AutoSens

Brussels 2017 Edition
18-21 September 2017, AutoWorld, Belgium

Monday 18th September

Official meeting for the IEEE Standards Association Working Group on Automotive System Image Quality – P2020

Tuesday 19th September: Technical Workshop Programme

plus Autonomous Vehicle Demonstrations

Morning Sessions

o The Role of AI for Autonomous Vehicles
Led by **Dominique Bonte,** Managing Director, **ABI Research**

o Automotive Cybersecurity
Led by **Faye Francy** and **Alexandra Heckler**, AUTO-ISAC

o Enabling heterogeneous systems with open standards for ADAS
Led by **Duncan McBain**, Staff Software Engineer, and **Tod Burns,** Developer Relations Manager, **Codeplay**

Afternoon Sessions

o Human Factors in Designing Self Driving Vehicles
Led by **Dr Sheldon Russell,** Senior Research Associate, **Virginia Tech Transportation Institute**

o Understanding the Image Colour Pipeline for Automotive Applications
Led by **Prof Albert Theuwissen,** Founder, **Harvest Imaging**

Conference Day 1: Wednesday 20th September

08:00   Registration and refreshments

OPENING PLENARY
Mezzanine Auditorium

08:50   Opening remarks from Organisers and Chairs
Robert Stead, Managing Director, **Sense Media**
Dr. Patrick Denny, Senior Expert, **Valeo**

09:00   Euro NCAP, "In Pursuit of Vision Zero"
- Achievements to date
- Euro NCAP Rating
- Automated Driving

Richard Schram, Technical Manager, **Euro NCAP**

09:25 M&A activity and industry assessment/where is value in market
- Active buyers
- Key acquisitions
- Best funded start-ups, and most active investors
- Hot or not – where the winners will be

Rudy Burger, Managing Partner, **Woodside Capital Partners**

09:55 Looking ahead with computer vision
- State-of-the-art examples of CV for automated driving
- Lessons from biology?
- Possible, future directions

Luc van Gool, Professor, **ETH Zurich** and Head, **Toyota Research Labs**

10:35 Networking refreshment break

	CAMERA DEVELOPMENTS, CHALLENGES AND EMERGING APPLICATIONS *Mezzanine Auditorium* Chaired by **Dr. Patrick Denny,** Senior Expert, **Valeo** and **Dr. Sven Fleck, SmartSurv**	SENSING BEYOND THE VISUAL SPECTRUM *Mahy Seminar Room* Chaired by **Benjamin May, AMX13**	FUNCTIONAL SAFETY TESTING, VALIDATION AND SIMULATION *Minerva Seminar Room* Chaired by **Professor Dr Alexander Braun,** Professor für Physik, **University of Applied Sciences, Duesseldorf**
11:20	Critical factors and future pathways for Camera Monitor Systems (CMS) - Understanding the development framework – ISO16505, UN Regulation no. 46 – missing elements for image stitching - System fundamentals – sensor, interface, processing (examples and illustration of basic and advanced systems) - Sensor fusion – the growing role of fusion in CMS	Application, market and technology status of the automotive lidar - The lidar controversy - Applications and forecast - Breakthrough technologies **Pierre Cambou,** Imaging activity leader, **Yole Développement**	Simulation testing for autonomous systems - Advantages and challenges of simulation vs real-world testing - Approaches to simulation – technology requirements - Case study: Automated verification process for vehicle-in-the-loop simulators **Prof Paul Jennings,** Experiential Engineering / Energy and Electrical Systems, International Digital Laboratory, **University of Warwick**

	• Development pathways from current to a future of mirrorless vehicles, and challenges along the way **Philipp Hoffmann,** Research, New Technologies and Innovation, Project Leader Interior Concept Research, **BMW Group**		
11:45	Developments in stereo vision systems in robotics and beyond • SGM: From robotics and remote sensing to driver assistance • Confidence and error modelling in stereo vision • Application examples **Dr Heiko Hirschmueller,** co-Founder, **Roboception**	Why LIDAR did not meet the demanding automotive requirements yet • Looking for an affordable solid state LIDAR solution offering automotive-grade reliability • Results of using a solid-state multi-beam laser source, using a CMOS imager as a low-cost detector • Discussion of the influence of different lidars onto each other in terms of performance in bad weather **Filip Geuens,** CEO, **XenomatiX**	An Universal Optical Model for lens simulations • Illuminate - What everybody wants and needs: Current state of universal optical models • Focus - Theoretical approach for an Universal Optical Model and first experimental results • Ignite - Call for an industry-wide collaboration effort for the Universal Optical Model **Professor Dr Alexander Braun,** Professor für Physik, **University of Applied Sciences, Duesseldorf**
12:10	Automotive Camera Trends Driving Changes in Optical Designs • Computer vision and algorithms demands represent a fundamental shift from viewing applications • HDR sensors and low light camera performance requirements are driving the state-of-the-art • Growing camera operating temperature ranges require shifts in material selections and design forms **Corey Zehfus,** Optical Designer, **Sunex**	Flash imaging LiDARs: from space to ground • Introducing the concept of hybrid flash imaging LiDAR and assessing its potential for ADAS applications • Reviewing and evaluating the system's potential and benchmarking it against state-of-the-art scanning LiDARs in terms of performances, eye-safety and key system figures • Outlook towards the feasibility of adapting this technology to automotive applications **Dr Christophe Pache,** Senior R&D Engineer, **CSEM**	Sensor Emulation – a new Methodology of Hardware in the Loop Systems • Current and future sensor topologies and the change in the requirements for adequate toolchains • Validation challenges coming along with higher resolution cameras/radars and higher frequency combined with high automated driving • A new approach on HiL Testing specialized for automotive sensors for new use cases and earlier access to validation during HiL **Johann Führmann,** Group Leader Automotive, **b-plus GmbH**

12:35	Fundamentals of an automotive-grade ISP	Practical design considerations for solid-state Lidar	Addressing the Data growth challenges in ADAS for Simulation and Development
	- Exploring the shifting trend towards cameras in vehicles - What makes an automotive camera special? - How can you achieve viewability and reliability? - Management of dynamic range and how an ISP with high dynamic range makes a difference to image quality - Deep dive into the factors behind this, including correct exposure settings, local tone mapping (vs global), etc. **Alexis Lluis Gomez,** Senior Manager of Image Quality, **ARM**	- Sensor technology comparison for 905nm and other higher wavelength devices - Beam steering approaches to enable large FoV systems - Tear down example of a solid-state long distance LiDAR to explore costs and performance **Carl Jackson,** Founder, CTO and VP of Engineering, **SensL**	- The challenges and best practices that are related to the complexity and volumes of data to efficiently validating driver assistant systems - Best practices of how the entire test and validation process can be leveraged in a private cloud environment and/or as a service - How a reference architecture that has been developed during various projects looks **Dr. Stefan Radtke,** CTO EMEA, Unstructured Data and Analytics, **Dell EMC** and **Ralf E- Nikolaus,** Team Manager Driver Assistant Systems, **Altran**
	13:00 Networking lunch break		
14:15	Challenges of HDR imaging in Automotive Environment - Knowledge of the underlying image capture principles is key - Understand advantages and limitations, for high dynamic range and flickering scenes - Capture artifacts can be critical for system safety **Tarek Lule,** Chief Image System Architect – Automotive, **STMicroelectronics**	LIDAR systems for automotive applications: The benefits and the challenges for the OEM - The development of LIDAR systems - The requirements for active safety and autonomous drive - The complementary advantages vs RADAR - Integration challenges such as location and window soiling/degradation - Configurations, Diagnostics and fusion **Andy Lewin,** Group Leader for Active Safety, ADAS, **Jaguar Landrover**	Recent developments in ISO26262; an update after the summer plenary **Riccardo Mariani,** Intel Fellow Functional Safety, **Intel**
14:40	Addressing the image sensor requirement for autonomous driving challenge Exploring the boundary conditions for autonomous driving	Next Generation ADAS radar design with Advanced Vector DSP Processors An Overview of an FMCW (Frequency Modulated Continuous Wave) radar application	SOTIF group focus session

	- How human eyes adapts under different traffic and road conditions - If we want to replace human eyes with image sensors, what are the parallels, what are the challenges? - How can we address those challenges? - What are the tradeoff choices and how do those tradeoffs impact the system design? **Abhay Rai,** Director: Product Marketing, Automotive Sensing, **Sony Electronics Inc**	- Implementation considerations - An example implementation on an advanced vector DSP **Pierre-Xavier Thomas,** Engineering Group Director, **Tensilica DSP SW Group, Cadence Design Systems**	
15:05	PANEL DISCUSSION: When have we enough pixels? **Abhay Rai,** Director: Product Marketing, Automotive Sensing, **Sony Electronics Inc** **Dr. Patrick Denny,** Senior Expert, **Valeo** **Dr. Martin Punke,** Group leader – Optoelectronic Modules, **Continental** Moderated by; **Dr. Sven Fleck, SmartSurv**	The quest for High Resolution Radar: Market drivers and technical challenges - Exploring the leading sensor technologies' key attributes and how they complement one another - Understanding the trade-offs required to increase resolution in any one dimension - Exploring the challenges of high resolution radar and how a deeper understanding of the required compromises is crucial to the future of the autonomous vehicle **Roger Keen,** ADAS Product Manager, **NXP**	Human Ethics for Cars: Assessment and Modeling of Moral Decisions in Dilemma Situations - What characterizes our moral decision making in dilemma situations? - Comparing virtual reality, image-based and text-based assessment - How can we model the assessed behaviour? **Leon Suetfeld,** Researcher, **Institute of Cognitive Science, Osnabrueck University**
	15:35 Networking refreshment break		
			ROUNDTABLE DISCUSSION SESSION
16:15	Next generation pulse time-of-flight sensors for autonomous driving - The limits of continuous wave time-of-flight sensors - The concept for direct pulse time-of-flight detection - The realization of a sensor chip for this new technology	Active sensing technologies for automotive applications - Automotive sonars - Imaging Lidar - Electronically steered array radar **Dr. Soeren Molander,** Senior Engineer, **Panasonic Corporation**	Delegates can choose from 4 roundtable discussions, with the opportunity to participate in 2 discussions across the session rotations. 1) "LiDAR data processing: Edge computing or centralized ECU architecture?" Led by **Dibotics**

	Beat De Coi, Founder and CEO, **ESPROS Photonics Corporation, Switzerland**		LiDAR sensors are already enabling an unprecedented amount of 3D data being gathered in real-time. The new generations of LiDAR sensors to come are going to deliver millions of points per second, which is an opportunity for advanced perception but also a challenge from the calculation power, bandwidth and energy consumption point of view. What are the advantages and inconveniences of processing this data in the sensor itself? Is a centralized architecture a better choice? 2) Topic led by Kalray 3) Topic led by 2getthere
16:40	CAOS Smart Camera – Enabling extreme vision for automotive scenarios - Extreme Linear Instantaneous Dynamic Range - Spectral and Speed Flexibility - Extreme Imaging Security **Nabeel A. Riza,** Chair Professor of Electrical & Electronic Engineering, **University College Cork**	Event-based vs conventional cameras for ADAS and autonomous driving applications **Christoph Posch,** CTO and Co-Founder, **Chronocam**	
17:05	Plenoptics: the ultimate imaging science and its application to automotive - Brief introduction to plenoptics as the theory of the light field and its processing - Plenoptics from a computational imaging perspective: how to sparsify and reconstruct the light field - Fourier analysis and profiling of light field displays **Atanas Gotchev,** Professor, **Tampere University of Technology** and Director, **Centre for Immersive Visual Technologies (CIVIT)**	AdaptIVe EU Project and Now What? - Purpose and experiences from AdapIVe - Role of Delphi radar and RACam technologies - What's coming next? Overview of successor project (L3 Pilot) **Prasant Narula,** EMEA Research, Regulations and Program Manager, **Delphi**	
17:30 – 20:00 AutoSens Drinks reception, sponsored by NXP 19:15 AutoSens Awards at the Atomium			

Conference Day 2: Thursday 21st September

	SENSOR FUSION *Mezzanine Auditorium*	IMAGING STANDARDS, QUALITY AND BENCHMARKING *Mahy Seminar Room*	IMAGE PROCESSING AND COMPUTER VISION *Minerva Seminar Room*
08:55	Opening remarks **Robert Stead,** Managing Director, **Sense Media** **Dr. Patrick Denny,** Senior Expert, **Valeo**	Opening remarks **Peter Labaziewicz,** Director of Engineering/Business Development, Vision & Imaging, **Texas Instruments**	Opening remarks **Dr. Sven Fleck, SmartSurv** and **Benjamin May, AMX13**
09:00	Functionality and system architecture for sensor fusion • Why sensor data fusion is needed for odometry, distribution data and mapping • Understanding data representation • Organising a deployment strategy • Exploring sensor fusion with vectorised and grid maps in terms of functionality **Markus Heimberger,** System Architect; Senior Expert, **Valeo**	Critical use cases for video capturing systems in autonomous driving applications • ISO 26262 SOTIF (safety of intended function) real use cases • Systematic derivation of object and scene parameters which are used to differentiate detection performance • Application of KPI-judgment in the given scene • The impact of camera HW and Signal reconstruction SW on detection performance **Marc Geese,** Chassis Systems Control, Next Generation Video (Imaging Chain), **Robert Bosch**	Intelligent sensing requires a flexible vision processing architecture • An overview of different processing architectures • Relevant vision algorithms and how they map onto different architectures • Example implementation on an advanced multicore, scalable vision processor **Marco Jacobs,** VP Marketing, **Videantis**
09:25	Raw data fusion for safer autonomous driving • Raw data fusion of LiDAR and camera together promises a safer cognition platform for autonomous driving • Describing real-time GPU applications that use AI in combination with RGB and 3D information for self-driving cars' cognition systems • Enabling the building of ultra-high reliability classifiers and facilitating the required	Objective Assessment Technology for ADAS & Autonomous Driving • Measurement of perceived safety and comfort during assisted and autonomous driving • Technical approach and assessment examples • Applications for objective measurements on road and in virtual development environment	Learnings from creating a training dataset for autonomous driving • How to enable autonomous vehicles to recognize objects in context, no matter the weather, time of day or season • Reconsidering the image-labelling workflow and getting to the highest levels of pixel-point precision • Drilling into the challenges of creating semantic segmentation masks, including

	cognition application for semi-autonomous and fully autonomous driving **Ronny Cohen,** CEO, **VAYAVISION**	**Erich Ramschak,** Senior Product Manager ADAS Engineering, **AVL List**	workflow design and annotation tools, and performing these tasks at scale **Matt Shobe,** Chief Product Officer, **Mighty AI**
09:50	PANEL: How will the supply chain adjust – who will take responsibility for sensor fusion? **Dr. Martin Pfeifle,** Director - Head of ADAS Perception, **Visteon Corporation** **Markus Heimberger,** System Architect; Senior Expert, **Valeo** **Junmuk Lee,** Senior Research Engineer, **Hyundai Autron** Moderated by **Robert Stead,** Managing Director, **Sense Media**	PANEL: Where are standards still lacking? What can be done? **Marc Geese,** Chassis Systems Control, Next Generation Video (Imaging Chain), **Robert Bosch** **Dr. Henning Wisweh,** Electrics/Electronics Development, Camera Technology, **Volkswagen** Moderated by **Peter Labaziewicz,** Director of Engineering/Business Development, Vision & Imaging, **Texas Instruments**	PANEL – What is trending in deep learning and how can this be applied to the journey from ADAS to AVs? Including a discussion of software architectural challenges in ADAS **Jim Aldon D'Souza,** Research Engineer, Autonomous Driving, **TomTom** **Felix Heide,** Principal Scientist, **Algolux** **Thusitha Parakrama,** Senior Manager – Advanced Technologies Camera Systems, **Hyundai Mobis** Moderated by **Benjamin May, AMX13**
	10:20 Networking refreshment break		
	HUMAN FACTORS AND THE FUTURE OF MOBILITY		
11:05	Lyft's vision for an autonomous ridesharing open network • The technological and operational challenges of scaling **Alex Starns,** Technical Program Manager, **Lyft**	Focusing on the Next Generation ADAS and Moving on to Autonomous Driving • Explaining limitations of current ADAS sensors • Development of next generation solutions • System architecture focused on ADAS sensors; designing a proper ADAS sensor to ECU system architecture **Junmuk Lee,** Senior Research Engineer, **Hyundai Autron**	Surpassing State-of-the-Art Computer Vision Accuracy and Robustness with an Autonomous Vision Approach • Challenge of bringing novel learning models, algorithms and physical components together in an efficient manner • How to provide the technology robustness that will enable today's assistance systems to jump to fully autonomous systems • Showcasing the intersection of all the technologies in the supply chain and what is needed to empower the optimization of vision system performance **Felix Heide,** Principal Scientist, **Algolux**
11:30	Auto Horizon 2025	The challenges for repairing and maintaining vehicles with ADAS systems	Deciphering automated driving technology

	- Envisioning a simplification of the current broad offering of transportation services in two major use cases - Defining two types of car: Near Car: Intra city transportation, fully autonomous, no steering wheel, and Far Car: inter city and country side transportation, fully autonomous on highways (lvl4) and in cities, the driver is required for small roads (lvl2-3) - Discussing technologies needed to achieve this vision from Health Monitoring to Pay per User business model **Eric Krzeslo,** Co-Founder, CMO, **SoftKinectic**	- The number of vehicles with ADAS technology is growing exponentially - No standardization means that there is no one way for sensor calibration - Complexities like sensor fusion and potential restricted access to OBD ports will be a challenge **Chris Davies,** Head of Technical Superiority, **Belron**	- Summary of various approaches e.g. traditional vs Deep learning and HD-map vs perception - Overview and best trade-off of various technology modules for automated driving, including Perception, Localization, Fusion, Driving Policy, Motion Planning and Control - Deep dive of each module, covering functions, data flow within each module and algorithm details **Mihir Mody,** Senior Principal Architect for Automotive Business, **Texas Instruments**
11:55	Why humans should remain at the centre of the design and engineering of autonomous vehicles - Presenting the latest thinking on human factors for ADAS and autonomous vehicles? - Inside the vehicle – hazard perception and transition of control - Outside the vehicles – interaction with pedestrians, cyclists, and other road users - New field trials are approved with increasing regulatory across the globe, but what human factors should we consider to ensure these are done with uniform safety? **Saskia de Craen,** Researcher, **SWOV Institute for Road Safety Research**	Cybersecurity considerations for autonomous vehicles sensors - Analysis of the cybersecurity threats against the sensors in an autonomous vehicle and an examination of specific threat models - Overview of the attack surface of a typical autonomous vehicle sensor and an exploration of the specific attack vectors - Methods and review of best practices to harden sensors against these attack vectors **Giri Venkat,** Technical Solutions Architect, **ON Semiconductor**	The importance of map data in the era of autonomous driving - Overview of hardware solutions for building map - HD map with high-end sensors - Sparse feature map with consumer grade sensors (crowdsourced) - Building large-scale and live maps with the crowd - The roles of computer vision/AI in map generation - A walkthrough of the current difficulties - Discussions on potential solutions **Yubin Kuang,** Co-Founder, **Mapillary**
	12:20 Networking lunch		

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CLOSING PLENARY
Mezzanine Auditorium

13:45   Opening remarks from Chairs
Robert Stead, Managing Director, **Sense Media**
Dr. Patrick Denny, Senior Expert, **Valeo**

13:50   Starting grid showcase

Auto Drive Solutions | Enway | NomiCam | Toposens | understandAI

14:15   Social nature of perception and driving and challenges that must be met to create Autonomous Vehicles
- Sensing and perception are the pivotal first step in developing the algorithms that make driving decisions and control the vehicle
- Enabling city driving; distinguishing between lampposts and pedestrians, between bicyclists and cars, and children and dogs
- Recognizing intention of other road users, and how these can change on a moment to moment basis in coordination with other road users

Erik Vinkhuyzen, Senior Researcher, **Nissan Research Center**

14:45   Customer Experiences of Driver Assistance – Are we designing robots for engineers or cars for customers?
- Are we building all this tech because we think it can really save lives and make society better, or is this just simply the "hottest new fad"?
- All the safety tech up and to this point has not saved ended traffic fatalities
- Training dealership personnel who will sell the autonomous capable cars and have a relationship with the customer will be key
- Let's keep doing what we're doing!

Carl Anthony, Managing Editor, **Automoblog**

15:15   What will be the real impact of vehicle autonomy on traffic conditions?
- The two different use cases for ADAS: conventional ADAS, for collision avoidance, and AVs, for regaining time and new mobility business models
- Conventional ADAS is effective in reducing road accidents, but a lot of work still needs to be done
- Presentation of statistics regarding the actual reliability of modern cars
- Findings of recent studies on road capacity; what will the actual impact of autonomous vehicles be on traffic conditions?

Alain Dunoyer, Head of Safe Car, **SBD**

15:45   Closing remarks from organisers