system with an air grid; a perfume diffuser, and a closed compartment for safe and easy object disinfection by ozone.

Reintroducing Tactility to the Automotive Experience

2019 BENTLEY EXP 100 GT CONCEPT (BENTLEY IMAGE)

The 14th International Conference on Automotive User Interfaces and Interactive Vehicular Applications was held last month in Seoul, Korea. Many papers were presented in the domains of accessibility; driver expectations and safety; human-centered design; novel interfaces, and e-HMI.

Bentley, based on research conducted with University College London and DCA International—a UK product design and development consultancy—presented a lecture called Tangible Interaction with In-Car Smart Intelligence, a paper on reintroducing tactility into the automotive experience Their work presents a tactile embodiment of an intelligent car system, different from previous studies, to improve engagement and emotional connection between users and future intelligent cars.

Interacting with a car was once an entirely tactile experience, but tactility has been more or less annihilated with the rise of touchscreens (much to the detriment of safety, usability, and UX quality) and in-car assistants. A 2019 Bentley concept car, pictured here, presented with no screens or digital interfaces. Instead, 3D sculptures are placed in the center of the front and rear of the car for users to tangibly interact with.

The researchers useda prototype tool, designed to embody an intelligent car system, to investigate how to interact with and control a smart-comfort system to improve user comfort. The tool invited users to interact through touch. They concluded there is a lack of published research around embodied and tactile smart car assistants. Parallel research shows having a physical interaction with the car results in more personal non-verbal cues being used by the occupants. More research should investigate this physical interaction modality and not only focus on on-screen and voice interactions.

Volvo to Detect Left-Behinds In Car

Volvo Cars says their new EX90 EV SUV will feature a world-first interior radar system designed to ensure that no one is unknowingly left behind in the car. One aim is to stop hot-car deaths, which have killed more than 900 children and an enormous number of pets in the U.S. since 1998.

To stop a leave-behind, the EX90 will feature sensors integrated in the overhead console; the roof-mounted reading lamps, and the trunk that can detect sub-millimeter movement.

Volvo's research has concluded the best time to alert on a potential leave-behind is when the driver attempts to lock the car. At that moment the interior radar system is activated and determines whether the car has any people or pets inside. If so, the car will remain unlocked. In addition, the car will display a reminder to check the cabin for occupants on the center console screen.

The car's climate system can remain on if people or animals are detected in the cabin, to improve comfort. This can also help lower the risk of hypothermia or heatstroke. Of course, it remains active only until the battery runs out of power.

Volvo developed the system with support of Alps Alpine of Japan for sensors, and Sweden's Acconeer for low-power radars. The interior radar system will come as standard equipment in the EX90 in all countries where the 60-GHz frequency is approved for automotive use—presently including Germany; Sweden; France; Italy; the UK; the US; Spain and Canada. It is not currently permitted in markets such as China and India.

Recycled Polystyrene With Virgin Properties

TECHNIP–AGILYX IMAGE

Technip Energies and Agilyx have launched their TruStyrenyx brand, said to be a complete solution for the chemical recycling of polystyrene (PS). The solution combines Agilyx's pyrolysis process and Technip Energies' purification technology, yielding a recycled styrene monomer with exceptionally high purity. Styrene monomer is used to make numerous plastics and other polymers. It is one of the three primary components of ABS (Acrylonitrile-Butadiene-Styrene), can be used as pure PS, and is an ingredient in various synthetic rubbers.

In interior applications, there is a trend towards light-colored interiors, and the use of transparent light guides and light diffusors. Painted and unpainted solutions are available. A company called Styrolution—part of British chemicals firm Ineos, for example, offers a material blend for unpainted interiors, an ABS/PA (polyamide) alloy. Components made of this blend, either unfilled or glass-reinforced, feature a matte surface with good haptics. Due to the strong flow properties of the new range of Terblend N EF (easy flow), very fine surface structures can be reproduced in the injection molding process, while weld lines or flow front lines are invisible.

Terblend S is particularly well suited for interior trims, especially parts above the beltline or in convertibles where light and brightly colored parts are exposed to a great deal of solar UV radiation. Main features include good UV resistance and high impact strength. Parts made of this blend do not squeak or rattle due to its favorable acoustic properties.

Recycled styrene monomer from the pilot plant meets ASTM standards and is over 99.8 per cent pure. Halogen content from flame retardants (added for the previous use of the pre-recycled styrene) are undetectible in the Styrolution recycled monomer product.

Styrolution is currently evaluating a number of their transparent products, such as Luran (SAN), Terlux(MABS) and NAS (SMMA) for automotive interior applications. Luran, for example, can be used to produce large and long parts due to the good flow properties during processing.

BMW XM's Roomy Premium Interior

BMW IMAGE

BMW XM concept car has turned into a production model, with a preview recently presented. DVN Interior previously reported on this concept.

High-quality interior surfaces enrich the cockpit, with BMW's curved display placed on a matte carbon surface which also features on the vehicle's center console. Carbon elements are fitted within the instrument panel and contrast the wide, pearl-effect chrome air vent surrounds.

M multifunction front seats are standard equipment with power adjustments including head restraint height; thigh support; backrest angle and width, and backrest upper section, as well as pneumatic lumbar support adjustment; memory functions; heating and ventilation, and a massage function contribute to making the driver and passengers more comfortable.

BMW's Merino leather is used as standard with interior and seat surfaces in black and contrast stitching in black grey. The upper section of the instrument panel and door shoulders have been covered in black nappa leather along with the headliner and A; B, and C pillars. Imitation leather is used in the lower sections of the instrument panel, door trim panels and back of the front seats.

BMW says the XM has the most spacious rear seat of any model, and the claim stands to reason; the vehicle has the same wheelbase as the X7 but without a third row of seats. The rear seat bench features two outer seats and a full-size third center seat. The sides of the backrests extend into the door trim panels, enabling passengers in the outer rear seats to face one another. Rear seat heating includes the side panels; seat surfaces, and backrests.

BMW IMAGE

Ambient lighting features in the form of LED illumination for the instrument panel; center console; door trim panels; footwells; speaker trim, and headliner. There is a 'sculptural headliner' incorporating 100 LEDs along with a vintage-look

leather and M Lounge signature. llumination can display pulses of light during an incoming phone call or if there is a collision risk when opening a door.

The audio system has 16 Harman Kardon Surround Sound speakers which deliver 415 W. Available at extra cost is a Bowers & Wilkins Diamond Surround Sound System with 20 speakers and 1,500 W amplifier. This option benefits from a digital seven-channel amplifier and four additional sound sources in the roof area to provide a multilayered 3D sound experience.

Bentley Bentayga Update Focuses on Wellbeing

BENTLEY IMAGE

The interior of the new 4-door Bentayga S Hybrid has a contemporary feel, featuring crafted leather and Dinamica eco-suede. A digital instrument panel displays performance design dials and a combination PHEV power meter/tachometer. There's fluted seating; s emblems on the fascia, and illuminated sillplates and headrests.

The Bentayga S models also feature a 'hybrid sports exhaust' which brings sound into the cabin and can be tuned for different effects between the front and rear seats.

Bentley has prioritized the wellbeing of occupants with a variety of interior changes, such as an acoustically-isolated cabin which walls off occupants from the sounds of the 3-liter V6 gasoline engine and the electric motor. Following a four-year research program which showed people exposed to traffic noise over 70 db are 65 per cent more disposed to depression, Bentley tested their Bentayga EWB and proved its interior is between four and 26 per cent quieter than competing vehicles, depending on frequency and occupant position within the cabin.

The Bentayga Azure Hybrid has Front Seat Comfort Specification, which enables up to 22-way adjustability and a heating and ventilation function to maintain the optimum body temperature to promote occupant comfort and alertness. The development team partnered with Katherine Templar-Lewis, a neuroscientist from Kinda Studios, whose research on external stress factors was key in defining the concept. She evaluated the in-car lighting; patterns; in-car posture, and thermal comfort. Her analyses were melded with Bentley's measurements to provide a science-based analysis on the experience of traveling within a Bentley.

BENTLEY IMAGE

Bentley's Color and Trim team can also offer 'wellness quilting' within the Azure Hybrid which provides visual and tactile diamond-quilted upholstery. Three open-pore veneers are used inside the vehicle, consisting of dark walnut; crown-cut walnut, and koa. Customers can choose from 15 hide colors and combinations, with contrasting stitching and seat piping. Bentley-B pedals; mood lighting, and a two-tone heated steering wheel round out the interior space's deluxities.

The Design Lounge

Citroën Oli: Radical, Responsible Concept Car

CITROËN IMAGE

Citroën says their Oli concept is a "radical, responsible" approach to offering affordable electric cars, featuring sustainable materials light weight, and simple construction. The Oli is a small pickup, Citroën says, with a target weight of 1,000 kg and a range of 400 km. Citroën says efficiency would be "best in class," with consumption of 10 $^{kWh}/_{100\ km}$ from a 40-kWh battery.

To achieve a smaller environmental footprint, the Oli employs innovative technologies such as Goodyear Eagle GO tires that use a tread partly made from sustainable materials including natural rubber; sunflower oil; rice husks, and pine resin. Interior materials also reflect this spirit. The tubular-frame suspension-style seats, which Citroën says use 80 per cent fewer parts than a conventional seat, are made of 3D-printed recycled polyurethane from BASF to eliminate waste and save weight. Floor materials are also polyurethane, molded like a sneaker sole, to reduce material diversity and aid in recycling.

The cabin is highly accessible thanks to rear-hinged rear doors. Inside, infotainment is controlled by the user's smartphone (as in the Ami), and there are detachable Bluetooth speakers, and built-in holders for earbuds and tablets

behind the front seats.

There's a flat deck behind the rear window covering a bed rather than a hatchback or conventional trunk. To create a large, open space, the rear-seat headrests fold into the roof; the seat folds flat, and the rear glass opens upward. Perhaps the most notable design element is the flat windshield, reminiscent of an old VW or U.S. Army Jeep, which allows for less material and a cheaper, simpler production process. Because the Oli is a concept, aerodynamic properties are less of a concern than they would be in a production car, but Citroën designers say an 'Aero Duct' system at the leading edge of the hood directs air above the roof to create a curtain effect.

CEO Vincent Cobee says there are no present plans to build the Oli, which he describes as more of a possible roadmap of ideas toward the goal of an accessible, desirable, environmentally-friendly electric car—though he says some Oli innovations will appear on future production Citroëns: "We want to make a statement about affordable, responsible electric cars that exude freedom," he told Automotive News Europe. "Oli is a laboratory that demonstrates that it's not completely crazy to aim at that".

The Oli name—pronounced "all E", as in electric) is meant to refer to the Ami, the automaker says, but unlike that car, which evoked the small Ami 2CV variant from the late 1960s, the Oli does not refer to past Citroën models.

The reveal of the Oli last week coincides with a new logo for Citroën, a 2D rendering of the brand's historic chevrons that is closely related to those from the brand's 100-year history.

The Oli's utilitarian shape reflects Cobee's and design chief Pierre Leclercq's belief that form follows function. Cobee says "Citroën is not a sports-car brand, and because we wanted (the messages to be) recyclable, affordable, attractive, and efficient, we wanted to start with form equals function".

The flat roof; rear deck, and hood are constructed from a recycled cardboard honeycomb covered in resin that weighs 50 per cent less than steel, but is also able to support a person's weight.

Other complexity-reducing measures include identical left and right front doors (mounted in the opposite orientation) without soundproofing, wiring or speakers, and identical front and rear bumpers, made by Plastic Omnium of 50% recycled materials.

In-Cabin Sensing

COFFEE CORNER
DVN
Interior

METROPOLITAN RAILWAY FIRST-CLASS CARRIAGE (JAMES PETTS IMAGE VIA WIKIMEDIA COMMONS)

Henry Ford is apocryphally claimed to have said 'if I would have asked people what they wanted, they would have said faster horses' . Made-up or not, it's an assertion readily used to vindicate the successful story of the automobile as the genius form of mobility back then and since. Well, this is an approximation. The tech ecosystem of the era, as well as the mobility shift that was about to occur, did not fit just between the horse and the automobile. At the same time, there was another form of transportation system—well developed and tested; a lot more autonomous, reliable, and predictable: railways. The equivalent back then of today's AV geofencing was a rigid train track, unlike early automobiles whose direction was decided through rudimentary maps, often leading to dead ends in the middle of the countryside. Back then, cars didn't have the necessary infrastructure nor the autonomy to travel far, and they frequently broke down. So why did people prefer cars?

An evident truth lies in the interiors of both transportation systems. While railways unified people to a specific schedule of arrivals and departures at the same time for everyone, they forced a social proximity by putting strangers next to each other in confined spaces in all ticket classes. In a time when urban life and civic sense were different from today's, another adversity also tested the passengers' patience: they were forced to look laterally and not forward to the destination, often shocked by the fact that the train would seem to fly above the window-framed landscape (bridges) or even drive through it (tunnels).

While cloistered, unrelated strangers were going through a novel kind of indescribable hardship, they felt lonely; small, and blind as they were carried along by the iron beast. In the early 1900s, a train pathology report was published concluding that people feared both the social and the technical context. The general idea of fully trusting the machine has always seemed strange to humans, evermore within an alien social context. As much as we like the machines, we actually rather prefer to control them.

Moving forward in time, in the film Minority Report, the main hero delegates driving to his flying urban vehicle and then he jumps off to his mission. A film critic rightly observed that a movie character always jumps out when driving the car is not thrilling anymore. This statement is very true—cinematographically and anthropologically. In fact, the HMI for train

passengers was as unpleasant as the automobile, but the latter could be abandoned when things got wrong or uncomfortable.

Perfect driving does not exist, and neither does a perfect environment. Technology is not about assisting humans through an idiot-proof mobility system, but much rather amplifying their acquired skill into a new level of excitement. If in-cabin sensing existed at the times of the early railways, to monitor the 'human condition', then the automotive evolution might have followed a very different path. Today, Henry Ford's mythologized dogma might have been recorded or coined as 'If I would have asked people what they wanted, they would have said trains with better in-cabin sensing'.

News Mobility

Adient–EnerTech Alliance for Mobility Tech

Adient is partnering with EnerTech Capital, a U.S.-based venture capital firm focused on emerging technologies and business models in the mobility space. EnerTech's current platform has a significant focus on emerging opportunities in the mobility space across electrification; autonomy; smart mobility, and connectivity.

This partnership provides Adient with opportunities to benefit from insights into trends in mobility and gives the company curated access to high-tech companies focused on automotive technologies that can help enhance their products and operations. Adient will leverage EnerTech's significant global mobility network, which includes the California Mobility Center (CMC). The CMC can help to identify new opportunities or start-up companies aiming to advance innovation in product, process and systems technologies supporting electrification and other new mobility initiatives.

Adient president and CEO Doug Del Grosso says "As a leader in automotive seating, we are always looking for ways to meet the emerging needs of our customers. This strategic partnership will allow us to continue to offer state-of-the art solutions for the vehicles of tomorrow, expanding our expertise and insight into EVs, NEVs and other future mobility trends.

General News

Mercedes-Benz Image

VOLKSWAGEN IMAGE

In automotive development, vehicle functions are increasingly no longer mapped in hardware but rather in software. The term 'software-defined vehicle' picks up on the shift of automotive value creation to the area of software development. But the software-defined car needs new architectures and processes as well as a completely different mindset. In the course of complex, software-based change, time-to-market will be much more important in the medium term than in the past. Crucial prerequisites for the success of the software-defined car are speed, scalability, security and cooperation with partners.

While the software of a new car consisted of 10 million lines of code around ten years ago, it now numbers around 100 million. By 2030, it could be around 300 million lines of software code, according to management consultants McKinsey. Electrification, automation and connectivity are changing customer expectations and prompting manufacturers to rely increasingly on software. An analysis by management consultants Roland Berger says spending on software could rise to as much as USD $59bn per year by 2030. New design concepts are emerging in which the vehicle is built around a software platform from the outset. This could save almost $16bn a year from 2030. Instead of a development cycle focused on model years, agile methods will drive continuous software development.

A Study by the Capgemini Research Institute shows, that most automakers are only at the beginning of their software-driven transformation. Only 15 per cent of automakers qualified for Capgemini's consideration as "trailblazers" in the successful transformation. They assume that sales generated by software will account for 28 per cent of their total sales in ten years' time.

Over-the-air update capability will become the key to almost every digital value creation in the vehicle, and the electrics/electronics or E/E architecture has to change. With increasing electrification and networking, the scope of functions is rising sharply. Each new function is synonymous with more software. This software complexity has to be managed, which makes a more centralized E/E architecture necessary with only a few, powerful electronic control units.

The transition to software-defined vehicles also means that data processing requirements will increase as vehicles process data from various sensors and interact with a broad ecosystem that includes other vehicles on the road. Vehicle manufacturers will need to develop data analytics systems capable of handling this enormous flow of data and processing it in near real-time. In order to unlock the full potential of the transformation, in addition to having a comprehensive understanding of vehicle technology and physics, a majority of the existing workforce must be trained in software skills and new ways of working. Currently, according to the Capgemini study, automakers face a skills gap of 40 to 60 per cent in areas such as software architecture; cloud management expertise, and cybersecurity.

Mercedes-Benz Digital Factory Campus

MERCEDES-BENZ IMAGE

With last week's official opening, the Mercedes-Benz Digital Factory Campus (MBDFC) is now up and running. The campus bundles the development, testing, and seamless and rapid global implementation of MO360 software applications for automotive production with a series of state-of-the-art pilot lines and test cells, and acts as a digital start-up factory in the plant area. MO360 stands for Mercedes-Benz Cars Operations 360 and is the name of the manufacturer's new digital production ecosystem.

M-B chairman Ola Kaellenius (photo, front and center) said "The transformation from a location for conventional drive components into an innovation hub for software and a production site for electric motors, is enormous".

The campus is to become the MO360 training and qualification center with innovative approaches regarding digital implementation in the global network. Mercedes plans to invest a total of three-digit millions in the transformation of the site (Berlin-Marienfelde) over the next five years.

As a center of excellence for the digitization of IT-based production, the Factory Campus is now driving the development, testing and validation of future software applications and concepts for MO360—significantly, in a real production environment. Production processes are replicated in the body-in-white and assembly management departments and in the technology cells, and new features and software updates are tested before they are transferred to real production lines. Virtual methods are combined with real-world validation methods. The result is shorter development times and greater robustness in the processes.

The campus relies on cooperation with partners from business and science; for example, with universities, research institutions and industrial companies. Mercedes-Benz and Siemens have been working together on the sustainable digitalization and automation of the automotive industry since 2021 with the support of the state of Berlin. To this end, Siemens is contributing their expertise to the partnership in order to develop flexible, efficient and sustainable automotive production together with Mercedes-Benz. Optimized algorithms in the applied robotics of the production lines make it possible to act more energy-efficiently and reduce production times.