SAE 2013 Active Safety Systems Symposium

Technical Session Schedule

As of 11/11/2013 07:41 pm

Tuesday, November 5

Active Safety Systems Near Term Technologies (0 - 7 years) Day 1 - November 5, 2013

Session Code: ***CASS1***

Room Great Lakes Ballroom ***Session Time:*** ***ALL DAY***

Time	Paper No.	Title
8:30 a.m.	ORAL ONLY	**Keynote: Active Safety Systems: Its Promises, Possibilities and Challenges in Achieving Total Safety**

It is a well-known fact that motor vehicle crashes are the leading cause of death among a large group of the U.S. population between the ages of 3 and 33 years. Over the last forty years significant gains have been made in the number of fatalities and serious injuries that occur in motor vehicle crashes. In 2011 the fatalities in motor vehicle crashes stood at 32,367 and were the lowest ever recorded in U.S. history since 1949. However, the 2012 estimates also show that this trend is reversing as the U.S. economy improves over time. Most of the safety gains made in the last several years have been due to the many safety improvements that have come about particularly in occupant protection countermeasures due to design improvements in highways and vehicle restraints and energy absorbing structures, increased seat belt use, improved emergency medical services, airbags for frontal and side crash protection, upper interior impact protection and many other such features, the focus being mostly on passive safety.

Joseph Kanianthra, Active Safety Engineering LLC

Time	Paper No.	Title
9:00 a.m.	ORAL ONLY	**What Do Real World Results Say About Drivers and the Design of Future Driver Assistance Systems?**

New technology increasingly allows drivers to ¿know¿ where they are and their relationships to other vehicles. Drivers also are becoming more connected to the world beyond their cars and the road. Whether these technological trends prevent crashes or make driving chaotic depends on how and whether drivers integrate new information into their driving. In the US, crash risk has not increased as drivers¿ use of electronics has increased nor are all crash avoidance systems having the expected benefits. These results raise questions about driver behavior and how new technology and old (think roundabouts) can be utilized to make driving safer.

Adrian Lund, Insurance Institute for Highway Safety

9:30 a.m.	***ORAL ONLY***	***Active Safety Technologies - Strategy for Meeting Goal of Zero Fatalities***

ll major studies indicate that human error plays a major part in the causation of motor vehicle crashes. The studies usually indicate somewhere between 90 to 95 % of the crashes where human error is a part of or as the sole cause of the crash. Reducing or eliminating the role of human error in causing crashes must therefore be a top priority in the way forwards towards target of zero fatalities. In 2007, Volvo Cars adopted its Vision 2020. The target of this vision is that, by 2020, no occupants are seriously injured or killed in a new Volvo. Active safety systems, systems that assist the drivers or autonomously act to avoid or mitigate crashes, are central in the planning for meeting this target.

The foundation in the development of active safety systems is the development of technologies for sensing the surroundings of the vehicles in order to make the proper assessments of the traffic situations and for necessary actions. Laser, radar and camera systems continue to be developed and will have improved capabilities. Volvo¿s strategy is to have systems covering all stages of potential conflicts from driver drowsiness, through lane keeping aid systems to systems that act autonomously and brake or steer in order to avoid a crash.

The presentation will include the company¿s experiences of active safety systems gained so far, including the benefits and the planned next steps, both in the near future and in the more distant future and its projections for autonomous driving technologies.

Lex Kerssemakers, Volvo Car Corporation

10:00 a.m.		***BREAK***
10:30 a.m.	***ORAL ONLY***	***Current State of Transition from Assistance to Autonomy (an OEM Perspective)***

Interest in the promise of technologies which assist drivers both in avoiding crashes and in automating aspects of driving itself continues to grow. The idea of autonomously driven cars is not new, but the possibility is becoming more apparent to consumers as new technologies are becoming available in the market, and also as examples of future autonomous capability are appearing in media demonstrations. Progress is being made at a rapid rate, and such systems are likely to be real someday, however there are challenges that must be overcome as we transition to autonomy. This paper will review some of the key transitions that will take place as vehicles progress from today¿s systems to systems that are more capable of making driving decisions for the driver, using OEM examples.

John P. Capp, General Motors LLC

11:00 a.m.	***ORAL ONLY***	***Driver Assist and Active Safety Design at Ford Motor Company***

Ford Motor Company has a long history in driver assist and active safety design and implementation focused on enhancing real world functionality for the mass market with exceptional value. This presentation will look at the many driver assistance features available on Ford Motor Company¿s current vehicles, as well as discuss elements of the design, development and implementation process for driver assist and active safety technologies. In particular, an overview of Forward Collision Warning with Brake Assist will be used to highlight attributes contributing to feature performance and customer acceptance. Finally a general framework for considering individual vehicle design elements in the context of real world functionality will be presented.

Jerry Engelman, Ford Motor Co.

11:30 a.m.	***ORAL ONLY***	***Meeting the Data Needs for Future Safety***

The presentation will cover our current and planned motor vehicle traffic crash data collection efforts. Discussion will include technologies we are researching to enhance our efficiencies in data collection; the relative precision of various data sources related to the collection of crash causation data; the current status of Event Data Recorder (EDR) collection in NHTSA's crash data collection programs including availability, acquisition, coding and practicality for research; and what we still anticipate as the "gaps" in the future data and suggestions to how industry can assist in acquiring these valuable information.

Augustus Chidester, US Dept. of Transportation

1:00 p.m.	***ORAL ONLY***	***Nissan's Technologies based on Safety Shield Concept***

Active safety technologies are expected to reduce the number and damage of accidents. Nissan has been working to introduce and enhance active safety technologies based on Safety Shield Concept which aims to realize vehicles that help protect people by multiple layered shields from various risks surrounding the vehicle. This presentation introduces accident analysis to identify potentially effective technologies in each layer and touches on the feature and configuration of each technology and possible applications in near future which are expected to be the basis of semi-autonomous system.

Andrew Christensen, Nissan Technical Center NA

1:30 p.m.	***ORAL ONLY***	***Toyota's Active Safety System Strategy***

Toyota Motor Corporation is always working for the technology development targeting the ultimate goal which is zero fatalities by traffic accident.

In addition to passive safety (crash worthiness) technology, recently active safety (collision avoidance) technology is focused on because active safety is expected to have certain potentials to reduce accidents.

It is important to keep dangerous situation away by helping driver¿s cycle of "recognition", "judgment" and "operation" as much as possible in case of supporting him to avoid the traffic accidents.

Toyota has introduced PCS (Pre-Collision System) into the market in 2003, continuously improved it since then and introduced some other advanced active safety systems based on the concept of "Integrated Safety".

This paper presents the aim and structure of those active safety systems and indicates future direction of technology development.

Yukihiro Ikeda, Toyota Motor Corp.

2:00 p.m.	***ORAL ONLY***	***Integrated Safety - Opportunities, Challenges and Needs for the Next Generation of Vehicle Safety***

The development of passive safety reached a very high level. Further improvement of vehicle safety can only be achieved by combining passive with active safety ¿ this leads to the BMW integrated safety approach. An example is the safety for pedestrians. Higher requirements for passive pedestrian safety lead to more weight and CO2 emissions with rather limited effects for safety. Active systems for mitigation or even avoidance have the highest potential for the safety of pedestrians. Main challenges are the system design of scenario detection and interpretation. A precondition for a quick market introduction is the worldwide harmonization of assessment requirements.

Klaus Kompass, BMW

2:30 p.m. ***ORAL ONLY*** ***Pre-Collision System Performance Evaluation***

This presentation describes the development of test scenarios from real world crash data, a new surrogate target representative of real world vehicles involved in rear-end crashes and evaluation results of Pre-Collision System (PCS) that include crash imminent braking and dynamic brake assist functions. The test scenarios were developed using rear-end crash data from NHTSA¿s General Estimate System and Crashworthiness Data System (including Event Data Recorder). The 77GHz radar reflection characteristics of the surrogate target was addressed using radar scan results of 25 actual vehicles at numerous angles. Finally the performance of two different PCS equipped vehicles was evaluated using the surrogate target at test track testing

Rini Sherony, Toyota Motor Engineering & Mfg NA Inc.

3:00 p.m. ***ORAL ONLY*** ***Active Safety via Simulation: Past, Present and (predicting the) Future***

TRW Automotive has used both desktop and HIL (hardware-in-the-loop) simulation and simulation automation effectively for many years. Originally as Kelsey-Hayes and then for a few years as LucasVarity, NHTSA Vehicle Automation Level (1) technologies like ESC have been successfully developed in both North America (Livonia, MI) and Europe (Koblenz, Germany) with the help of simulation since the 90¿s. In one recent example, TRW used HIL simulation and automation to meet the ECE (European) governmental requirements for TRW¿s rollover prevention technology embedded within its ESC system produced for a Japanese truck OEM. This testing and prove-out encompassed simulating nearly 100 buildable combinations, with multiple loadings using multiple driving scenarios on 2 surfaces. Thousands of HIL simulations were necessary. The simulation automation was absolutely necessary for this level of subsystem validation to occur. Going forward, then, companies must recognize that future system validation needs will not only require simulation, but also simulation automation due to the vast number of tests that are necessary; therefore, simulation automation (in whatever form) will quickly become a technological necessity. The current challenge of using simulation to reduce the number of development vehicle builds and/or in-vehicle development is also currently underway in the automotive industry (typically at OEM and Tier 1 levels). This cost-saving trend, combined with the ECE example just mentioned, is pushing the automotive industry in the proper simulation-usage direction and thus a foundation is being laid for the unknown testing requirements of systems that are 7+ years in the future. With respect to having a saleable product (i.e. not the Google car), the issue is to what NHTSA Vehicle Automation Level (2-4) will the automotive industry successfully progress to in the next 7+ years? Some of the issues to be faced in using increasingly complex simulations to do system validation will be: (1) CAN nodes (or possibly FlexRay) modeling (i.e. physical vehicle subsystems) vs. actual supplier implementation, (2) how will an increasing number of subsystem suppliers work together in order to test their interdependent subsystems, and what development timing would be involved, (3) how is the system response ¿feel¿ determined when only system ¿function¿ can be measured directly in simulation, (4) what scenarios will be required in order to fully test a system rather than just show (subsystem) functionality and how does this relate to (1), (5) what level of simulation detail within each subsystem will be required in order for testing to be meaningful, (6) how will genuine sensor/surface/air/electrical/temperature variability and noise be effectively implemented since these seem to be the source of many `real world¿ issues, (7) how to increase data mining of simulation results, i.e., looking for issues not related to the particular response expected for a given scenario, (8) hiring and/or utilizing personnel beyond the stereotypical `simulation modeler¿ in order to assure the process and overall effectiveness of simulations across subsystem performance, CAN, fault management & handling, system variation (both design and production variation), scenario variation and creation, performance metrics, and overall system performance, (9) having customers assigning responsibilities to suppliers in order to assure system test coverage, and (10) timing of all simulation related requirements in relation to the production cycle in order to accomplish the final goal.

Mark F. Elwell, TRW Automotive US LLC

3:30 p.m. ***BREAK***

4:00 p.m.	***ORAL ONLY***	***From ADAS to Highly-Automated Vehicles*** *Active Safety & Advanced Driver Assistance Systems help prevent accidents or mitigate accident severity. Some of these safety systems provide alerts to the driver in critical situations, while others respond to threats by automatically braking and steering the vehicle to avoid crashes. Today's ADAS systems are enabled by on-board vehicle and environmental sensors such as radars and cameras, along with sophisticated situational awareness and threat assessment algorithms. This presentation discusses the evolution of ADAS technology, current features and the progression towards highly-automated vehicles under real-world driving conditions.* *Mark Lynn, Delphi Corp.*
4:30 p.m.	***Panel***	***Expert Panel Discussion: Infrastructure, Test Bed and Implementation (Test Performance)*** *How do we develop and use new methodologies for safety description, evaluation, verification, and certification to be applied to crash avoidance and automation technologies?* *Questions:* *Can we use the same approach that has served well for crashworthiness, ie a discrete set of tests (often worst-case or near worst-case) to verify and certify safety?* *Can a handful of simplified and discrete test conditions reliably represent the wide range of operational scenarios that automated vehicles must negotiate?* *If we tell the public that a technology is "safe" based on a handful of tests, are we generating an environment where drivers will over-rely on these systems?* *Since new technologies rely on some interaction with the human, how do we incorporate variation in human capability and acceptance into the evaluation and certification of these systems?* ***Moderators -*** *John Maddox, Texas Transportation Institute* ***Panelists -*** *Matthew J. Avery, Motor Insurance Repair Research Centre; Anders Eugensson, Volvo Cars of North America LLC; Richard Schram, Euro NCAP; David S. Zuby, Insurance Institute for Highway Safety;*

Wednesday, November 6

Active Safety Systems - Long Term Technologies (7+ years) Day 2 November 6, 2013

Session Code: ***CASS3***

Room Great Lakes Ballroom ***Session Time:*** ***ALL DAY***

Time	***Paper No.***	***Title***
8:30 a.m.	***ORAL ONLY***	***Plenary Keynote: Long Term View of Active Safety as Seen by Google*** *Anthony Levandowski, Google Inc.*

9:00 a.m. ***ORAL ONLY*** ***Technologies and Tools for the Development and Test of Active Safety Systems***

Active safety systems are gaining importance in the automotive area. Based on the well-established V-cycle, this presentation will introduce a tool chain for the development and test of active safety systems. Emergency brake assistant and lane departure warning, serve as examples to outline how safety systems can be tested in a virtual traffic environment on a PC by means of model-in-the-loop simulation. It is shown how the same tool chain, comprising the simulation models, tests and the framework for automating and visualizing test scenarios, is reused for validating production ECUs with hardware in-the-loop simulators or to perform test drives (prototyping).

Vivek Moudgal, dSPACE Inc.

9:30 a.m. ***ORAL ONLY*** ***Evolution from Assisted to Automated Driving***

An insight in how Continental perceives and approaches the development from assisted to automated driving.

Holger Schanz, Continental Corporation

10:00 a.m. ***BREAK***

10:30 a.m. ***Panel*** ***Expert Panel Discussion: OEM Perspective on Mass Deployment Strategies***

In this panel discussion, OEMs, industry analysts and tier suppliers will discuss the state of active safety 7 years from now and what will be the challenges to implement technologies with a vehicle platform. What state will autonomous driving be in? What will the potential active drive assist systems look like? Will there be a full integration between active and passive safety systems? The panel will also address these topics plus the challenges such as consumer acceptance, costs and government regulations how these might be overcome.

Moderators - *Gerald Conover, Carsmart News*

Panelists - *John P. Capp, General Motors LLC; Hideki Hada, Toyota Motor Engineering & Mfg NA Inc.; Christian Schumacher, Continental Automotive Systems; Kay Stepper, Robert Bosch LLC; David S. Zuby, Insurance Institute for Highway Safety;*

1:00 p.m. ***ORAL ONLY*** ***System Robustness for Next-Gen Active Safety Computing Platform***

The rapid evolution of active safety systems is leading to an increasingly automated and autonomous driving. Next-generation active safety systems will need to support high performance, sophisticated, often undeterminstic, and specialized computation on cost-effective computing platforms. It is of paramount importance that such platforms are capable of handling errors during computation, recovering, and continuing to perform safety-critical missions. This talk will present a systematic approach to system robustness that combines innovations in circuit design, hardware architecture, and virtualization technology.

Xingang Guo, Intel Labs

1:30 p.m. ***ORAL ONLY*** ***Cyber Security Issues and Challenges for Long Term Deployment of Actuve Safety Systems***

Modern vehicles are increasingly equipped with electronic systems to improve safety and comfort of passengers. The use of more complex electronic systems comes at the cost of an increased vulnerability to hacker attacks to potentially endanger integrity of safety systems. This presentation will present challenges and solutions around automotive cyber security to protect vehicle safety systems. Security mechanisms, such as secure software flashing, secure diagnosis, secure communication and protection of wireless and wired interfaces, will be presented.

Andre Weimerskirch, Escrypt Inc.

2:00 p.m. ***ORAL ONLY*** ***Time of Flight Cameras: Optical Range Sensing for Safety Applications***

Optical range sensing with time of flight cameras is gaining a foothold as a human interface technique in consumer applications. But it also brings many benefits for automotive safety. For example, inside the car gesture control can give the driver "eyes on the road" control of navigation, HVAC, and infotainment systems. Range sensing can also improve passenger classification, detect hand position on the steering wheel, and even identify drowsy drivers by head position. Outside the car, time of flight cameras can be used for autonomous parking, cross-traffic alerts, and forward-looking pedestrian protection. In this session, we will focus on the hardware and software components needed to address these applications effectively.

Steven Gross, Infineon Technologies North America Corp.

2:30 p.m. ***ORAL ONLY*** ***Legal Implications of Long-term Active Safety Technologies***

Stephen P. Wood, National Hwy Traffic Safety Admin

3:00 p.m. ***ORAL ONLY*** ***Test Procedures to Effectively Evaluate Active Safety Systems***

The past 50 years of motor vehicle safety have registered significant reductions in the injury and fatality rate consequent to motor vehicle collisions. Motor vehicle safety researchers and practitioners are increasingly focused on collision avoidance technologies as offering great potential for continued progress in reducing collision related injury. The potential for safety improvements are evident from a review of collision causes and circumstances. Since most collisions are caused by driver errors in observation or judgment, we can envision safety improvements (reduced injury and fatality rates) that could conceivable be harvested were it possible to invent, develop, and deploy technologies that improve performance of the driver/vehicle system in collision avoidance. It is reasonable to assume collision avoidance technologies will offer safety improvements as we have experience and measures for some that do so. However, not all collision avoidance measures are likely to provide consistent performance improvements. The range of potential collision types to which a specific technology can apply will differ; it is likely the effectiveness of such technologies will not be uniform. Not all collision avoidance technologies will be equal in potential of effectiveness. Further, some technologies may have potential (and even unknown) trade-offs or adverse consequences. It is necessary that the specifications for collision avoidance technologies address: safety need, the potential range of application, potential adverse consequences, potential trade-offs, and important issues related to human interactions (the human-machine-interface or HMI.) Some electronic functions to be added may have potential safety advantages and also possibly negative tradeoffs if they cause distraction or diminished attentiveness to the driving task at a moment when high cognitive load is demanded. Therefore, evaluation techniques must be developed to measure and assess such potential. Evaluation criteria must also be applied to justify the additional vehicle level costs that are to be borne by consumers at purchase. Vehicle-level requirements must be set to enable systems engineering of the individual technologies and graceful integration of the technology/system into a complete vehicle. It is possible to consider requirements setting based on the work NHTSA has done in developing performance criteria for several collision avoidance technologies. This presentation examines NHTSA's process and proposes a framework for possible consideration in developing vehicle level requirements for emerging collision avoidance technologies.

Robert C. Lange, Exponent Inc.

3:30 p.m. ***BREAK***

4:00 p.m.	***ORAL ONLY***	***Security for Automotive Semiconductors - Preparing for Future Risks***

In this presentation, we will review the context and the actual use cases of automotive security. This basis will then serve to describe the typical security architecture that will provide protection to the automobile within its environment. Finally, we will highlight solutions from this architecture, which are readily available or road mapped to be integrated within the upcoming automotive platforms.

Jeffrey Kelley, Infineon Technologies North America Corp.

4:30 p.m.	***ORAL ONLY***	***Lesson Learned from Leidos (formally SAIC) and What¿s Happening Now and Its Effect on Future of Active Safety***

This presentation will discuss lessons learned from the USDOT Safety Pilot conducted in Ann Arbor from a DSRC device Interoperability Testing perspective along with current Connected Vehicle efforts as a result of the Safety Pilot and other Connected Vehicle Projects. The presentation will conclude with a section discussing how recent connected vehicle project and findings could affect the future of Active Safety.

Frank Perry, Leidos

Thursday, November 7

Active Safety Systems - Understanding Human Factors and Crash Analysis for Active Drive Assist Systems - Day 3 November 7, 2013

Session Code: ***CASS5***

Room Great Lakes Ballroom ***Session Time:*** ***ALL DAY***

Time	***Paper No.***	***Title***
8:30 a.m.	***ORAL ONLY***	***Toyota's Approach to "Integrated Safety"***

Various safety technology developments including collision safety have been conducted for traffic fatalities reduction. For more reduction, especially for vulnerable road user¿s safety, active safety technologies have a great potential to contribute. Autonomous emergency brake system could be able to reduce pedestrian or cyclist accidents, and automated driving technology will be applied to driving support systems which can help compensating elderly drivers for his or her decay in driving abilities. In the presentation, Toyota¿s approach to Integrated Safety and our latest technologies will be shown.

Seigo Kuzumaki, Toyota Motor Corp.

9:00 a.m.	***ORAL ONLY***	***Low Automation Definitions - Some Issues and Considerations***

Automation definitions may become important in near-term vehicle development because they determine what vehicle features may be in scope of upcoming standards, regulations or law regarding testing and/or sale of the technology. The NHTSA has recently released guidance definitions of various levels of vehicle automation, and other organizations are also drafting definitions, including SAE, ISO, OICA, Germany¿s VDA and several US state legislatures. Definitions that include references to ¿monitoring¿ are important for driver behavior in NHTSA¿s ¿Level 2¿ and ¿Level 3¿ levels of automation, and could impact nearer term production of ¿Level 2¿ systems. In most definitions, ¿Level 2¿ automation differs from ¿Level 3¿ automation in the amount of monitoring by the driver required, yet even with no automation, drivers do not provide constant visual attention to the driving task. Separation of performance between ¿Level 1¿ and ¿Level 2¿ automation also merits further consideration as separating steering automation for specific driving events, versus continuous control of steering to maintain lane position, may affect driver¿s propensity to exhibit different behaviors.

Charles Green, General Motors Co.

9:30 a.m.	***ORAL ONLY***	***HMI to Effectively Manage Warnings: Changes in the Driving Task and Associated Challenges***

With the wide variety of technological advances being introduced into motor vehicles, and far more significant advances on the horizon, the role of the driver, and hence the driver-vehicle interface (DVI), is likely to change radically. With the promise of increasing levels of automation will come increasing challenges to convey not only the state of the vehicle, but also when ¿ and how ¿ drivers are expected to be directly engaged in the vehicles¿ control. Getting from the current state of vehicle automation to a fully automated vehicle poses significant and exciting challenges, particularly in the design of safe and effective DVIs. This presentation will examine levels of vehicle automation, and discuss DVI challenges, associated with each level.

James R. Sayer, University of Michigan

10:00 a.m.		***BREAK***

10:30 a.m.	***ORAL ONLY***	***Using Naturalistic Driving Data to Understand Crash Causation and Crash Countermeasures Associated with Active Safety Systems***

aturalistic driving research has enabled the analysis of driving safety at a level that has previously been unattainable. Instrumentation packages with multiple camera and other sensors have been installed on 1,000s of personal light vehicles, commercial trucks and motorcycles. As a result, very large datasets with 10¿s of millions of miles of driving are now coming online that allow us to analyze crashes, near crashes, and other safety critical events in great detail. This presentation will discuss the data that are available, and provide several example analyses that specifically address the effectiveness of active safety systems.

Thomas A. Dingus, Virginia Tech.

11:00 a.m.	***ORAL ONLY***	***Driver Distraction, Driver Judgment, & Risk Mitigation***

In recent years, a great deal has been learned about driver distraction as it relates to real-world safety. This new knowledge is due to large-scale, government-sponsored, naturalistic driving studies. This presentation will review recent crash trends and key findings and talk about practical aspects of driver cognition that might help explain this recent data. The presentation will introduce examples of a new, evolving area of naturalistic driving research that complements an understanding of how drivers get into trouble with research into how drivers stay out of trouble the vast majority of the time. The presentation will conclude with some suggestions on how the combination of these factors might guide active safety and driver assistance systems enhancements in the future.

Louis Tijerina, Ford Motor Co.

11:30 a.m.	***ORAL ONLY***	***The Use of Advanced Event Data Recorders to Reconstruct Vehicle Trajectories for use in Active Safety Systems Assessment***

Safety Impact Methodologies (SIMs) have the goal of estimating safety benefits for proposed active safety systems. Because the pre-crash movements of vehicles involved in real-world crashes are often unknown, previous SIMs have taken the approach to reconstruct collisions from incomplete information sources, such as scaled scene diagrams and photographic evidence. The objective of this study is to introduce a novel methodology for reconstructing the pre-crash vehicle trajectories using data from advanced Event Data Recorders (EDRs).

Some EDRs from model year 2009 and newer Ford vehicles can record steering wheel angle in addition to pre-crash vehicle speed, accelerator pedal, and throttle input prior to the crash. A model was constructed using these pre-crash records and a vehicle model developed in the simulation software PreScan. The model was validated using the yaw rate, longitudinal, and lateral accelerations also recorded by this type of Ford EDR but not used to develop the models.

In general, the model was able to approximate the recorded dynamics on the EDR. The model did not match the observed dynamics when either the vehicle departed the paved surface or when Electronic Stability Control was active. Modifying the surface friction at the estimated point at which the vehicle departed the road produced better simulation results. The developed trajectories were used to simulate two road departure crashes, one into a fixed object and one into a vehicle traveling in the opposite direction, as if the departing vehicle were equipped with a Lane Departure Warning (LDW) system. This example application demonstrates the utility of this method and its potential application to a SIM.

This study demonstrated a novel method for crash reconstruction that can be applied to a SIM for active safety systems. Benefits of this method are that the driver inputs do not need to be inferred from other reconstructions because they are recorded directly by the EDR. Currently, there are too few cases with the advanced EDR data to estimate fleet-wide benefits of a system. Because of recent regulation (49 CFR Part 563), EDRs are likely to be downloaded in more real-world crashes making this method a potentially valuable and low-cost method for developing SIMs in the future.

H. Clay Gabler, Virginia Tech.

12:00 p.m.		***BREAK***

1:00 p.m. ***ORAL ONLY*** ***Event Data Recorder Standardization***

In some form, the Event Data Recorder (EDR) function in light duty vehicles has been around for over 20 years. EDR will be a critical component in analyzing active safety systems. Due to the amount of electrification and computer control, EDR data will be an important analytical tool in understanding system and vehicle performance. The Society of Automotive Engineers (SAE) EDR Committee recently published an updated recommended practice for EDR parameters, testing and tools to read the data. The presentation will provide the current and future state for the recommended practice and how it relates to the National Highway Traffic Safety Administration's "EDR Rule", 49 CFR Part 563.

Brian J. Everest, General Motors Co.

1:30 p.m. ***ORAL ONLY*** ***Post Collision Brake Systems: Introduction and Benefit Estimation Method***

Approximately 25 percent of all collisions are followed by a secondary impact, some of which lead to more severe injuries than in the first collision. As a countermeasure, Volkswagen group is introducing an automatic post collision braking system in the new Audi A3 and the new VW Golf. This presentation will explain this feature and as well as the development process outlining how new safety systems are being implemented to address relevant real world crashes. This approach is applied to integrated safety system development covering several critical areas, such as: how driver models are included, how side effects in real life are estimated, how accidents change with the introduction of new safety systems among others.

Thorsten Leonhardt, Audi AG

2:00 p.m. ***ORAL ONLY*** ***Graphical Requirements and Validation Tool for ADAS***

IAV has developed over the past 10 year for internal usage a tool that allows an easy and accurate requirement capturing as well as simulation and testing in ADAS (Advanced Driver Assistance System)., Called SceneSuite, this tool enables graphical representation of test scenarios (or scenes) that minimizes misunderstanding. In addition, SceneSuite is very portable across all platforms since the test scenarios, once developed, only require standard web browsers. Therefore, these test scenarios or requirements can be played on any computer without installing a special software. This portability makes sharing of information particularly efficient when multiple parties are involved (for example, among OEM and suppliers) in development and clear communication of requirements is critical.

In addition to providing an efficient platform for requirement capturing, another unique advantage of SceneSuite is the large number of test scenarios (about 1000 cases) developed and compiled over the years. Having this library of test scenarios both accelerates development of critical requirements in a new program but also helps refinement of algorithms with a large number of test cases against which suppliers can test their algorithms.

The last advantage of SceneSuite is that it also aids in development of actual algorithms through simulation of test cases. Realistic sensor data (typically through characterization of the real sensor in question) can be incorporated into SceneSuite simulations so that performance of algorithms can be quickly analyzed and improved.

Hong Bae, IAV Automotive Engineering Inc.

2:30 p.m.	***ORAL ONLY***	***Active/Passive Safety Integration***

As automotive manufacturers and suppliers continue making advancements in safety features, an area of research is in the integration of active and passive safety features. This presentation provides an overview of the key elements needed to facilitate integration of active and passive safety technologies. These elements include: (1) The development of appropriate active safety HMI warnings, (2) Sensor reliability and robustness, (3) ¿Resettable¿ vs. ¿non-resettable¿ safety systems and (4) Customer acceptance. Additionally, the presentation will provide an overview of a variety of safety and driver assist features that are currently in production.

Steven M. Kenner, Ford Motor Co.

3:30 p.m.	***Panel***	***Panel Discussion: Active and Passive Safety Integration***

As we move towards a ¿safe vehicle¿ the ability to take information from active technology and integrate that knowledge into the performance of function. A panel of experts will discuss the various opportunities and applications being developed and the challenges of system integration of these technologies.

Moderators - *Drew Winter, WardsAuto World magazine*
Panelists - *Hideki Hada, Toyota Technical Center; Robert Jones, Robert Bosch LLC; Thorsten Leonhardt, Audi AG; John McGowan, Infineon Technologies North America Corp.;*