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

- The Role of AI for Autonomous Vehicles
  Led by **Dominique Bonte,** Managing Director, **ABI Research**
- Automotive Cybersecurity
  Led by **Faye Francy** and **Alexandra Heckler**, **AUTO-ISAC**
- Enabling heterogeneous systems with open standards for ADAS
  Led by **Duncan McBain**, Staff Software Engineer, and **Tod Burns,** Developer Relations Manager, **Codeplay**

Afternoon Sessions

- Human Factors in Designing Self Driving Vehicles
  Led by **Dr Sheldon Russell,** Senior Research Associate, **Virginia Tech Transportation Institute**
- 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 Group**
Prof. Patrick Denny, Senior Expert, **Valeo Vision Systems**

09:00 Euro NCAP, "In Pursuit of Vision Zero"

- Achievements to date
- Euro NCAP Rating
- Automated Driving

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

AutoSens

Brussels 2017 Edition

18-21 September 2017, AutoWorld, Belgium

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 **Prof. Patrick Denny,** Senior Expert, **Valeo Vision Systems** and **Dr. Sven Fleck, SmartSurv**	SENSING BEYOND THE VISUAL SPECTRUM *Mahy Seminar Room* Chaired by **Benjamin May, AMX13** and **Andy Lewin,** Group Leader for Active Safety, ADAS, **Jaguar Landrover**	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	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**	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**

AutoSens

Brussels 2017 Edition

18-21 September 2017, AutoWorld, Belgium

11:45	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**	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	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 **Beat De Coi,** Founder and CEO, **ESPROS Photonics Corporation, Switzerland**	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 • Exploring the shifting trend towards cameras in vehicles • What makes an automotive camera special?	Practical design considerations for solid-state Lidar • Sensor technology comparison for 905nm and other higher wavelength devices • Beam steering approaches to enable large FoV systems	Addressing the Data growth challenges in ADAS for Simulation and Development • The challenges and best practices that are related to the complexity and volumes of data to efficiently validating driver assistant systems

AutoSens

Brussels 2017 Edition

18-21 September 2017, AutoWorld, Belgium

	• 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**	• Tear down example of a solid-state long distance LiDAR to explore costs and performance **Carl Jackson,** Founder, CTO and VP of Engineering, **SensL**	• 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 • 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?	Next Generation ADAS radar design with Advanced Vector DSP Processors • An Overview of an FMCW (Frequency Modulated Continuous Wave) radar application • Implementation considerations • An example implementation on an advanced vector DSP	AdaptIVe EU Project and Now What? • Purpose and experiences from AdaptIVe • 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**

AutoSens

Brussels 2017 Edition

18-21 September 2017, AutoWorld, Belgium

	• 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**	**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** **Prof. Patrick Denny,** Senior Expert, **Valeo Vision Systems** **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	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**	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. Rotation 1 at 16:15 – 16:40 Rotation 2 at 16:45 – 17:10 1) LiDAR data processing: Edge computing or centralized ECU architecture? Led by **Dibotics**
16:40	Plenoptics: the ultimate imaging science and its application to automotive • Brief introduction to plenoptics as the theory of the light field and its processing	Event-based vs conventional cameras for ADAS and autonomous driving applications **Christoph Posch,** CTO and Co-Founder, **Chronocam**	

	• 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)**		2) What is the most reliable and accurate localisation technology for self-driving vehicles? Led by **2getthere** 3) Automotive Cybersecurity; How does the risk landscape change with the deployment of autonomous vehicles? Led by **AUTO-ISAC** 4) From simulation to reality: how far can we take it? Led by **Professor Alexander Braun**
17:15 AutoSens Drinks reception, sponsored by NXP 19:15 AutoSens Awards at the Atomium			

AutoSens

Brussels 2017 Edition

18-21 September 2017, AutoWorld, Belgium

Conference Day 2: Thursday 21st September

	SENSOR FUSION *Mezzanine Auditorium*	IMAGING QUALITY AND BENCHMARKING *Mahy Seminar Room*	IMAGE PROCESSING AND COMPUTER VISION *Minerva Seminar Room*
08:55	Opening remarks **Robert Stead,** Managing Director, **Sense Media Group** **Prof. Patrick Denny,** Senior Expert, **Valeo Vision Systems**	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,** System architect for optical capturing systems, **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

AutoSens

Brussels 2017 Edition

18-21 September 2017, AutoWorld, Belgium

	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 **Prof. Patrick Denny,** Senior Expert, **Valeo Vision Systems**	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**	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	OTHER CONSIDERATIONS FOR ADAS AND AUTONOMOUS VEHICLES	
11:05	Lyft's vision for a self-driving ridesharing open platform • Lyft's origin story and scale • Why Lyft believe Autonomous cars will play an important role in the future of ride sharing • Their vision of an open network for autonomous vehicles • Plans to develop their own solution to the challenge of autonomous ridesharing **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**	Artificial Intelligence – The Future of Transportation? • Building blocks for developing autonomous vehicle applications for perception, localization, and path planning • Building blocks (APIs, modules, HW/SW components) to help with data acquisition for mapping and neural network training • Sensors required to perceive the driving environment **Pradeep Chandrahasshenoy,** Automotive Solutions Architect, **NVIDIA**

AutoSens

Brussels 2017 Edition

18-21 September 2017, AutoWorld, Belgium

11:30	Auto Horizon 2025 • 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, **SoftKinetic**	The challenges for repairing and maintaining vehicles with ADAS systems • 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**	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**
11:55	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**	Deciphering automated driving technology • 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**
12:20 Networking lunch			

AutoSens

Brussels 2017 Edition

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CLOSING PLENARY

Mezzanine Auditorium

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

13:50 PANEL: Where are imaging standards still lacking? What can be done?
Dr. Marc Geese, System architect for optical capturing systems, **Robert Bosch**
Dr. Henning Wisweh, Electrics/Electronics Development, Camera Technology, **Volkswagen**
Robert Stead, Managing Director, **Sense Media Group,** Chair, **IEEE P2020 Group for Automotive Image Quality**
Moderated by **Peter Labaziewicz,** Director of Engineering/Business Development, Vision & Imaging, **Texas Instruments**

14:20 Starting grid showcase

Viktor Sdobnikov, Head of Strategic R&D, **Apostera**
Auto Drive Solutions
Enway
Jukka Sillanpää, CTO, **NomiCam**
Toposens
Vitali Kaiser, Deep Learning Researcher, **understandAI**

14:45 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**

15:15 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**

15:40 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**

16:10 Closing remarks from organisers