DrivingVisionNews.com
Automotive lighting and driver assistance technologies

Tue, 16 June 2020 Weekly Newsletter NEWSLETTER #651

Editorial

New Lighting Functions: Benefits And Challenges

At every DVN Workshop and lighting congress, there are lectures and demonstrations and expositions of new lighting functions for cars to communicate with the equipped driver (width guidelines, lane keeping guidelines, etc) and with others—drivers and VRUs (turn signal and reversing lamp projections, road condition and looming-hazard warnings on the back of the vehicle, etc), to communicate with the surroundings; as well as other new lighting functions for styling and marketing and other nontraditional purposes (welcome and farewell light-fanfares, new decorative lights all over the outside and inside of the car).

So we have more and ever more new lighting functions developed by automakers and their suppliers, mostly without any research into their safety effects, whether directly or by distraction.
Even just a brief survey could at least provide a general suggestion about the potential risks and/or benefits, but there have been only a few studies started by the likes of TU Darmstadt and ELS/KIT—so far, these are scant exceptions to the general rule.
We should eagerly welcome them for their own worth as well as to encourage more work along this line, and now we have just such an opportunity with a study Audi started on the potential for distraction created by welcome/farewell lighting displays. You'll find the work in this week's In-Depth report.

For our part, we at DVN are working with major lighting experts on a study to better understand these new functions and prepare for their arrival.

Sincerely yours

DVN PRESIDENT

In Depth Lighting Technology

Audi Study: Are Welcome - Farewell Light Displays Distracting?

Audi have carried out research to evaluate the potential for distraction by animated light displays.

41 test subjects were involved, and a situation was constructed with several traffic participants and an animated-light vehicle parked so as to be conspicuously within the test subjects' view.

91% of the test subjects stated they felt little or no distraction or impairment from the light display on the parked car. 29% noticed something conspicuous about the test vehicle. 22% indicated they'd noticed the car's lights flashing as its central locking system was operating. Only 7%—three of the 41 participants—noticed the animations in addition to their traffic monitoring. Of these, two said they didn't feel disturbed at all by the animations while the third found it only very slightly distracting. Nobody said the distraction or impairment was "neutral", "little bit" or "strong".
The Audi researchers take this to mean there is no connection between annoyance, distraction, or impairment with welcome/farewell animations of a vehicle's front or rear lighting, though a firm conclusion about safety would need more footing than the subjective opinions of a small number of people asked if they were annoyed by one particular car in a staged static observation.

Background

In today's vehicle lamps, more than 70 LEDs can be used for one function. Since 2017, new "Leaving Home" and "Coming Home" functions have involved animated procession of illumination across the multiple LEDs. Several Audi models, e-tron, TTRS, Q8, Q7, A8, A7, A6, A5, A4, A3, with this function have been available over

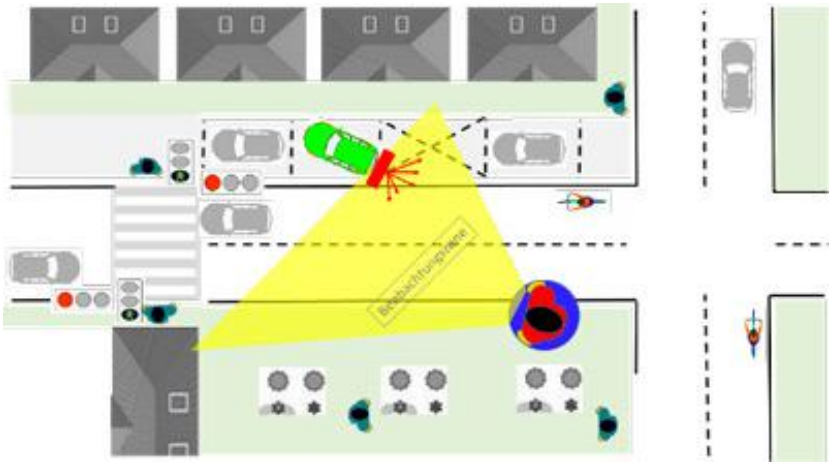
the past few years, with animations differing in detail depending on the design and configuration of the front and rear lights.

Purpose of study

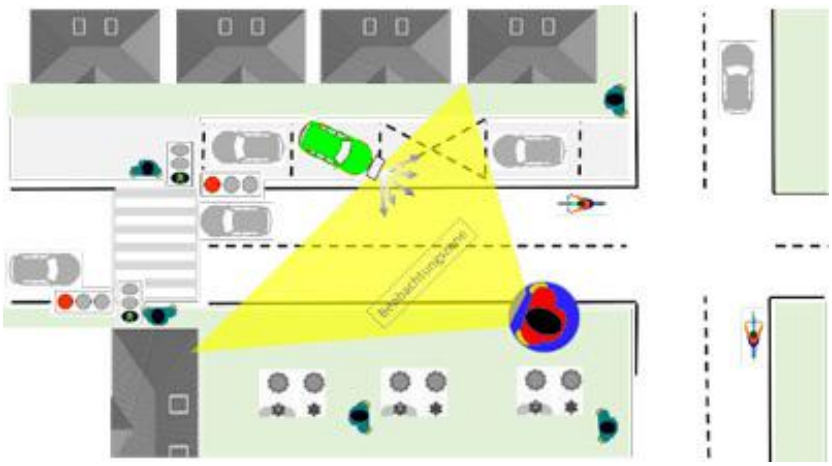
When locking or unlocking the car, in addition to the standard double flash of the turn signals, the DRL and rear lights are activated for two to three seconds. Since these light displays are visible to any onlooker, questions arise of potential distraction, impairment, or nuisance.

Experimental setup

Impairment, annoyance, or disturbance seemed to the Audi team to be difficult to quantify with physically measurable parameters, so they decided to use a survey method.
When choosing the location, they looked for a site with active and diverse road users, activities and traffic regulations. The situation was selected and configured to include circulating traffic with cars, trucks, buses, pedestrians, and cyclists; traffic lights and pedestrian crossings, parking cars, and visible light animation on a parked vehicle. The market place of the municipality of Kösching in the Eichstätt district was chosen as a suitable location, meeting all relevant criteria.
The animation display vehicle was parked in the test subjects' field of view, as shown schematically in figures below and photographed in figures next. Special care was taken to ensure that the test subjects had a clear view towards the animation.



SCHEMATIC OF SCENE FOR REAR LAMP ANIMATION



SCHEMATIC OF SCENE FOR DRL ANIMATION

The vehicle with animations was positioned within the parking bay in such a way that it was as well visible as possible. This parking position differed significantly from that of the neighbouring vehicles, and the Audi team feels that in itself would attract greater attention.

REAL SCENE AFTER REAR LAMP ANIMATION

REAL SCENE AFTER DRL ANIMATION

The observation situation was chosen so that the traffic light was about 25 m from the observation site, and the vehicle with animations was about 12.5 m from the observation site. Since the test subjects were supposed to observe the entire scene, the perception angle fluctuated between 20° and 45°, depending on the observation direction of the test subject.

Experimental Setup

The weather situation was about half sunny, half rain. Visitors and passersby were approached, asked to participate, and positioned on the street for a study, then asked to observe the traffic situation and the road users for one minute.
During this period, three animations were carried out for rear lights and DRL.Then the subjects were given a questionnaire about age group, experience, and the evaluation of the situation.

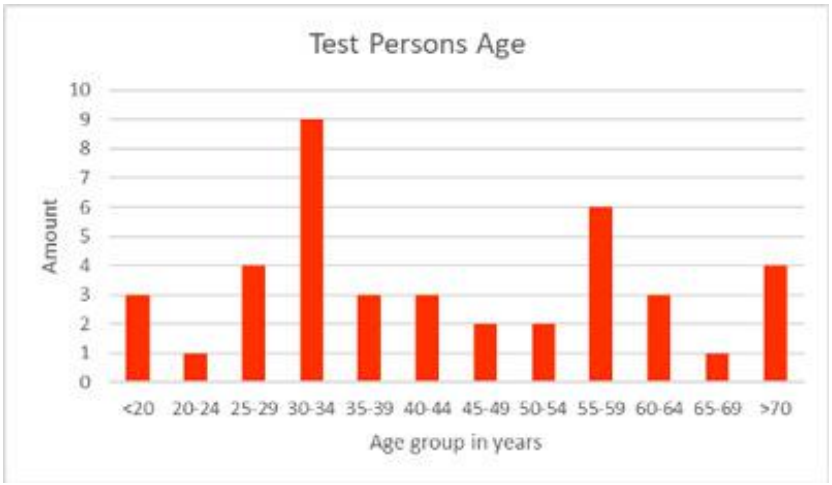
Animations

An Audi e-tron was used as test vehicle. The serial standard animation running when the vehicle is unlocked/locked was used.

ANIMATED AREAS FRONT AND REAR.

Test Subjects

A total of 41 people, passersby and visitors to the farmers' market in Kösching participated in the study.The selection of the test subjects from the market visitors resulted in a wide spread of age and other classifications such as driving performance and pedestrian activity. The average age was 44 years. In general, men were more willing than women to participate.

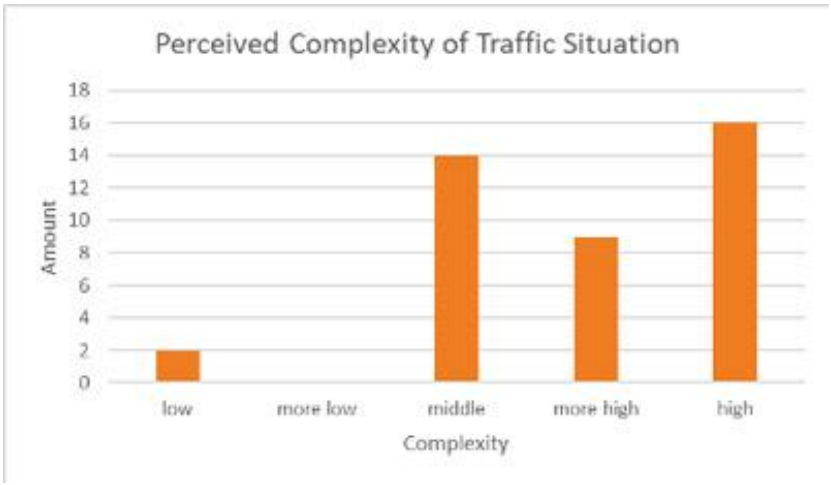


DISTRIBUTION OF AGE

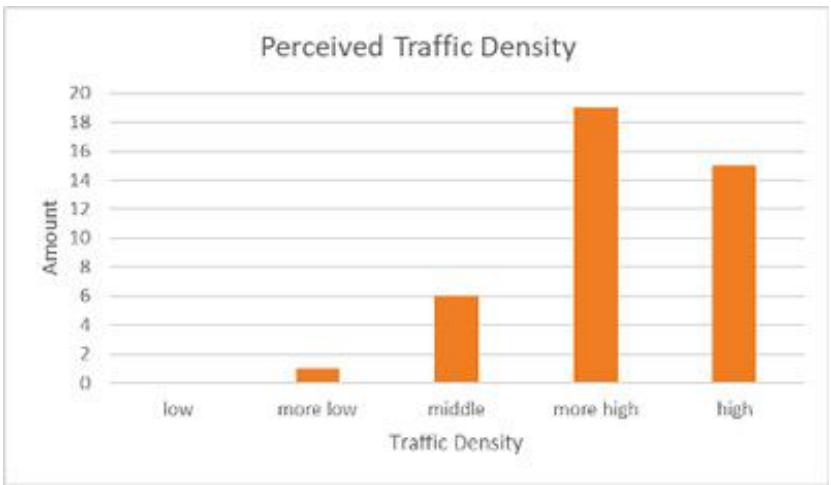
DISTRIBUTION OF GENDER.

Data analysis: Traffic

After the observation phase, the test subjects were asked about their individual assessments of the observed traffic situation. To do this, they were asked to assess the complexity of the situation.



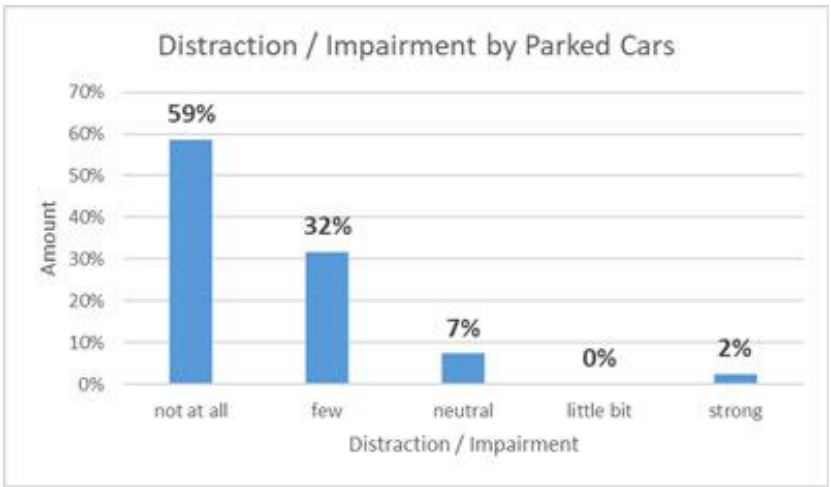
ASSESSMENTS OF PERCEIVED SITUATIONAL COMPLEXITY



EVALUATION OF PERCEIVED TRAFFIC DENSITY

The analysis of the information on traffic density and complexity shows that the perceived complexity of the situation with pedestrian crossing, traffic lights, and flowing traffic was rated as medium to high. The perceived traffic density was rated as "rather high" or "high".

Data Analysis: Distraction

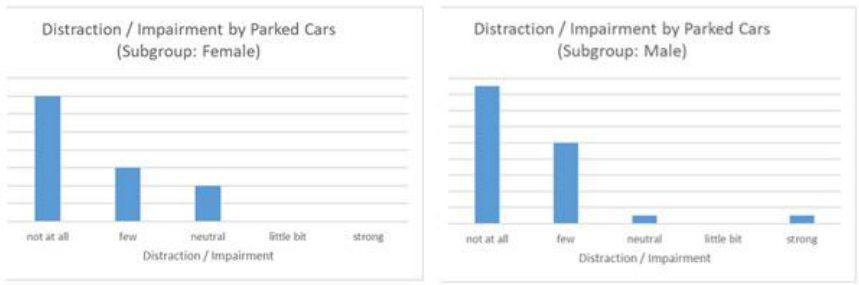


PARTICIPANTS' RATINGS OF DISTRACTION OR IMPAIRMENT BY PARKED CARS

As part of the survey, the test subjects were explicitly asked, among other questions, whether they were impaired or distracted in any way by parked cars.

As shown in figure above, 91% stated "not at all" or "little". 7% answered "neutral".

The only participant who felt "severely" disturbed later said he generally disapproves of any parked vehicle in the town centre. Analysis of male vs female responses showed no significant difference.



FEMALE (L) AND MALE (R) PARTICIPANTS' ASSESSMENTS OF DISTRACTION OR IMPAIRMENT

Data analysis: Conspicuity

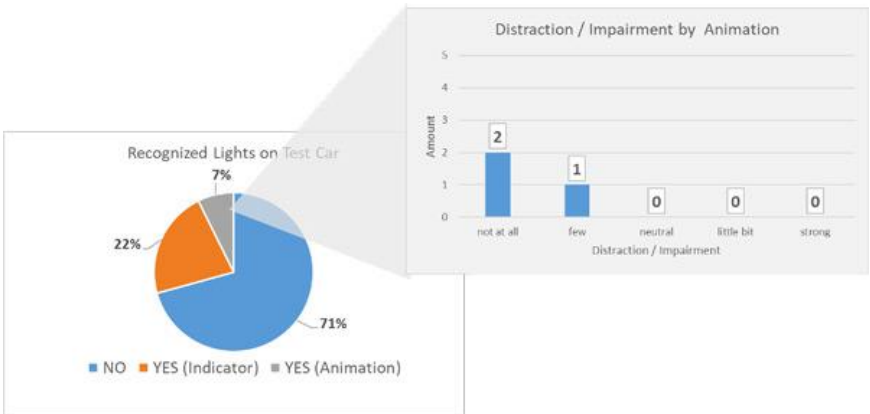
The test subjects were in the direct field of vision of the test vehicle, in which the rear or front animation was activated three times during the observation job.

In the further course of the survey, the test subjects were explicitly asked whether they noticed anything about parked traffic. If the answer was positive, the exact cause was asked.

Out of the 41 participants, 12 (29%) recognised something about parking cars. Of these, nine participants (22%) noticed the indicators lights that activated the opening flashing when the vehicle was opened, before the animation started. This flashing when the central locks are opened is present in a large part of today's vehicle fleets. Three of the test subjects (7%) mentioned the car's animation even when they were explicitly asked about light.

Detailed analysis: Animation

A detailed analysis was carried out to determine whether the three participants who noticed the animations had felt disturbed or impaired in the previously given assessment; none of them had previously stated that they had been impaired or distracted.



Summary

The Audi team found that of the 41 participants, 91% stated that they felt little or no distraction or impairment from parked cars during their observation. 29% of the participants noticed something conspicuous about the test vehicle. 22% indicated the opening flashing of the central locking system as an observation. 7% (three people) noticed the animations in addition to their traffic monitoring, of whom two people did not feel disturbed and one person felt a little disturbed by the parked vehicles. 0% was the result for "neutral", "something" or "strong".

From this, the Audi team conclude "Animations were never found to be disturbing in the study carried out. This indicates that there is no connection between annoyance, distraction or disturbance with animations (coming home / leaving home) by front or rear lighting."
The second step of the study should be a dynamic survey with drivers as subjects.

Lighting News

2 Lighting CTOs: Good Chance !

Ralf Kladtke from ZKW left his company and is replaced by Jûrgen Antonitsch who has already done in ZKW a wonderful job.
The seconf CTO, Todd Morgan is leaving his position. His successor will arrive in July.

I want to say them that DVN and mainly myself, we regret their leave. We have had very nice relationship with them. They were everytime involved in the DVN activity, in workshops, in participation in the newsletters and in the reports. They understood how much important is DVN for lighting industry.
I wish them a great future.
Good Bye Ralf and Todd and thank you for all your involvment in DVN and in the lighting commuunity. It was a pleasure to work with you !
DVN wishes you a great future.

- Morgan joined Ford as a manufacturing engineer in the Interior Systems plant in Saline, Michigan. In 1994, he began his experience in the design of exterior lighting systems for Ford. Then, he moved to the Czech Republic.
Morgan became Director of Lighting Product Development-Europe/Asia in 2007 before assuming his current role as Senior VP of Product Development for Varroc Lighting Systems. He led all development activities globally with technical centers in the Czech Republic, Germany, India, China, Mexico, and the USA.

- Ralf Klädtke was Vice-Chairman and CTO of ZKW Group since July 2017.
He has a master's degree in aerospace engineering, and he started his career as Captain of the German Air Force. He has been a German delegate of the German Space Agency, was the European Program manager for the X38 Space Vehicle with

NASA. And has been CEO of Carl Zeiss Optronics, CEO of Airbus DS Optronics, Vice President at Airbus and several further positions

Obituary: Marelli AL's Alain Buisson

ALAIN BUISSON

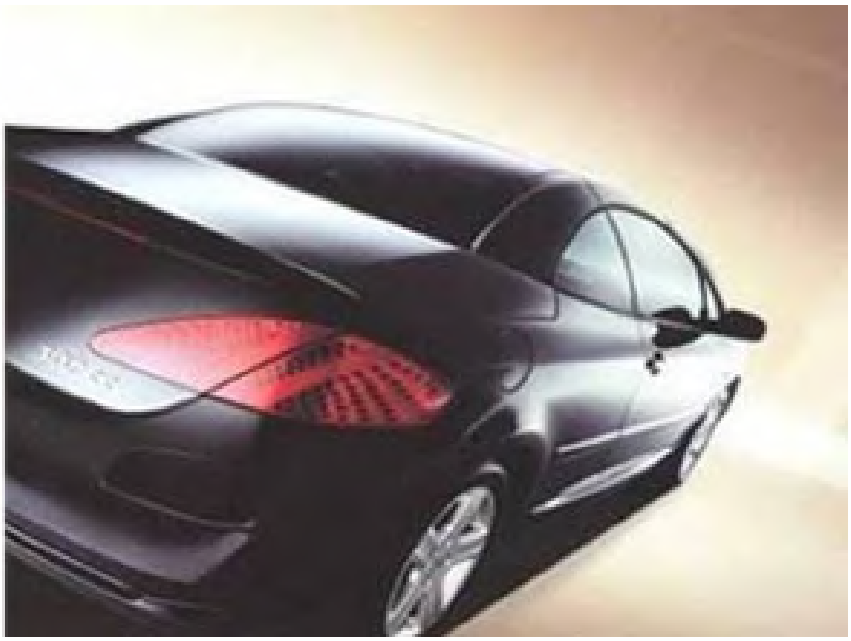
We are sad to report that our colleague Alain Buisson has died.

Extremely passionate about his work and with an uncommon flair for innovation, he regularly created new optical concepts for magical effects based on simple solutions.

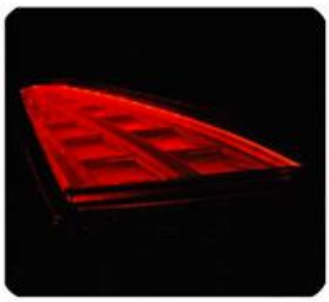
Alain spent most of his career in vehicle lighting and was a real wizard in signal lighting. In 1973 he started his career at Seima, a French company which later became part of Valeo. In 1983 he then joined Axo Scintex which is known today as Automotive Lighting Rear Lamps France. In that period, he was a mechanical and optical engineer involved in the development of rear lamps and small lighting applications for Peugeot, Citroën, and Renault. In 1986, Alain moved to DBM in Canada, working in the field of reflex optical engineering. At DBM he developed a new 3D reflex reflector for automotive applications, targeting especially US carmakers.

During this period, he developed a special passion for small optics and micro optics, which were later applied in many of his designs and inventions. In 1989, Alain came back to France, being successively R&D Director, and then Innovation Manager of Automotive Lighting France. He developed multiple innovative signaling products for European and Japanese car makers and was one of the very first to

apply LED light sources in rear lamps.**A few bright innovative concepts developed by Alain:**
Over his career, Alain was the originator of many clever concepts resulting in almost 40 patents in the field of signaling applications. Here's a small selection:



2003 - PEUGEOT 307 COUPÉ
FIRST LED REAR LAMP FOR PSA
PAINTED BEZEL WITH HOLES CONCEPT
OPTICAL COLLIMATOR



2010 - PEUGEOT RCZ FIRST REARLAMP WITH LIGHT CURTAIN WITH MICRO OPTICS

2013 - CITROEN PICASSO
- ONE OF THE FIRST REARLAMP WITH MIRROR EFFECT
- VERY COMPACT DESIGN BASED ON COMPLEX LIGHT GUIDE

201 7-DS7 CROSSBACK
- SCALE EFFECT FROM METALLIZED INNER LENS
- COMPACT STOP / TAIL / TI / REVERSE

2018 - HONDA ACCORD TAIL FUNCTION REALIZED WITH LIGHT CURTAIN WITH MICRO OPTICS

And more wonderful ideas to come in 2021…!

We are grateful to Alain for his sparkling contributions to the lighting community, and sad he's gone.

LRC's Short Video Series: Lighting in a Post-COVID World

During the coronavirus closedown, experts at Rensselaer Polytechnic Institute's Lighting Research Center have been making videos about the future of lighting in a post-COVID world.

Renowned vehicle lighting researcher John Bullough recently put up a video about headlighting, drawing on his experience driving at night in today's dramatically reduced traffic. It's well worth a watch, for he raises an interesting idea: could the unusual temporary conditions of the pandemic get people better acquainted with their under-used high beams? And could that new familiarity have other beneficial

knock-on effects? **Watch John's video** and share your thoughts with him and with us—let's get a conversation going!

There's a new video being added every day for the next couple of weeks; the whole series can be found at the **LRC's YouTube channel**.

Automotive Experience Reaches New levels with LEDs

REAR EXTERIOR ROAD MARKING

Extract from LEDs magazine

LEDs are changing the game in exterior lighting. In the future, intelligent display systems on the front and back of a vehicle could send messages or project information in order to communicate with pedestrians or other cars on the road, such as flashing a message to pedestrians that it’s now safe for them to cross the road.

This is also important in a world of autonomous driving, because pedestrians are safer when they know the intentions of oncoming vehicles. They don’t have to peer through the windshield to discern a hand gesture or head nod; they’ll get a lighted message that tells them it’s okay to proceed.
Already we’re seeing the introduction of high resolution, controllable LEDs that feature thousands of individually addressable pixels to safely light the road ahead and project valuable information and warning signals to pedestrians.

ADAPTATIVE DRIVING BEAM

Controllable LED headlamps will move beyond currently available adaptive main beam technology that responds to reduce glare for oncoming vehicles. For drivers, these headlamps can also flash warnings and messages regarding road conditions, such as “icy surface ahead.” On a winding and treacherous road, they can project lines that help drivers better negotiate the terrain, thus greatly enhancing safety

Imagine that your taillights are sectioned into thousands of digitized pixels so that you can customize them to show a preferred pattern. Instead of settling for the stock display from the manufacturer, vehicle owners could customize their exterior lighting to their heart’s content, adding a level of personalization never seen before.

The road ahead for automotive lighting looks very promising. A variety of cutting-edge LED technologies are now emerging which will help ensure that the future of driving is not only bright but also safe and enjoyable

New Mercedes S-Class and Electric EQST

The new Mercedes S-Class will bring a "completely new level" of artificial intelligence to the luxury sedan class when it goes on sale later this year, Daimler CEO Ola Kallenius has said.

Daimler revealed the front of the new car in an artful teaser photograph ahead of its launch later this year. The picture shows the car's wide grille and multi-projector headlamps. "The new S-Class reaches a completely new level in terms of artificial intelligence and needs-based electrification," Kallenius said in an interview.

The S-Class launch will be followed by the electric EQS version. Both models will be built in the new "Factory 56" in Sindelfingen, which will open in September 2020, Kallenius said.

German press reports say the S-class will be available to order in Europe from September, with deliveries starting in November. The S-Class held onto the lead of the upper premium sedan sector in Europe in 2019, despite sales dropping 30 percent 8,446, according to data from JATO Dynamics market researchers.

Hyundai's New Santa Fe Unveiled

Hyundai's upcoming New Santa Fe has been shown, and it bristles with new looks and new features.

The egg-crate grille neatly hides the headlamps, which are both inboard and outboard of the vertical element of T-shaped LED DRLs.

The taillights are connected across the rear hatch by a slim illuminated bar that complements the horizontal design theme on the front and sides of the vehicle. The theme is once again expressed by the wide rear reflector and skid plate, creating a three-layer look.

Driver Assistance News

Controversy: IIHS Says AVs Would Cut 1/3 of U.S. Crashes

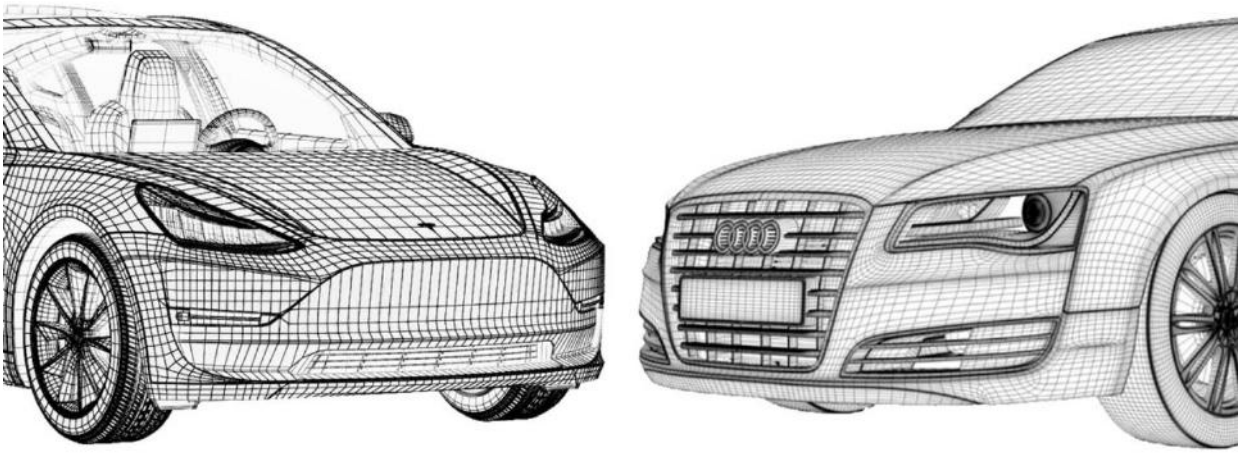
The U.S. Insurance Institute for Highway Safety has released a report saying autonomous vehicles could likely only prevent a third of all U.S. road crashes, but couldn't help those caused by mistakes that self-driving systems can't handle any better than human drivers.

The institute analysed 5,000 U.S. crashes and concluded that AVs could likely only prevent those caused by driver perception errors and incapacitation. They sorted the crashes into five causal categories: sensing and perception; predicting; planning and deciding; execution and performance, and incapacitation errors. Then they filtered those through current and likely forthcoming self-driving technological capabilities, to find that AVs will be able to eliminate sensing and perception errors, or crashes that result from driver distraction, and autonomous technologies won't be subject to incapacitation by intoxication, fatigue, or medical events. Those two causal categories total up to 34% of crashes. The IIHS noted that automated systems will need to take road conditions and other driving strategies humans exhibit into account at all times. Any sort of misjudgment could end up as a planning or deciding type of crash if the self-driving car misjudges things.

Companies working on self-driving vehicles don't agree; they say AVs can prevent many more crashes caused by a much wider range of factors, including more complex errors caused by drivers making inadequate or incorrect evasive manœuvres. Specifically, the Partners for Automated Vehicle Education, a consortium of AV tech companies, say self-driving cars could prevent 72% of crashes. And individual companies developing self-driving cars have called AV technology key to greatly reducing crashes.

The Self-Driving Coalition, an industry group that includes Waymo, Ford and Uber, says the IIHS has got it wrong: "Self-driving vehicle technology will help reduce the incidents of drunk driving (29% of all 2018 fatalities) and distracted driving (14% of all 2018 fatalities), and hold the potential to avoid problems that arise from fatigue, human error, speeding or other common causes of fatalities".

Yole-System Plus Webcast: From ADAS to AV



Yole Développement and System Plus Consulting are putting on a webcast this coming 30 June on the theme: "*From ADAS to Automated Driving*", presenting the evolution of sensing, computing, and architecture in the ADAS sector.

ADAS functionalities were initially developed for safety and are now increasingly used to enable some automated driving features. This requires more sensors and computing power, and a more complex E/E (electric and electronic) architecture.

This webcast will discuss the evolution of the main kinds of sensors used for ADAS: cameras, radars and lidars. They will also show the evolution of the E/E architecture and what is needed in terms of computing to enable automated driving features. An assessment of Audi and Tesla implementations will be performed. Attendance is open and free; **registration is online**.

General News

Nikola Motors: The Tesla of Trucks?

Truck maker Nikola Motors, created five years ago in Salt Lake City, Utah, USA and based in Phoenix, Arizona since 2018, went public last week. This they did not via a traditional IPO, but by merging with VectoIQ Acquisition Corporation.

Nikola's stock price more than doubled following the announcement of the opening of online pre-reservations for their Badger pickup truck, which is expected to enter production with an established OEM partner—yet to be selected—sometime in 2022. It's said to offer up to 965 km range; 1,330 N·m torque, 676 kW, and go from 0 to 100 km/h in about 3 seconds. We note an interesting driver vision system configuration, with sideview cameras (not yet legal in North America, the Badger's intended market) and amber rear side marker lights (they have to be red), as well as turquoise side accent lights (conflict with turquoise autonomous-mode front lights?) and prominent LED DRLs, headlamps, and integral driving light bar.

Nikola, who have yet to begin marketing any vehicles, now have a capitalisation of USD $26bn, eight times their valuation when they last raised funds in September. The level is close to that of Ford's $30bn—Ford sold 2.4 million vehicles last year—and higher than that of FCA or PSA.

Nikola's unique proposition is vehicles powered by hydrogen. Mixed with oxygen, it is transformed into electricity via fuel cells. This mode of propulsion is considered very promising because it releases only water and promises a user experience closer to petroleum-powered vehicles than to battery electric vehicles: greater autonomy and refuelling in a few minutes. Detractors point to the high cost of

deploying a charging network, and the energy loss linked to the process: its yield is currently limited to 20 to 30 per cent.

Nikola co-founder and President Trevor Milton says 14,000 pre-bookings for the Badger pickup have been registered online. If maintained, they will generate more than $10bn.In the meantime, there are Nikola's commercial freight trucks with conventional electric batteries. He will use IPO funds to build his own factory in Arizona and plans to produce 600 semi-trailers with electric batteries by the end of next year. These fuel-cell trucks, intended for both the North American and European markets, are in the prototype phase and on track for production next year; they'll be built in Germany with Nikola partner CNH Industrial, who build Iveco trucks.

Nikola also want to implement their technology beyond trucks—such as on a buggy, 4×4, or jet ski. Competition will be fierce, with announcements on the development of hydrogen propulsion increasing among manufacturers, aware that the ramp-up of battery-powered vehicles will not be enough to meet growing environmental constraints.

Nissan CEO on How to Overcome the Crisis

In an interview with Les Echos, Nissan General Manager Makoto Uchida manager explained his transformation plan:

"The transformation of Nissan is on the "Nissan Next" plan that we have presented. It’s not just a simple plan with medium term goals, it’s about streamlining our organisation. Currently, we have a production capacity of 7.2 million vehicles per year, but we need to get closer to the 5 million, which is what we actually manufacture. This will involve reducing the number of models we offer, but it is also an opportunity to rejuvenate our offer. This rationalisation will lower our fixed costs, but it is above all the only way to put the group back on the growth path. With this

new strategy, we will focus on our three priority markets: China, the United States, and Japan.

"We are betting a lot on the Ariya, an all-electric model that we will be presenting next July. The commercial version is going to be quite close to the concept we unveiled last year in Tokyo. It's a concentrate of our best technologies, in terms of empowerment, electrification and design. There’s a lot of internal excitement around this project. The last two years have been very difficult, in terms of management and performance, but I keep saying that Nissan is much better than that. It's time to prove it.

"We never expected the Nissan brand to leave Europe. This brand has great strengths, in the electric or autonomous car, these are areas where it can be appreciated. But we do have to cut costs, which is why we have had to make tough decisions. We must also use the assets and expertise of Renault, our partner in the Alliance, to improve our competitiveness."

How the pandemic will speed up some trends, stall others

The coronavirus outbreak has the potential to reshape the auto industry in ways that go far beyond the short-term effects on sales and production.

"COVID-19 is hitting the industry just as we're seeing a transition from the old traditional value tools and profit pools into completely new ones," said McKinsey senior partner Andreas Tschiesner. As such, he said, the pandemic will act as both an accelerator and a stress test for existing trends and future business models. Tschiesner and other analysts predict that the global auto market will be smaller, with sales and production in a prolonged slump. In 2020, both are likely to be down about 20%-25%, meaning roughly 70 million passenger vehicles will be built and sold, compared with more than 90 million in 2019, and more than 94 million in the record year of 2017.

IHS Markit expects that it will take until 2024 for global sales to return to pre-pandemic levels. Even then, volumes will remain around 10 million vehicles below IHS's previous forecast track, which showed production reaching nearly 104 million vehicles in 2027.

To deal with this uncertainty, IHS and other analysts have been gaming out situations. In IHS's best case, the industry recovers by 2022. In the worst case, recovery is pushed beyond 2025. Tschiesner of McKinsey expects a recovery around 2023.

Tschiesner said that a faster transition to digitizing the "customer journey" will pay dividends for automakers, starting with the supply chain.

"The future is going toward online," he said. "Automakers want a direct touch point with consumers, because what we also see in the future is that the business model will change toward recurring revenues, software updates and monetization of data offerings, like Tesla is doing."

Early post-lockdown studies in China show that private cars, walking and bicycling have gained while bus and subway ridership has fallen, McKinsey said in a report.

"We believe that there is potential that investments are cut because of difficult economic situations, which could delay mass adoption" of self-driving vehicles, Franjicevic said.

Now, for hygiene reasons, potential riders may be reluctant to get into a robotaxi that has been used by numerous people earlier in the day,

A number of auto companies have said publicly that they are putting autonomous vehicle investments on hold, with profits from the technology years away.

IHS predicts that out of 458 global starts of production expected in 2020, 393 will take place, a 14% decline.

At the same time, "work from home" for white-collar workers is increasingly being seen as a long-term solution rather than a temporary remedy. PSA Group, which had been pushing many workers to telecommute before the crisis, said it would make the option available to 80,000 of its 200,000 employees worldwide.

Because the pandemic is not over, automakers, suppliers and analysts are hesitant to make predictions. All agree, however, that there are opportunities and lessons to be learned.