2020 Year-End Review: VSI Roundtable Discussion on the State of ADAS/AV

By the VSI Labs Team

In the last week of 2020, VSI employees participated in a round-table discussion on how the ADAS/AV industry has evolved this year. Topics included notable technology and product implementations, near and long-term challenges/opportunities from the year, and more.

What technology/product implementation this year do you think is most significant to the industry?

DK: Waymo pulling off the world's first commercial robotaxi service, Waymo One, in Arizona. Being way more transparent than any other AV developer in sharing its safety performance data, Waymo was confident enough to launch a public commercial service in 100% fully driverless rides. The confidence stems from all aspects of operation: technical, legal and commercial sustainability.

AM: I would mention the progress that Mobileye is making on their "Super Vision" vision-only L2+ ADAS system, REM crowd-sourcing, and L4 True Redundancy for AVs. It may be also worth mentioning somewhere that the Comma Two with OpenPilot software (launched in January 2020) received the highest ratings for an L2 ADAS system from Consumer Reports. All for around $1,000.

KM: Cruise and Zoox, two of the leading robotaxi players, both released their new vehicles in 2020. Cruise's production-ready vehicle, the Origin, is a shuttle-like car, notably without steering wheel or pedals. The Zoox car is similar and boasts the ability to travel bi-directionally. Zoox also claims its vehicle is the first of its kind to be able to travel up to 75 mph. Another major technology launch of 2020 was the beta-release of Tesla's Full Self Driving (FSD). The release came just two weeks after Waymo's announcement of their public launch. Tesla's system will operate in beta for the foreseeable future and was released only to a handful of beta testers. The features build on Autopilot, but new software makes the vehicle capable of driving autonomously on city streets.

AA: I think Waymo by far launched the most significant technology that took the news this year. I've recently seen a company called Nuro that launched a small car that delivers pizza and groceries in California. What grabbed my attention is this service

seems to be subscription based, which means many people would be able to try the services. But even if it's not a monthly service, considering the times we are in at the moment, more people would be encouraged to try it out.

What technology did you anticipate the most, but was not implemented this year?

DK: The potential of smart sensor capabilities has not been promoted or demonstrated further this year, as COVID-19 hit such advanced research programs from moving forward. Advanced sensor (imaging radar or software-defined lidar) manufacturers have introduced potential software capabilities through their sensors: "scene interrogation via cueing application." Utilizing sensor's control API, AV system can cue sensor interrogations based on rule-based ROIs or cue sensor interrogations tailored to collect missing info from other computer vision systems. With a specific notion of where to look, the embedded system sends commands to point the sensor in the designated direction. The brain of the AV decides when and where it needs additional sensor data from a sensor system. However, making cueing applications is not a sensor vendor's job, but auto system architect's job as you need to leverage information from deep inside the AV stack to get full benefits of these sensors measurement capabilities. Such applications will be eventually realized in robotaxi systems, rather than ADAS, due to high complexity of software and demand of efficient compute.

ML: I expected Waymo to launch some sort of pilot programs similar to Early Rider or Waymo One in some city in California (CA). This did not happen but is likely still on the way, pending the climate of pandemic and regulatory approval in CA. Meanwhile, many anticipated product launches including L2+ and L3 systems with adoption of technology seen rarely in production so far, such as HD maps and lidar were expected to launch in 2020 but were pushed off slightly. Naturally, this is expected for new technology launches even if there wasn't a pandemic. First government approval of sale of L3 did happen in 2020 in Japan, however, delays include:

- SuperCruise 2: 2020 -> Early 2021
- FCA L2+ Autopilot: Early 2020 -> Early 2021
- Mercedes Drive Pilot: Late 2020 -> Late 2021
- Honda Legend L3: Late 2020 -> Q1 2021
- Toyota Teammate: Late 2020 -> Q1 2021

What were some near-term challenges and/or opportunities from COVID-19 this year?

DK: The COVID-19 pandemic could have significant impact on technology projects in the automotive sector. The development of some AD features may be delayed as OEMs and investors scale back funding for innovation to focus on day-to-day cash management. Some AV testing was tempo¬rarily suspended early in the pandemic, for

instance. These delays will probably stall the development of AVs for months rather than years.

AM: COVID may have accelerated Waymo removing all safety drivers from passenger rides in AZ.

ML: I think the most obvious is so many companies had to suspend AV testing. Some companies have added new policies and procedures to continue to test in some form, however, efficiency is definitely crippled from before the pandemic started.

AA: Because of COVID-19, the market changed as some players left the market while others were able to make profit. Services that were able to function during COVID like Amazon and delivery services were able to make lots of profit as there wasn't any room for competitors.

KM: COVID-19 has made us all aware of our exposure to others' germs. This has led to greater interest and accelerated development of robo delivery services. While not yet widely deployed, unmanned delivery vehicles would be very valuable in a pandemic like the one we're experiencing now. Current conditions have led some companies releasing new driverless vehicles to hasten development. For example, self-driving startup Nuro made timely news early on in the pandemic when it was approved to test its driverless delivery robots on public roads in California, becoming the second company to receive clearance in the state. Many other examples of this can be found; French company NAVYA partnered with Beep and the Jacksonville Transportation Authority to repurpose their self-driving vehicles to transport COVID-19 test samples for the Mayo Clinic. In China, Neolix repurposed its tiny self-driving vans to deliver medical supplies and food to hospitals throughout Wuhan, where the coronavirus originated. Delivery robots have become an important aspect of mobility during the pandemic, eliminating contact between individuals, and reducing the burden of delivery programs that rely on human drivers. It is entirely possible that this increased exposure to autonomous technologies will improve public perception of autonomous driving for the greater industry.

JC: Overall vehicle production in the US and most of the world did not suffer all that much, considering the never-before-seen experiences of COVID on the world economy early on. Yes, COVID did delay many launches, but I think even more remarkable is that no OEMs went bankrupt, no big suppliers either. Yes, there has been a consolidation, but that was due anyway, especially in the AV/ADAS sector. In fact, COVID has encouraged more car sales. It is remarkable that most automotive development and manufacturing was able to stay almost to schedule. Says a lot for the flexibility and online reality of most all of these companies. Personally, I am surprised that we expect a US SAAR (Seasonally Adjusted Annual Rate) of about 16M for 2020. I expected an SAAR disaster of 10M like in 2009/10 or worse. So, the story here is, we hit a HUGE iceberg, but

only a few compartments flooded and lowered the ship somewhat in the water. It was not Titanic.

What are some long-term challenges stemming from this year?

DK: There is some long-term uncertainty because AD regulations are still evolving. Although the UNECE's working party 29 (WP.29) and several governments are actively drafting legislation for highly autonomous driving, one that passed legislation in September is only for very limited AD applications – L3 low-speed ALKS (traffic jam pilot). The exact requirements for highway pilots (high-speed applications) and urban autonomous driving remain unclear.

KM: Industry events and meetings will likely be impacted for years to come. With all of us adjusted to video meetings and virtual conferences, there may be long term deterioration in how much travel/commuting and conferences people do even after the pandemic is over. VSI participated in several online conferences in 2020, such as TU-Automotive and AutoSens. While both were a success, it is doubtful that virtual conferences will fully replace their in-person counterparts forever. It remains to be seen how CES goes, but the all-virtual conference will serve as a test for the future.

ML: Ride-hailing, ride-sharing, and public transit are still crippled from COVID-19 and will need to be designed with germs in mind even into 2021 and perhaps longer.

How has the robotaxi market evolved? How significant is Waymo's advancement?

DK: While removing the safety driver in testing programs is a significant milestone, starting a commercial robotaxi service is a breakthrough where Waymo stands out among the crowds. Companies started getting rid of safety drivers in their pilot programs in respective ODDs: Baidu (Beijing), AutoX (Shenzhen, Shanghai, and Guangzhou), GM-Cruise (San Francisco), Zoox (San Francisco, Las Vegas) and Motional (Early 2021, Las Vegas).

ML: From 2016-2020 only one company, Waymo, has hit the safety driver milestone. Now over five companies are at that milestone, and this shows progress and maturity in this field. The above-mentioned companies that have hit the removal of safety driver milestone will now be shifting towards working on the next milestone that Waymo achieved this year, a public driverless commercial service. Waymo released a safety report including all accident data from 6 million miles of driving setting the bar for all other robotaxi companies to strive toward. Mobileye has also upped their target goal of MTBF from 10^7 to 10^8 in 2020.

How has the OEM consumer ADAS/AV market evolved this year?

DK: For automotive OEMs, as opposed to tech giants developing solely AV technologies, their ADAS and AV building programs have never been truly incremental. This year was where we saw those programs oftentimes operating in different parts of the organization with separate budgets. Some OEMs may be developing L3+ solutions, however that would be a separate program with separate teams, hardware solutions, etc. Between L2 and L3 is essentially the crossover from driver-assist to some level of autonomy. Not only does the liability shift from the driver to the system, but also different configurations of key components enable new use cases and better performance of ADAS systems. VSI calls these advanced ADAS systems "new ADAS" and traditional OEMs see it as a very rapidly growing consumer segment. Rather than continuously investing in AV for uncertain timelines and ROIs, this new ADAS can support their bottom lines, while preparing to redeem the profits from such new products for their AV R&D expenditures down the road. The L2+ market is where automotive OEMs can reclaim their leadership status in serving mass-market mobility demands and delivering a new automotive user experience – hands-free driving. At the end of the day, it is the consumer's user experience that will determine the most lucrative and important markets. As more L2+ systems are deployed in the market, consumers will start realizing what makes baseline L2 systems and the differences offered by more advanced L2+ and L2++ systems. Producing such advanced systems will act as the brand differentiator between competing OEMs. L2+ is the new ADAS and is on every automotive OEM's roadmap: at least 15 OEMs either started producing or are planning to come up with L2+ ADAS systems this year and next year. Honda and Mercedes-Benz announced upcoming low-speed L3 TJP systems, but the consumer availability of these systems were all delayed until next year.

AM: Hands-free driving has been promised by more OEMs, but delivery has been pushed into later 2021, perhaps delayed by COVID. GM expanded Super Cruise availability to more models, notably the Cadillac Escalade.

ML: In 2020, it became clear that Point to Point (Address to Address) L2 systems are coming to market in the near future. The industry has not settled on a good name for these systems yet though. Tesla released FSD beta in October publicly to vetted individuals and is expected to gradually expand it to all Tesla cars throughout 2021. Mobileye announced a similar product called SuperVision which is coming to Geely vehicles in 2021 in China but will coming to more OEMs and more regions after that. Many other OEMs and tech companies are working on competing products, but Tesla FSD and Mobileye SuperVision will be the first to market in 2021.

What is the status of AI in automotive?

DK: Tesla Autopilot represents the progress of computer vision and AI in the domain of perception, prediction, tracking, and planning. The real-world training data

management and system validation has been one of the most popular topics in the industry from dSpace acquiring Understand.AI and Intempora to Amazon AWS collaborating with a variety of industry players such as NXP, BlackBerry, etc. Meanwhile, companies focusing on testing and validation via simulation environments expanded their methodologies with more real-world like scenarios and realistic rendering engines.

MG: The COVID-19 pandemic has slowed, and even halted the flow of data, as AV companies limited testing on public roads. However, there were certain companies who made improvements in the stream. Scale AI is a startup to process and label image, lidar and map data for companies building machine learning models for autonomous driving. The company collaborated with lidar manufacturer Hesai and launched an opensource data set called PandaSet which includes more than 48,000 camera images,16,000 lidar feedbacks, more than 100 scenes of 8s each, and also 28 annotation classes for each scene and 37 semantic segmentation labels for most scenes. CMU developed a method to train much larger datasets effectively, which consist of tracking systems such as movements of pedestrians, bicycles and other vehicles around. Through the release of DriveSeg dataset by MIT and Toyota, allows the autonomous driving systems to train much like human perception, perceive the driving environment as a continuous flow of visual information.

About VSI Labs

Established in 2014 by Phil Magney, VSI Labs is one of the industry's top advisors on AV technologies, supporting major automotive companies and suppliers worldwide. VSI's research and lab activities have fostered a comprehensive breakdown of the AV ecosystem through hands-on development of its own automated vehicle platform. VSI also conducts functional validation of critical enablers including sensors, domain controllers, and AV software development kits. Learn more about VSI Labs at https://vsi-labs.com/.

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