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Wednesday 12 May 2021

09:00	Opening remarks from Organisers and Chairs	
09:10	Global NCAP requirements and perspectives This session will include a roadmap of global NCAP requirements and perspectives on how demanding NCAP should be in prompting investment in ADAS innovation. **Richard Schram,** Technical Director, **EuroNCAP** **Alejandro Furas,** Secretary General, **Global NCAP** **Alain Dunoyer,** Head of Autonomous Car Division, **SBD Automotive**	
10:00	Beyond physics: Tackling the limitations of camera-based perception As advanced driver assistance (ADAS) and highly automated systems take to the roads, one thing has become clear: automated systems need to better understand people. Industry accepted physics models don't go far enough to protect and understand vulnerable road users (VRUs). By assessing a persons' current position, velocity, acceleration and rotation over time, the system then uses this information to forecast the future position of an individual. From this "'crossing in front of the vehicle", or any similar action, can be inferred. This physics model approach is solely based on variables obtained from the bounding box displacement, but doesn't do a thorough enough job to understand the psychology behind human action or inaction. In summary: human behaviour is too complex, leading to false positives or failure to predict intention altogether. Behavioural psychology can help. **Dr. Dominic Noy,** Senior Behavioural Data Scientist, **Humanising Autonomy**	
10:30	*Coffee break*	
10:45	Design for Manufacture Panel discussion Traditional ADAS world (level 2/2+) vs AD (level 4+); the challenges that prevent AD from becoming mass market (e.g., calibration). Chaired by **Prof. Dr. Alexander Braun**, **University of Duesseldorf,** with **Dragos Maciuca**, Executive Technical Director, Palo Alto Research and Innovation Center, **Ford Motor Company** **Benjamin May,** Founder and CEO, **obsurver** **Prof. Patrick Denny,** Senior Expert, **Valeo Vision Systems**	
11:30	ADAS camera optical alignment and testing in mass production to meet requirements of tomorrow This presentation describes the latest achievements in actively aligning a lens and camera sensor for optimal image quality. The theoretical limits of	Real 2 Sim - Large Scale Sensors Simulation for ADAS & AV **Danny Atsmon,** CEO & Founder, **Cognata**

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	accuracies determined by the physical properties of lens and sensor are compared with examples from practice. In addition, the requirements an active alignment system must meet to achieve the best possible accuracy and repeatability for the alignment process are described. Key Takeaways: • Evaluation of the possibilities and limitations in active optical alignment of camera modules. • Results on precision and accuracies achieved in active alignment of high performance ADAS cameras using TRIOPTICS process and equipment. • Ways to transfer best results from small batch production to mass production through modular equipment and scalable processes **Sebastian Frisch,** Development Engineer, **TRIOPTICS**	
12:00	Developments in flat optics and their future in the automotive industry Flat optics may be defined as all the optical elements that show flat surfaces whilst acting as regular refractive optical elements. They start mainly with Fresnel lenses and blazed gratings to expand to diffractive optics, metamaterial lenses or liquid lenses. The last decades showed a continuous development and improvement of these optical elements. With the new mass-production processes, these new optical elements are about to define a new paradigm in optics in general and therefore in the automotive industry as well. In this presentation the different kinds of flat optics will be described with their pros and cons. It will be explained how they can be used in combination with other optical elements and how they can significantly improve the actual optical systems while decreasing the bill of materials. Their use in different types of industries will be presented, and a timeline will be established showing how close we are from the acceptance of these new optical elements in the environment of the automotive industry. **Donald A. Peyrot,** Optical Team Leader, **Valeo R&D Prague**	

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12:30	*Coffee break/Lunch*	
1:00	Environment and sensor digitalization for virtual driving in multiple level freeway interchange CAUS is working on the ADAS feature driving through multiple level freeway interchanges. This endeavour presents new challenges to the digitalization of the sensor, road, smart traffic flow, and the environment. Different ways of approaches were explored to reach the balance of time and performance. Given the current PreScan capability and toolchain, CAUS has combined the automatic data processing with necessary human interaction to enable control engineers and perceptions engineers to verify and validate the design on the computer. A smart traffic flow was also introduced to evaluate the robustness and sensitivity to various factors. **Honghao Tan,** Principal Engineer, **Changan US R&D Center**	Sensor Innovation and In-Cabin Intelligence Following our purpose to provide freedom to move in a personal and safe way, Volvo Cars is working towards offering a more personal and safer in-cabin experience. This presentation shares our vision of future in-cabin intelligent experience based on innovations of sensor software and hardware, with the aim of enhancing the functions to support drivers and passengers and building an intuitive, safe and natural car-occupant interaction. **Danilo Neves,** Advanced Engineering Leader, **Volvo Car Corporation**
01:30	Shifting perceptions and solving the challenges of sensor model development in simulation through technological advancements and collaboration Working with technically limited sensor models of the (intended) end product can restrict the potential value of what is achieved through simulation. rFpro's collaboration with a world-leading sensor developer has helped expose a set of technologies which, together, strengthen and validate the simulation offering. And it's these rFpro advancements, coupled with far more accurate sensor models from developers, which has seen a shift in perceptions around the use of simulation for the generation of training data. Join	Enabling ADAS system by Automotive Image edge processor The presentation will include how Nextchip targets ADAS system and why Nextchip's ADAS SoC has positioned as edge processor in the market by explaining our products named APACHE4. As the image edge processor manufacturer, Nextchip proposes the practical solution which can be adoptable to mass production in ADAS application such as SRV (Smart Rear View) and DMS (Driver Monitoring System). Especially with DMS solution, Nextchip targets commercial vehicle including fleet management, and affordable vehicle line-up by image edge processor, APACHE4. You will learn:

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	Matt Daley to learn more about what's been achieved, the hurdles we overcame and how the results are progressing sensor development within the industry. **Matt Daley,** Managing Director, **rFpro**	1. Considerable technology in decentralized architectures targeting commercial vehicle and affordable vehicle, and which can provide audience fresh view about vehicle ADAS system apart from centralized architecture. 2. Incorporating DMS solution which can be provided with DSP on APACHE4 3. How to integrate DMS algorithms from S/W partners and How to work in vehicle (DMS Functional demonstration). **James Kim,** Team Leader, **Nextchip**
02:00	Coffee Break	
02:15	Panel discussion: Extending the limits of CMOS; can cameras standalone and ensure true safety? Over recent years we have seen lots of innovation in the different sensor modalities, lidar moving to solid state, radar increasing resolution, cameras building 3D images etc. Also at the edges of performance, we have seen the domain of each sensor become blurred and overlap more. There are specific innovations in what we traditionally call 'image sensors', based on CMOS technology that are extending the capabilities of what could be considered a 'camera' as well. The argument of the discussion is "Cameras will be the only sensor mode required for true safety". Discuss. **Boyd Fowler,** CTO, **OmniVision Technologies** **Christoph Posch,** CTO, **Prophesee** **Vladimir Koifman,** CTO, **Analog Value** Moderated by **Ian Riches,** VP Automotive Practice and Director, **Strategy Analytics**	
03:00	Expanded Imaging Processing Options, Widest Range of Total Automotive Sensing and Viewing Solutions Adding to the current comprehensive automotive imaging solutions, OmniVision will demonstrate the latest imaging processing solutions, add flexibilities and possibilities for multi-cam architectures across different viewing and sensing applications, including ADAS, AD, RVC, SVS, DMS, and IMS. • Next-generation automotive global shutter and Nyxel® powered sensor with IR+RGB dual processing and context switching capabilities • Industry's first 8.3MP LFM & HDR sensors delivering premium performance on the advanced NVIDIA DRIVE AGX™ platform	

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	• 140dB HDR, best LFM performance, along with the robust imaging processing power – creating new possibilities for architectures throughout the car. **Mathew Arcoleo,** Staff Product Marketing Manager and **Brian Pluckebaum,** Sr. Automotive Marketing Manager, **OmniVision Technologies**	
03:30	Characteristics of image sensors for precise object detection in automotive ADAS systems The number of ADAS systems in the automotive industry using imaging technology is steadily increasing year over year, both for external viewing as well as for in-cabin purposes, to help make vehicles safer for drivers, passengers and pedestrians. Most current commercially available systems are based on CIS technology, but next generation systems are increasingly looking to adapt some level of depth sensing technologies. In this paper we will present which image sensor characteristics are important in order to provide robust and reliable ADAS sensing systems and in-cabin monitoring systems, both from traditional CIS solutions, as well as new ToF and LIDAR depth sensing technologies. We will present analysis based on common available sensor parameters to determine the system level performance, and what it means for object detection probability as well as distance uncertainty for depth sensing solutions. The analysis will include some specific common real world traffic scenarios as well as NCAP scenarios **Marius Evensen,** Head of Automotive Marketing, **Sony**	RGB-IR image quality challenges and solutions RGB-IR camera systems are capable of generating color and IR monochrome images simultaneously for Occupancy Monitoring System (OMS) and Driver Monitoring System (DMS) purposes. The ability to combine both color and IR video from a single camera reduces the cost and area required for these applications. As a new technology in automotive, this approach faces unique challenges, which need to be addressed from a system perspective, including areas related to optics, image sensors, and ISP algorithms. **Hans Li,** Principal ISP Architect, **GEO Semiconductor**
04:00	*End of Day One*	

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09:00	Lidar integration for automotive ADAS series production Lidar sensors are increasingly becoming important for ADAS in consumer vehicles. This talk will provide some insights on considerations for high performance ADAS lidars and how such lidars can be integrated into vehicles to support the next generation of ADAS functionality. **Mitch Hourtienne,** VP of Business Development, **Cepton**	Autonomous Trucking – looking far ahead **Dr. Fridtjof Stein,** Senior Researcher in the Field of Perception, **Daimler Truck AG**
09:30	The human eye as an example for LiDAR The performance of the human eye is awesome. It has a fantastic resolution, hence small objects can be seen at long distances. It works very well in a huge brightness dynamic range and it is able to estimate distance. This in a system of two eyes and a dedicated computer system - the human vision system (HVS). There are many aspects of the HVS, which outperforms any LiDAR system. However, the performance is based on a very cleverly designed system. Why not use the human eye and the human vision system as an example for future LiDAR systems? **Beat de Coi,** CEO, **ESPROS Photonics**	The Future of AVs Depends on Non-Stop Vision, Day & Night Mr. Levi introduces VISDOM, an automotive-qualified eye-safe (class 1) Camera System with high-speed gated illumination. It can be mounted on the front windshield or integrated into the vehicle headlights, and comes in three configurations for multiple transportation sectors, including cars, trucks, light trains, buses, and robotaxis - offering a range of up to 300M, horizontal FOV from 16 to 60 degrees, and resolution from 800x480 to 2M pixels. VISDOM enables optimal contrast, detection, and recognition required by leading automotive manufacturers and AI perception technologies. Powered by proprietary GatedVision technology protected by 26 patents, VISDOM incorporates an extended-range imaging technology that produces high-contrast images from thousands of micro-exposures per frame with dynamic and variable range slices. GatedVision technology provides a detailed and clear image by accumulating multiple range slices from varying depths into a single clear frame, and can perform background removal to improve contrast by enabling depth-slices of the scene. **Eyal Levi,** Co-Founder, **Bright Way Vision**

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10:00	Panel Discussion: What is the state of AI for ADAS? As more and more AI based approaches are being developed for NCAP related applications, the panel will discuss what the state of AI is for ADAS and what the future holds. **Rini Sherony,** Sr. Principal Engineer, **Toyota** **Dr. Lalitha Dabbiru,** Assistant Research Professor, Center for Advanced Vehicular Systems, **Mississippi State University** **Yaniv Sulkes,** VP Automotive, **Hailo** Moderated by **Phil Magney,** Founder and President, **VSI Labs**	
10:45	*Coffee break*	
11:00	No Automated Future Without LiDAR As we look to the future of automated driving, there is no single sensor that can do it all. Instead, there is a need for camera, radar and LiDAR sensors, complementing each other's sensing capabilities and creating safety through redundancy. Short-range LiDAR sensors are crucial to negotiate urban environments and traffic jams, while long-range LiDAR sensors enable high speed driving on highways. As a mobility supplier, this highlights some key questions – what technologies are meeting the requirements of automated driving in urban and highway scenarios? What is available now and what should we plan for later introduction? How can we deliver the right technology mix in a way that is affordable? While it will be a race to see who can drive down the cost of LiDAR, Continental's perspective is clear: Safe autonomous mobility requires LiDAR technology – with the right performance-to-cost ratio – to address existing corner cases unsolvable by camera and radar solutions. **Dr. Gunnar Juergens,** VP and Head of LiDAR Segment, **Continental**	Fast deep learning inference for autonomous driving and particle physics Presenting the research Zenseact are doing in collaboration with a group at CERN, concerning how to compress and deploy deep neural networks in order to achieve short runtimes on-device. **Christoffer Petersson,** Deep Learning Engineer, **Zenseact**
11:30	Active Sensing: a Live Driving Demo	Using Sound to Supplement Line-of-Sight ADAS Sensors

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	Active LiDAR expands upon LiDAR's intrinsic value to bring agility to the sensor, delivering ultra-long ranges, wide field of view, software configurability and instantaneous resolution. AEye's co-founder Jordan Greene will speak to and showcase the role of intelligent software and firmware in improving probability of detection and reducing false positives in a live driving demonstration. **Jordan Greene,** Co-Founder and VP of Corporate Development, **AEye**	Reality AI offers software and solutions using a proprietary approach to machine learning based on advanced signal processing math. Working with its partner Infineon and others, Reality AI has created a supplementary sensing modality that lets vehicles "see around corners with sound." We will discuss the approach, the technology and reference design, and its performance. We'll also discuss ancillary use cases, such as detecting weather, terrain, and even emerging maintenance issues that can be detected using the same technology. **Stuart Feffer,** Co-Founder and CEO, **Reality AI**
12:00	Autonomous Vehicles: Where Are We? • AVs and other disruptive forces • What are the AV use-cases? • Human driver vs. AV software driver • What transportation issues can AVs solve? • What are the leading AV software platforms? • Future AV perspectives **Dr. Egil Juliussen,** Contributor, **EE Times**	
12:30	*Coffee break/Lunch*	
01:00	Detecting the "Invisible": Designing Cameras for Challenging ADAS/AV Computer Vision Edge Cases In this talk, Dave will introduce optimization, computational imaging, and computer vision approaches being successfully used to handle such edge cases. For teams in the architecture phase and able to modify their perception stack for the best possible performance, he will showcase a way to revisit the camera design itself and co-optimize new processing stacks, from sensing to detection. For teams unable to change the	How super wide-angle camera and pixel processing can improve machine perception In this demo, we will demonstrate how cameras equipped with super-wide-angle lens and sensor can be specified, simulated, and designed with the purpose of improving machine perception. We will also show how a specific pixel processing called adaptive dewarping can increase machine perception's accuracy. For the demo, we will make use of 2 applications scenario: monocular single frame depth perception and object classification, such as YoloV4.

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	vision system architecture of their current or in-production designs, he will show how automated optimization of the camera imaging pipeline can quickly improve computer vision results by significant margins. I will share results from a case study from an automotive Tier 1 program that delivered over 25% mAP improvement in object detection performance vs. their current methodology. **Dave Tokic,** VP Marketing & Strategic Partnerships, **Algolux**	**Patrice Roulet,** VP Technology, **Immervision**
01:30	Quickfire Innovations **Monica Vatteroni,** CEO and Founder, **Eye-Tech** **Mansoor Zaman,** Director of Business Development, **Helm.ai** **Dr. Andre Srowig,** System Development Engineer, **Elmos Semiconductor** **Dr. Leaf Jiang,** CEO & Co-Founder, **Nodar**	
02:10	In-Cabin Neuromorphic Sensing This panel will tackle intelligent sensing enabling the next-generation in-cabin experience. Sensor fusion centric advanced research is the critical path towards this and neuromorphic sensing is one of the technologies that can shape the future of the industry. **Petronel Bigioi,** CTO, **Xperi** **Christoph Posch,** CTO, **Prophesee** **Willard Tu,** Sr. Director - Automotive Business Unit, **Xilinx** Moderated by **Pierre Cambou,** Prinicpal Analyst, **Yole Developpement**	Advances in Lidar Test Targets Automotive OEM's, their suppliers, and lidar system development teams need calibrated reflectance targets for accurately characterizing the range sensitivity of lidar systems. Diffuse reflectance targets are used for point spread lidar range sensitivity testing across multiple reflectance levels and at lidar system wavelengths. Labsphere continues to develop innovative diffuse reflectance materials and implement advanced calibration techniques to support your lidar testing needs. Join us as we introduce our new diffuse reflectance materials and discuss lidar specific reflectance calibration methods and spectral reflectance calibration technology suitable for companies exploring new lidar wavelengths in response to the industries desire for broader spectral ranges, lower reflectances, more configuration options, and better calibration data. You will learn how test targets, field reflectance meters, and laser power measurement and control

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		systems can help with lidar system validation testing. **Lorne Loudin,** Product Manager, **Labsphere**
02:40	Leading Edge Sensor Innovations for ADAS and AVs This session will include an overview presentation from **Dr Khasha Ghaffarzadeh,** Chief Technology Analyst, **AutoSens Research,** followed by a panel discussion between leading innovators from LiDAR, Radar, and Gated Vision. **Maha Achour,** Founder, CEO and CTO, **Metawave** **Davide Canavesi,** Senior Business Development Manager, **Scantinel Photonics** **Ofer David,** Co-Founder & CEO, **Bright Way Vision**	
03:30	End of AutoSens Detroit edition	