CAV Update

From the Editors

We often explain the similarities and differences between CAVCOE and CASPI, so we decided to address it here. The common features are that most of our team are involved in both companies, and both companies are focused on the CAV ecosystem. The differences include the business models: CAVCOE is a consulting organization that uses a fee-per-project model, whereas CASPI is an association in which membership fees fund the various activities. Also, CAVCOE is focused on all aspects of the CAV ecosystem, whereas CASPI is specifically focused on the automated snow plow and winter maintenance part of the ecosystem. Finally, CAVCOE and CASPI are separate companies with no ownership connection.

Inevitably, some projects overlap the two companies, such as the CAVCOE project with the City of Toronto described below. This is a CAVCOE research project but is very much part of the CASPI ecosystem.

Canadian CAV News

The **Information and Communications Technology Council** (ICTC) in association with CAVCOE is pleased to announce a webinar on *Non-Passenger CAVs: The ecosystem and regulatory and legal implications.*

In this Webinar, we explore a critical area of connected and autonomous vehicle (CAV) technology: non-passenger vehicles. Significant advances have been made in industrial and service vehicle automation, and the economic benefits and technological and social impacts may well result in their broad deployment before passenger CAVs.

The distinguished panel consists of:
- Barrie Kirk, Executive Director, CAVCOE
- Uwe Müller, Program Manager – Commercial Pilots, **Volvo Autonomous Solutions**
- Martin Abadi, Counsel – Emerging technologies in transportation, **BLG**
- Dr Peter Taillon, Senior Data Analyst, ICTC, will be moderating.

This free webinar is on Tuesday October 27 at 11:00am-12:00n EDT. To register, please click here.

The **Province of Ontario** continues to be Canada's leading province in CAV investment and innovation. One of the latest incentives for the CAV industry is a $10 million program called *Ontario Automotive Modernization Program* (O-AMP). This program is mainly directed at auto parts manufacturers based in Ontario. The program covers up to 50 per cent of eligible project costs up to $100,000. More than 250 companies are active in the CAV space in Ontario. More information is at this link.

Another **Ontario** funding initiative through **AVIN Waterloo Ventures** will see ten companies receive up to $50,000 each for projects related to CAVs or HD mapping. The funding is to be used to develop or demonstrate a viable working prototype or make product or service improvements that generate more sales and increase their market share. More information and the list of funded companies can be viewed at this link.

A Connected Vehicle project is in progress at **The City of Calgary**. This *Vehicle-to-Infrastructure* (V2I) project along Calgary's 16 Avenue N. (part of the Trans-Canada Highway) will initially encompass 12 signalized intersections equipped with **Kapsch TrafficCom**'s dual-mode DSRC/C-V2X roadside units. Ultimately, 16 intersections will be equipped, including two at off-site beta testing locations. Testing is underway to pilot this technology for **Si**gnal **P**hase and **T**iming (SPaT) data, signal pre-emption for emergency vehicles, as well as Kapsch's smartphone-based pedestrian application, *eWalk*. The test bed incorporates *Security Credential Management System* protection through **BlackBerry Certicom***'s* free trial service. The project was partly funded by **Transport Canada's** *Program to Advance Connectivity and Automation in the Transportation System* (ACATS). More information can be viewed at this link.

The Covid-19 crisis has been a boon for drone technology companies to deploy their equipment for delivering test kits, test swabs, medicines, PPE, etc. to remote areas quickly and economically. **Drone Delivery Canada** (DDC) has been engaged in such an activity with Ontario's **Georgina Island First Nation** for delivering supplies to/from the mainland to Georgina Island. DDC had partnered with **Air Canada Cargo** and the indigenous-owned **Pontiac Group** for this endeavor. The Government of Canada has provided the funding for this project. More information is at this link. Also, see two more delivery drone stories in the *International AV News* section below.

CASPI News

CAVCOE is conducting a research project for the City of Toronto on Automated Sidewalk Winter Maintenance (ASWM). The focus is on automated sidewalk maintenance (from remote control to autonomous) for clearing snow, sanding/salting, etc. We are identifying who is doing what in this space in research, development and/or deployment. More specifically, we would like to develop an understanding of ASWM development, requirements and estimates of future capabilities.

We encourage anybody working in this space in research, development and/or deployment to contact us. We would like to hear from people in academia, the private sector, municipalities, and other levels of government. Please write to aswm@cavcoe.com (This is a project that overlaps CASPI's and CAVCOE's activities.)

CASPI has announced the *2021 Canadian Student Automated Snow Plow Competition*. It provides an opportunity for students to apply their knowledge and skills from the classroom to a tangible real-world problem. The problem is a major snowstorm just days before a big city event. The challenge is to develop a semi-autonomous snow plow capable of completing a number of snow clearing tasks. There are two phases:

- Phase 1: deliver a report with the technical design, approximately 10 pages, to the competition judging panel.
- Phase 2: Competition either on-site or virtually by video (COVID-19 dependent).

Prizes will be awarded to the winning team of each competition round!

Key dates:
Register by November 10, 2020
Technical paper due by January 25, 2021
Competition May 15-16, 2021

To express interest, please write to Nicola McLeod, PMP at competition@caspi-icda.com Nicola will send you the registration form and the competition details.

CASPI is about to launch its first membership drive. Detailed work has developed membership benefits, pricing and communication materials that provide stakeholders a view of the future of winter maintenance, and offers a chance to change the landscape of the ecosystem. Watch for this in your inbox.

Still on the subject of the student competition – the 2020 edition – the student teams were asked if CAVCOE could send the Technical Papers to the City of Toronto as part of CAVCOE's research study mentioned above. All the teams agreed enthusiastically!

CASPI received encouraging feedback from the August issue of *CAV Update*, confirming the integration of automated snow plow technologies into the broader CAV sector. This feedback also confirmed stakeholder interest in aligning equipment manufacturers with the student competition.

CASPI now has its own phone number: 613-699-2241 as well as individual phone numbers for any inquiries. We look forward to hearing from you!

International CAV News

Both **Walmart** and **Amazon** have made recent announcements about deploying autonomous drones for delivering goods. Walmart has partnered with **Flytrex** to use drones for quick delivery of groceries and other goods. Walmart selected Fayetteville, North Carolina to test its drone technology. See this link for more information.

Amazon has been working on its delivery drone technology since 2013. In a step forward, the **Federal Aviation Administration** (FAA) has now granted Amazon a permit to start testing its Prime Air drones for commercial deliveries. More information is at this link.

The Russian technology company **Yandex** has been active in AV development since 2017. It recently announced a new collaboration agreement with **Uber** to invest US$150 million in a new AV venture called *Yandex Self Driving Group B.V.* (Yandex SDG). Yandex has about 130 AVs deployed in Russia, Israel and U.S. The company is also active in delivery robots and ride-hailing. More information is at this link.

In an article titled *Autonomous Vehicle Industry's Self-Inflicted and Avoidable Collapse*, **Michael DeKort** names a long list of companies and initiatives in the CAV space that have failed to deliver or have gone out of business altogether. He argues that the current approach for developing AVs (public shadowing and safety driving) is the wrong approach. He advocates for the proven techniques developed by the aerospace industry over many years as a better approach. The article can be viewed at this link or this one.

On a similar theme, **inverse.com** has a short article titled *Autonomous Cars: 5 Reasons They Still Aren't on Our Roads*. The five reasons are shortcomings in the following areas: sensors, machine learning, the open road, regulations, and social acceptability. Details are at this link.

A new CAV research project undertaken by the **University of North Texas** in collaboration with **AutonomouStuff** will explore the limitations inherent to single-vehicle perception systems operating independently as opposed to utilizing data from many vehicles in the vicinity, even those not in the direct line-of-sight. This technique (dubbed *collective perception*) is thought to provide a much richer data set for CAVs to work with. The research will use an AutonomouStuff GEM *Automated Research Development Platform* for its research work. Details are at this link.

Another article on the *Ethical & Moral Considerations* of AVs delves into the dilemma that AV manufacturers will face in the future when it comes to incorporating these issues into their AV decision making software. The article argues that the ethical & moral considerations are influenced by nationality, culture, religion, and other factors. This is based on the findings of a huge online survey of two million people who participated in the *Moral Machine* experiment in 2017 conducted by the **MIT Media Lab**. The participants collectively made 40 million decisions on who lives and who dies if/when they were in a position where they had to make such decisions. At present, **Germany** is the only country that has devised a legal framework for the ethical considerations it thinks should be incorporated into self-driving systems. Details are at this link.

Researchers at **Penn State University** are attempting to discover how the vision system of locusts work for possible application to autonomous vehicles. These insects can move together in massive swarms of millions of individuals without so much as a fender bender. This is due to a specialized neuron in their brains called the *Lobula Giant Movement Detector* (LGMD). By designing a small, energy-efficient device that mimics this skill, the researchers hope to build a vision system that can keep self-driving cars from colliding with each other on the road. More information is at this link.

The **BBC** technology program *Click* featured a high-tech greenhouse in England where autonomy is part of the design. Vegetables such as peppers, tomatoes and cucumbers will be harvested by autonomous machines using computer vision and AI. Many other innovative technologies are built into this greenhouse so that it can produce ten times the produce from an acre compared to conventional methods of growing produce. The BBC video clip can be viewed at this YouTube link.

Marine research organization **Promare** has partnered with **IBM** and others to design and build the *Mayflower Autonomous Ship*. When completed, this high-tech ship will sail from Plymouth in the UK to Plymouth, Massachusetts to commemorate the sailing of the original Mayflower ship in 1620. It will autonomously trace the same 3,220 miles (5,180 Km) route that the Mayflower took to reach the New World. More details are at IBM's site at this link.

The Mayflower Autonomous Ship

The German company **Bosch** has teamed up with **Ford Motor Company** and real estate development firm **Bedrock** to demonstrate Bosch's *Automated Valet Parking* at a new residential development in Detroit. The project will use Ford's *Co-Pilot360* driver-assist system and vehicle to infrastructure (V2I) communication for this implementation. Equipped vehicles will be sent to a designated parking space using an app and recalled from that space via the same app. More information and a short video are at this link.

The influential **Brookings Institution** in Washington D.C. has come out strongly in support of autonomous vehicles. In an article on its site, it describes the many socio-economic benefits that a future AV ecosystem might provide. Additionally, it believes that it will free up many police forces currently enforcing traffic laws to attend to more serious matters. The author of the article (Clifford Winston) and his colleague Quentin Karpilow have also published a book titled *Autonomous Vehicles: The Road to Economic Growth* in June 2020. The Brookings article on AVs can be viewed at this link and more information about the book is at this link.

The issue of liability in CAV space is a complex one. Case in point is the fatal collision of an **Uber** AV with a pedestrian in Arizona in 2018. The Uber vehicle had a safety driver behind the wheel as is customary with almost all AV companies. On September 15, 2020, prosecutors in Arizona charged Uber's safety driver with *negligent homicide* in that fatal collision. Previously, investigators had cleared Uber of any criminal charges. Details are at this link.

REUTERS
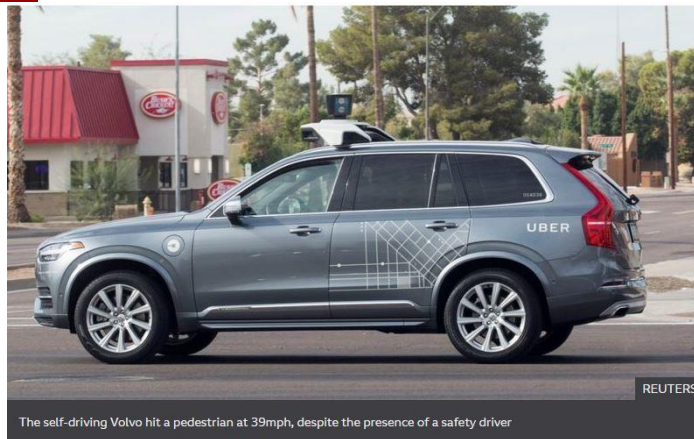
The self-driving Volvo hit a pedestrian at 39mph, despite the presence of a safety driver

This year's **Automated Vehicles Symposium** (AVS) was held online from July 27-30. AVS was established in 2014 and is a non-profit. The symposium was co-sponsored by the **Association for Unmanned Vehicles Systems International** (AUVSI). Forbes magazine had a detailed report on this year's event where substantive matters were discussed by many AV industry experts and regulators. Among these were developments in the robotaxi space, when driverless as opposed to self-driving might go mainstream, automated urban delivery, evolution of autonomous trucks, remote monitoring & control and new rules and regulations governing AVs. All of these and more can be viewed at Forbes site at this link. AVS2020 sessions and speakers can be viewed at this link.

In July 2020, the **U.S. Department of Energy** published a 241-page report titled *Smart Mobility, Connected & Automated Vehicles Capstone*. This major report looks into the energy, technology, and usage implications of vehicle connectivity and automation, electric powertrains, and other issues. The report does a deep analysis in four areas: 1) travel demand impacts due to automation and connectivity, 2) CAV adoption and market dynamics, 3) fuel (and energy) efficiency impacts due to connectivity and automation, and 4) connectivity and automation insights for heavy-duty vehicles. A copy of the report can be downloaded from this link.

On August 31, 2020, the **British Standards Institution** (BSI) released a *Publicly Available Specification* (PAS) titled *Operational Design Domain (ODD) taxonomy for an automated driving system (ADS) – Specification*. This 26-page document is intended to help enable safe automated driving by defining a common language for describing the operating conditions, such as the environment and driving situations, an automated vehicle has been designed to function in. More information and a download link for the document can be viewed at this link.

A September 4, 2020 article titled *Lean Sensing – A Critical Enabler for Autonomous Vehicles* in **Forbes** magazine takes a different look at how various sensors on an AV should work. Sensors such as LiDAR, radar and cameras collect an enormous amount of data requiring a lot of computing power, storage, and electrical power to process. The *lean sensing* approach posits that a lot of the data gathered is irrelevant to the driving task. Instead, it focuses on four areas: learning based sensor design, event-based sensing, Region of Interest (ROI) scanning, and semantic sensing. An analogy goes like this: Human drivers sense a tremendous amount of information through different senses – visual, audio, smell, haptic, etc. An inexperienced driver absorbs all this data, initially assuming that all of it is relevant. With practice and training, experienced drivers can filter out the irrelevant and focus on the relevant information, both in time and space (lean sensing). Machines trying to simulate human intelligence should be able to follow a similar model – initially acquire a large amounts of sensor data and train on this but become more discriminating once the training achieves a certain level. More details are on Forbes site at this link.

Toyota Research Institute – Advanced Development has created an US$800 million investment fund to pursue development of technologies and business models in areas such as autonomous mobility, automation, artificial intelligence, machine learning, data and analytics, connectivity, and smart cities. More information is on Toyota's site at this link.

And finally, another article on the history on autonomous vehicles takes us all the way back to 1478 and an ingenious design by **Leonardo Da Vinci** for a navigation mechanism that could be attached to any vehicle and allow for autonomous movement through a predetermined course. Since then, the continued quest for autonomy has encompassed early guided torpedoes, autopilot systems for airplanes, Mars rovers, and

of course, cars. All are explained in this interesting article. The article can be viewed at this link.
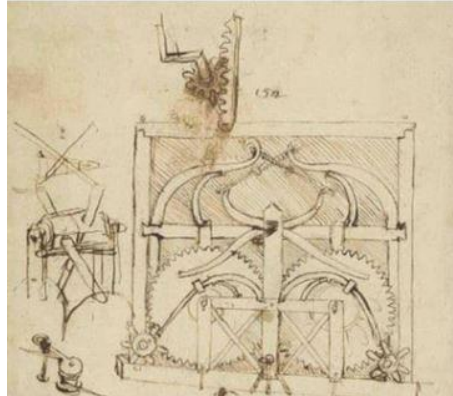
CAVCOE Speakers' Bureau

CAVCOE provides speakers for many different types of events across Canada, the US and overseas; we are now booking for 2021. This keeps us busy because people understand that CAVs will have an impact on almost everything. On the one hand, our presentations have core messaging on the status of CAVs, their deployment scenarios, and the impact on business plans, government policy, regulations and almost all aspects of society. On the other hand, each presentation is customized for the audience and the time available. To enquire about a speaker for your event, please write to speakers@cavcoe.com

Upcoming CAV-Related Events

Oct 4-7, 2020: IEEE 92nd Vehicular Technology Conference, now on-line

Oct 4-8, 2020: ITS World Congress, Los Angeles CA: CANCELLED

Oct 27, 2020: ICTC in association with CAVCOE: Non-Passenger CAVs: the ecosystem and regulatory and legal implications. Free webinar.

Nov 2-6, 2020: UC20 Remote: Unmanned Systems Canada's annual conference On-line.

Nov 16-18, 2020: Canadian Parking Association Annual Conference and Trade Show, Montreal (hybrid event)

Nov 16-17, 2020: Car.HMI and Tech.AD USA 2020, Detroit MI

Dec 8-9, 2020: Autonomous Vehicles 2020; Long Beach California

Jan 6-9, 2021 Consumer Electronic Shows (CES), Las Vegas NV

Feb 21-24, 2021: Ontario Good Roads Association Annual Conference; Toronto ON

Apr 2021: ADAS Sensors 2021, Detroit MI

Apr 25-28, 2021: IEEE Vehicular Technology Conference 2021-Spring, Helsinki, Finland.

Jun 20-23, 2021: ITS Canada 2021 Conference

Dec 14-17, 2021: UITP Global Public Transport Summit; Melbourne, Australia

CAV Update is a free, monthly roundup of news and analysis in the world of automated vehicles and their impact on the private sector, government, and society.

Chief Editor: Ahmad Radmanesh
Contributors to this issue: Barrie Kirk, Glenn Martin, Nicola McLeod

To subscribe, click here. To unsubscribe, click here.
We welcome all comments; please send them here

CAVCOE (formerly the Canadian Automated Vehicles Centre of Excellence) provides advice to the public and private sectors to help plan for the arrival of self-driving vehicles.

CASPI (the Canadian Automated Snow Plow Initiative) is an association for all stakeholders involved in winter operations and maintenance of sidewalks and trails.

300 Earl Grey Drive, Suite 222, Ottawa ON K2T 1C1, Canada.
info@cavcoe.com   www.cavcoe.com
© CAVCOE 2020