Intelligent Vehicle Testing Symposium Global Policy, Regulation, and Standards

ITS World Congress | Palais des Congrès de Montréal | November 1, 2017

Executive Summary

Context

Michigan has long been a worldwide automotive hub, not just for manufacturing, but also for research, engineering, design, and testing. As intelligent vehicle technologies develop, namely connected and automated vehicle (CAV) technologies, Michigan is staying on top of the ever-evolving technology race. Many automakers, suppliers, and mobility startups are developing and testing the technologies that will drive the vehicles of tomorrow.

Thanks to its critical role in the global automotive industry, the State of Michigan is acutely aware of the need to strengthen the international dialogue around policy, regulation, standards, and testing of CAV technologies. Such an exchange is an essential tool in making compatible or even harmonized national and regional frameworks related to CAV testing, certification, and deployment. An international convergence will be crucial in accelerating the worldwide implementation of these new technologies in transportation.

The Michigan Economic Development Corporation (MEDC), the State's economic development agency, envisioned this Intelligent Vehicle Testing Symposium as the beginning of an international dialogue between the leading experts and companies to contribute to the global convergence of policies, regulations, and standards. The symposium brought together speakers from ten countries and over 60 participants.

Highlights of the Presentations and Discussions

This executive summary presents the main takeaways from the symposium presentations and discussions.

Introduction

Kevin T. Kerrigan, Senior Advisor for Automotive Initiatives at the MEDC, welcomed the participants at the symposium and introduced the following speaker.

Ray Tanguay, Automotive Advisor to the Governments of Ontario and Canada, gave a few introductory remarks and introduced Michigan Governor Rick Snyder. Mr. Tanguay welcomed the symposium participants to Montréal, emphasizing the city's efforts in becoming a hotbed for innovation – namely

through investments in electric taxis and buses, automated vehicle tests, and artificial intelligence research.

Governor Rick Snyder of Michigan gave the opening remarks of the symposium. Governor Snyder began by underlining Michigan's commitment to international collaboration in the automotive sector, illustrated by the two Memorandums of Understanding signed with Ontario in 2016 and 2017. The Governor stressed the importance of cooperation involving the industry and the public sector to develop robust CAV testing procedures and technology standards and to foster a convergence between legal and regulatory frameworks across the world to ensure a timely and safe deployment of CAVs.

European Initiatives

The first panel of the symposium focused on European initiatives. Each of the four experts gave a few opening remarks, and **Adela Spulber**, Transportation Systems Analyst at the Center for Automotive Research, moderated the following discussion.

Álvaro Arrúe, Project Manager of Connected & Automated Driving at Applus+ IDIADA (Spain), gave a short overview of his company. Applus+ IDIADA is an engineering company with more than 2,500 professionals – with half of the staff working in the Barcelona area. The company specializes in design, testing, and type approval services for the automotive industry in Europe. IDIADA also has a 370-hectare CAV test track south of Barcelona and a second proving ground in China.

Peter Janevik, CEO of AstaZero (Sweden), presented the AstaZero CAV proving ground, which opened in 2014. The test facility has 4G and IEEE 802.11p Wireless Access in Vehicular Environments (WAVE) connectivity and will soon have 5G connectivity. AstaZero is also working on the EuroNCAP certification for 2018 and is collaborating to develop a standard for a CAV test control.

Dr. Risto Kulmala, Principal Advisor at the Finnish Transport Agency (Finland), talked about winter CAV testing in northern Finland and explained the Finnish legal framework for CAV testing on public roads. Then, Dr. Kulmala gave a short overview of the Arctic Challenge, a CAV testing initiative part of the Aurora project, and mentioned the cross-border collaboration on CAV testing with Norway, which leads the Borealis project.

Gwen van Vugt, Director of the Mobility Center at TASS International (Netherlands), started by giving an overview of TASS International, an organization that is headquartered in the Netherlands and offers software and testing services related to safety, CAV, and vehicle dynamics. Mr. van Vugt also talked about TASS's CAV test track in the Netherlands and their efforts to develop CAV testing protocols that blend hardware-in-the-loop tests, software-in-the-loop tests, and real-world driving.

After the presentations, Ms. Spulber opened the **discussion**. Mr. Arrúe pointed out the difference between the European type approval for vehicles and the American self-certification that will also apply to CAVs. Mr. Janevik stressed the complementarity between working groups within ISO and SAE that aim to create international standards. Mr. van Vugt talked about the two legislation layers in Europe – the European Union level and the national level. Mr. Arrúe added there are still a large number of national differences in legislation related to vehicles which will affect vehicle connectivity and platooning applications, for example.

Ms. Spulber then asked the panelists for their opinion on the ways to create a legislative framework for CAVs. Mr. Janevik and Mr. van Vugt said that faced with a disruptive and fast-evolving technology like CAVs, legislators must change their approach to drawing legislation and refrain from making laws too technical that they stifle innovation.

Finally, Ms. Spulber asked the speakers to provide some concrete ideas on how to encourage international convergence of CAV standards and legislation. Mr. Arrúe mentioned the Road Automation tri-lateral dialogue between United States, European Union, and Japan. Dr. Kulmala said that working jointly on concrete international projects is the best way to foster the needed convergence on a global level. Mr. van Vugt added that forums like ISO and UNECE are essential for creating convergence, but that in the short term substantial efforts need to be put into creating international testing protocols. Mr. van Vugt also mentioned collaboration on building a portfolio of scenarios for testing CAV and a portfolio of operational design domains.

North American Initiatives

The second discussion of the symposium centered on North American initiatives. **Kirk Steudle**, Director of the Michigan Department of Transportation (MDOT), gave introductory remarks and moderated the panel. Mr. Steudle pointed out that in 2016, Michigan enacted a package of legislation that made CAV testing and operation on public roads legal in the state and allowed truck platooning and the creation of driverless taxi networks. Mr. Steudle also mentioned that Michigan will have more than 500 miles of smart corridors in 2019 and is testing roadside units for vehicle-to-infrastructure communication. Then, Mr. Steudle gave an overview of other MDOT collaborations, including one with the U.S. Army's Tank Automotive Research Development and Engineering Center (TARDEC), and a cross-border CAV test between Michigan and Ontario with Robert Bosch GmbH and Magna International, Inc.

John Maddox, CEO of the American Center for Mobility (ACM) (Michigan, United States), gave an overview of ACM, which is a not-for-profit U.S. Department of Transportation-designated CAV test facility. ACM will open the first part of its track at the end of 2017 and the second part in 2018 on a parcel of land with a total of more than 500 acres. ACM will focus on testing, but also on standards development and education. Finally, Mr. Maddox emphasized the need for creating a shared simulation environment with a common data structure, as well as a universal scenario catalog, test procedures, and test targets.

Dan Mathieson, Mayor of Stratford, Ontario (Canada), started his presentation by stating that the public ubiquitous high-speed internet fiber network installed by the municipality is a fundamental part of the city's infrastructure that will increase its attractiveness for businesses and residents. Mayor Mathieson also mentioned the city would be the first CAV demonstration hub in the province of Ontario and had plans to install 5G and Dedicated Short Range Communication (DSRC) infrastructure.

Dr. Huei Peng, Director of Mcity (Michigan, United States), presented his organization. Mcity has a CAV test facility that opened in 2015. Mcity is also a public-private partnership focused on CAV R&D that brings together 65 companies, the State of Michigan, and the University of Michigan. Mcity handles not only on-road testing but also simulations, thanks to a full Prescan model of the test facility.

Habib Shamskhou, GoMentum Station Program Director and Global ITS/CAV Practice Leader at Stantec Consulting (California, United States), presented the GoMentum Station, also one of the ten U.S. DOT-designated proving grounds. This 5,000-acre facility created at the former Concord Naval Weapons Station has 20 miles of existing roadway, tunnels, and bridges. Mr. Shamskhou highlighted one of the many ongoing demonstration projects at GoMentum Station, a first mile/last mile project with EasyMile.

John Barton, Associate Vice Chancellor of the Texas A&M University System and Executive Director of the RELLIS Campus (Texas, United States), talked about the RELLIS Campus currently being built. Texas A&M University is one of the ten U.S. DOT-designated proving grounds for CAVs, in partnership with Texas Department of Transportation, the University of Texas at Austin Center for Transportation Research, Southwest Research Institute, and more than two dozen municipal and regional partners.

After the presentations, the **discussion** focused on the next steps in international collaboration. Mayor Matheson talked about the need to have an inventory of what everyone is doing to avoid redundancies and have an overall picture of the progress made. Mr. Barton suggested presenting the different testbeds to private and public sector partners as additive rather than duplicative. Mr. Maddox proposed building a common data structure for testing purposes.

Lunch Keynote

Dr. Peter Sweatman, Principal at CAVita, gave a presentation on the world of CAV evaluation during lunch.

Future Technology – What Happens Next?

The first segment of the afternoon focused on the future technologies; **Kevin T. Kerrigan** moderated the discussion.

Dr. David Atkinson, Head of the Systems & Technology and Chief Research Scientist for Artificial Intelligence, Chassis and Safety Division at Continental Automotive (California, United States), talked about some of the challenges that Continental faces in the development of CAV technology. Dr. Atkinson mentioned choosing CAV test scenarios, determining what is relevant when analyzing data and what features of the driving environment are essential for driving decisions, human-machine co-driving, and boundary enforcement for operational design domains.

Pat Bassett, Vice President of the North American Research and Engineering Center at Denso International Inc. (Michigan, United States), talked about a few of Denso's partnerships and investments related to CAV, namely in manufacturing in Tennessee and engineering in Michigan. Mr. Bassett also mentioned that Denso is developing several products of the energy management of electric vehicles.

Dr. Ryan Eustice, Vice President of Autonomous Driving at the Toyota Research Institute and Associate Professor of Engineering at the University of Michigan (Michigan, United States), discussed the two main types of driving automation Toyota is working on: 'chauffeur' – in which the human is a passenger, and 'guardian' – in which the human driver is always in control and the automation augments their capabilities. Dr. Eustice also highlighted a few of the most difficult and complex situations in which a CAV could find itself.

The **discussion,** moderated by Kevin Kerrigan, touched upon the most challenging areas of CAV development that are ripe for international collaboration. Mr. Bassett mentioned that automotive companies would appreciate having harmonized rules on liability related to CAVs.

Asian Initiatives

The next panel discussed Asian initiatives, **Dr. Qiang Hong**, Senior Research Scientist at the Center for Automotive Research moderated the session.

Charlie Cheng, North American Representative of A NICE City (National Intelligent Connected Vehicle Shanghai Pilot Zone, China), presented a few of the most recent activities of his organization, the Shanghai International Automobile City (SIAC). The A NICE City CAV testbed opened in 2016 and includes an urban area, a countryside area, and a smart corridor. SIAC plans to expand the testbed to include installation of DSRC devices. A NICE City also has a United Innovation Center that can house the public and private founding partners of the testbed.

Dr. Han Geom Ko, Research Team Leader at Korea Automobile Testing & Research Institute (KATRI) (South Korea), gave an overview of the CAV testbed called K-City. K-City will have various traffic environments

(urban, community, school zone, motorways, rural, CAV parking) and communication technologies (4G, WAVE, and wifi). Korea will use K-City as a national certification facility for CAVs.

Dr. Nobuyuki Uchida, Senior Researcher and Manager of the Safety Research Division at the Japan Automobile Research Institute (Japan), presented the JTown CAV testing facility. JTown opened in the spring of 2017, has five specific test environments, and can simulate harsh visibility conditions such as fog, rain, and direct sunlight.

During the **discussion**, the panelists talked about international collaboration. Mr. Cheng mentioned that SIAC has agreements with Mcity and the Transportation Research Center (TRC), and is working on partnerships with ACM and GoMentum. Dr. Uchida added that the industry needs international collaboration in developing CAV test scenarios.

United Kingdom Initiatives

Ella Taylor, Head of Innovation at the Centre for Connected and Autonomous Vehicles (CCAV), moderated the last panel of the symposium highlighting initiatives in the United Kingdom (UK). CCAV was established in 2015 to support the UK CAV ecosystem and R&D through an intelligent mobility fund.

Alex Burns, President of the Millbrook Group (UK), gave an overview of his company's activities related to CAV safety testing. Millbrook has won a grant from CCAV for creating a controlled urban testbed, between the Millbrook Proving Ground in Bedfordshire and Oxfordshire. The test environment will combine simulations using a virtual image of the proving ground, controlled test environment, and real-world roads.

Tim Edwards, Principal Engineer - Intelligent Mobility at HORIBA MIRA (UK), first presented his company's proving ground located in the Midlands. Then, Mr. Edwards highlighted the UK Autodrive collaborative R&D project that includes MIRA, Jaguar, Ford, Tata, and RDM Group. In this project, MIRA is focusing on trial safety, among other areas. Mr. Edwards also mentioned the Smart ADAS Verification and Validation methodology (SAVVY) program, which aims to look at the end-to-end methodology for automated vehicles and advanced driver assistance systems (ADAS).

Paul Jennings, Professor and Lead for Connected and Autonomous Vehicles in the Warwick Manufacturing Group (WMG) at the Warwick University (UK), focused his presentation on WMG's 3xD indoor simulator that recreates the sights and sounds around a real test vehicle. WMG's partners on this simulator are Land Rover and RDM. Mr. Jennings added that WMG won a recent competition to build a real testbed in the Coventry-Birmingham area, as part of the UK Test Bed Initiative of the Meridian Mobility technology cluster.

Peter Vermaat, Principal ITS Consultant at the Transport Research Laboratory (TRL), presented the Smart Mobility Living Lab located in Greenwich, London (UK), which also won a grant from CCAV. The Living Lab includes a shuttle test area around the Millennium Dome, major road corridors, and the 2012 Olympic Village neighborhood. Partners of the Living Lab include Transport for London, Digital Greenwich, TRL, Cisco, and Cubic. Among the Living Lab's objectives are vehicle validation, building expertise in creating CAV-ready cities, and standards development.

In the **discussion** part of the panel, the participants talked about keeping testing infrastructure current. Mr. Burns stressed the importance of investing in communications capabilities, such as 4G, 5G, and DSRC. Mr. Edwards stated that one of MIRA's goals is keeping their testbeds flexible. Mr. Vermaat added that it is crucial to remain in contact with communication equipment providers. The panelists also highlighted a few challenges of collaboration, such as intellectual property and access to data.

Conclusion

Kevin T. Kerrigan thanked all the panelists and shared a few concluding thoughts. Mr. Kerrigan stated that many duplicative efforts could be eliminated through international collaboration to speed up the CAV deployment collectively. Other potential areas of cooperation include shared simulation environments and data structures, as well as common test procedures and targets.

Governor Rick Snyder gave the closing remarks of the symposium. Governor Snyder started by mentioning that the Premier of Ontario is ready to join this effort for international convergence of CAV legislation, policy, and standards. Governor Snyder then spoke about five interdependent questions the public and private sector need to think about when working towards the deployment of CAVs:

1. How long is it going to take to develop CAVs ready for deployment, and how long will it take to reach significant levels of CAV adoption?
2. How safe do CAVs need to be before deployment, and how safe they will be once they are in real-world traffic conditions?
3. How real are CAV capabilities? (Underlining the importance of demonstrating CAVs to the greater public to increase technology acceptance.)
4. How exciting are CAVs? (Linked to the safety, mobility, and efficiency benefits of CAVs.)
5. How well does the entire transportation ecosystem collaborate? (No private or public entity can work on CAV development alone.)

Collaboration is the key to making CAV deployment faster, safer, and more exciting for the greater public. Governor Snyder finished by encouraging all symposium participants to engage in collaboration and let him and MEDC know how they would like to participate in this effort.

Potential Next Steps

In the six months following the symposium, MEDC will reach out to the speakers and participants to keep the dialogue going and identify areas of purposeful and actionable collaboration. The event will be followed by other initiatives part of an exciting dynamic to facilitate the deployment of CAV technologies.

The MEDC will participate in the ITS America Annual Meeting and provide updates on the collaborative efforts sparked by discussions during the symposium. A reception is also being planned to welcome attending symposium speakers and attendees. A follow-up event on the ongoing efforts related to the convergence of CAV legislation, policy, testing, and standards will be organized at the 2018 ITS World Congress (Copenhagen, Denmark, September 17-21, 2018).