DVN-I
Automotive Interior

Thu, 7 May 2020 Weekly Newsletter **NEWSLETTER #27**

Editorial

Market Restart, Interior Upgrades

As the automotive industry progressively resumes production all over the globe, a second big hurdle is in front of us: customers have not put "car" on their after-the-virus shopping list! Governments, automakers, and dealers will likely offer incentives and special sales to help spark sales demand. Government incentives mostly will center on electric cars; dealers will offer attractive purchase financing, and automakers will most likely try to differentiate on design and interior content—starting from what's already available, then options that can quickly be brought to market, and progressively to new design.

The pandemic has probably put "care" and "trust" at the heart of the concerns of future buyers, so these values are the core of the main topics we are addressing here in DVN Interior: safety, health, hygiene, comfort, convenience, friendly materials and suchlike. That's why industry has to use quickly-available options, packages, and other fast

improvements to rejuvenate sales of current models at the most affordable price in order to pump up customer desire.

To that end, this week we've got our second in-depth chapter on advanced interior lighting and RGB-LED technology. And we continue our look at the center console/floor console space.

As promised last issue, our first 2020 DVN-I Report, on Interior Trends, went live last week; **download it** if you haven't yet, and if you've not yet registered for our 1st DVN Interior Workshop in Darmstadt on 23-24 September, you may **do so here.**

In the meantime, Go carefully and stay safe

Sincerely yours,

Philippe Aumont

Philippe Aumont
General Editor, DVN-Interior

In Depth Interior Technology

Advanced Car Interior Lighting

MERCEDES-MAYBACH ULTIMATE LUXURY CONCEPT - BEIJING 2018

When progress in car interior lighting resumes—after the pandemic—the number of RGB-LEDs in a car's interior will resume its steady increase from hundreds today to thousands in the near future, serving an increasing number of new interior lighting functions. Autonomous driving with further use cases is certainly an additional driver for an advanced interior lighting.

Interior lighting is becoming more complex, creating mood not only at night but also in daylight conditions, welcoming passengers with theatre-like effects, supporting the user with saved light settings, automatically and individually adapting to increasing use cases, and transmitting information, warnings and signals. To fulfill all specifications for a larger number of applications with more orchestrated effects, the RGB-LEDs have to be controlled at a higher data rate, must be dimmable from daylight to night level and their technical characteristics have to be compensated in different temperature environments for good uniformity in luminance and color reproduction. These ambitious requirements are hard to fulfill with older LED and driver designs ("older" being "from not very long ago", given the very rapid pace of development). These are some reasons that a smart automotive LED with a new electronic concept has been developed—an RGB-LED that can be calibrated on demand before it is integrated in a lighting component.

Ambient lighting is no longer limited to orientation, wellbeing, decoration and styling, and brand amplification. Now it is also important for communication with visual and safety information at brightness levels for night and daylight. Therefore, the digital electronic

interfaces have to be designed for high speed data rates in the range of Mbit/s. ECUs with new software have to address hundreds of RGB-LEDs in real time for today's and tomorrow's light configurations.

For advanced interior lighting you need dynamic light effects in light guides with a high uniformity of luminance and color over the whole specified automotive temperature range. For daylight performance you need high power RGB-LEDs with an adapted power control, thermal management and optimized optical technologies for an optimum efficiency.

Figure 1:

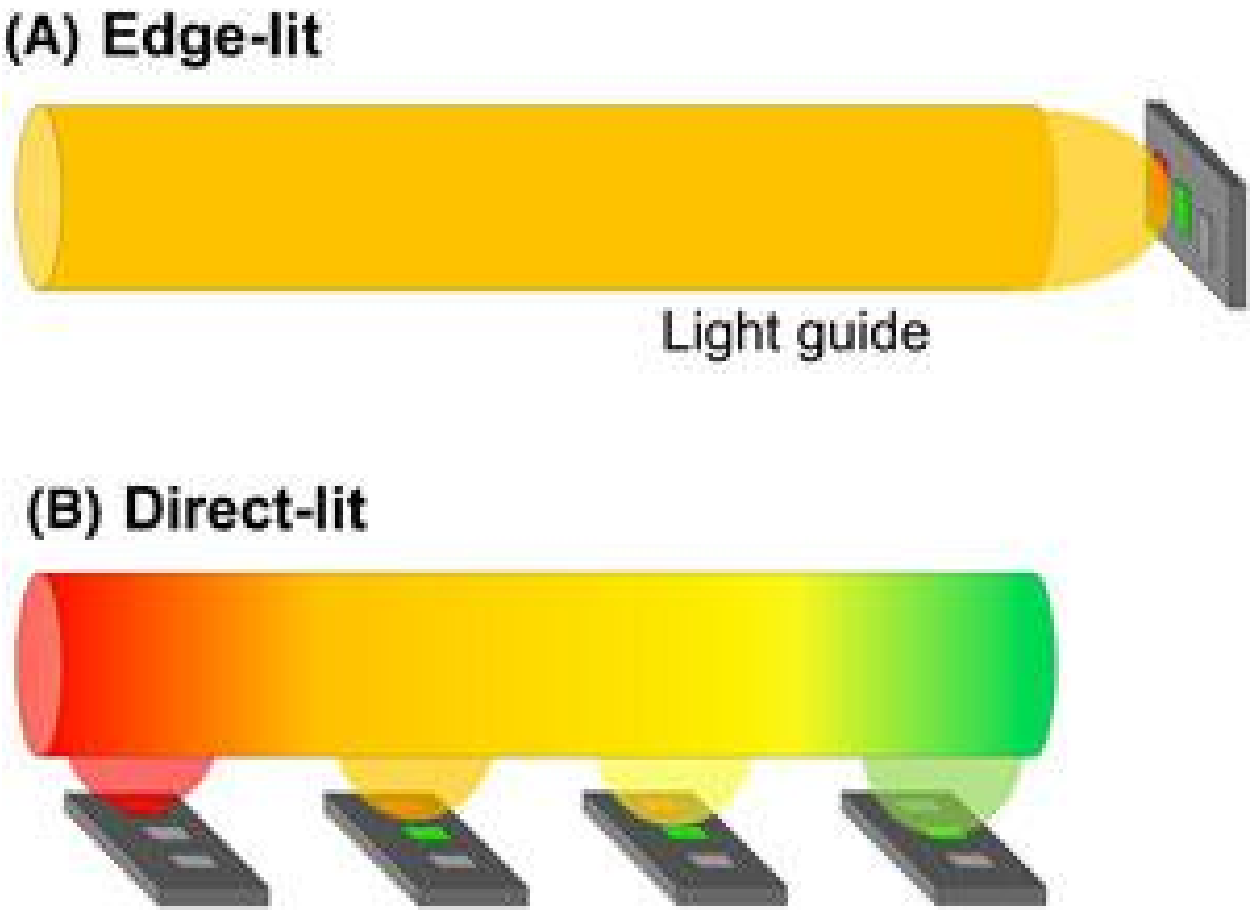


Figure 1 (A) shows an **edge-lit light guide**, as it is usually used today for LED-modules, normally controlled by LIN bus with a maximal data rate of 20kbit/s and 16 bus slaves.

For the **direct-lit system** - Figure 1 (B) - the LIN bus data rate is too slow and the number bus slaves are not enough to address all LEDs for dynamic animations with a high resolution.

Figure 2:

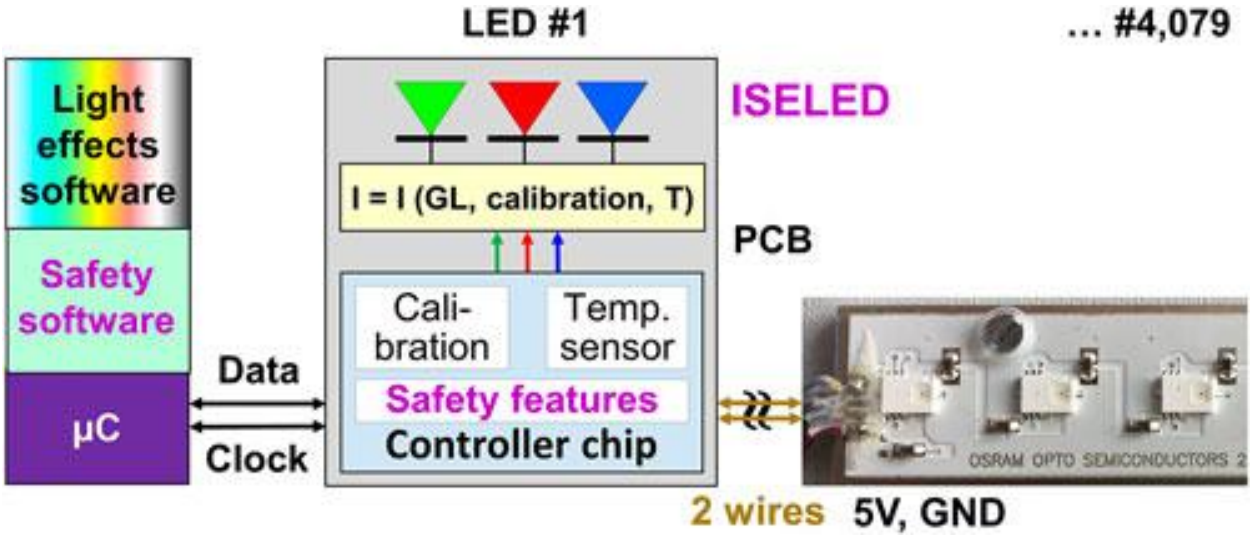
Figure 2 (A) shows an example of the extensive interior lighting of a premium vehicle today, which is partly standard equipment in the higher car segments but also available as extras in the lower car segments. The contour lighting is mainly static and realized in edge-lit light guide technology.

Figure 2 (B) shows an advanced interior lighting with direct-lit light guides and "pixel light" with daylight performance for dynamic light effects (Sources: BMW, Mini)

The extensive technical requirements for a dynamic advanced interior lighting led to the development of a new smart RGB LED, called “ISELED”.

The ISELED LED is based on a controller chip integrated in the housing of each RGB-LED to a “system in package” (SIP). These packages can be connected to a long daisy chain, controlled by a customized protocol. The control data protocol runs at a data rate of 2 Mbit/s and can control 4,079 LEDS in one chain. It enables also safety functions, e.g. readout of LED forward voltages for the visualization of status messages. For dynamic animations every single ISELED can be individually addressed and 200 LEDs can be serialized with a frame rate over 80 Hz. The chip enables a precise calibration of the RGB-LEDs directly after package assembly—namely the dominant wavelength adjustment by individual LED currents and RGB intensity calibration for D65 white point.

Figure 3: Block diagram of the ISELED RGB LED system



Professor Dr. Karlheinz Blankenbach (Hochschule Pforzheim, Germany), Franziska Hertlein, and Stefan Hoffmann have published a paper "Advances in automotive interior lighting concerning new LED approach and optical performance" with the following topics:

· New smart automotive RGB LEDs with integrated driver, calibration, temperature compensation and data connectivity in one small housing (ISELED), to fulfill the technical requirements for dynamic lighting and to reduce the efforts and costs for binning

· Perception of structured surfaces backlighted by RGB LEDs under different illuminance levels for visualization of driving modes below the windshield

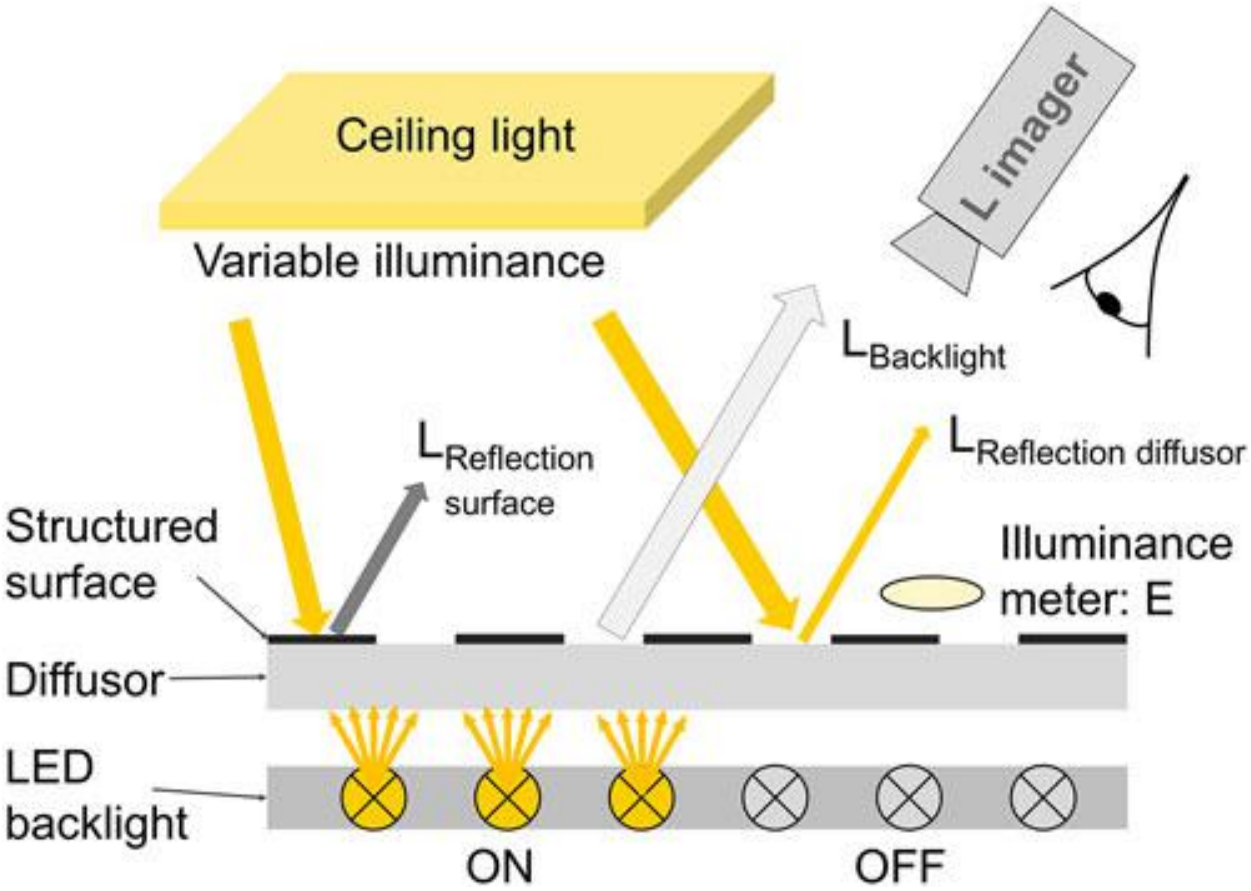
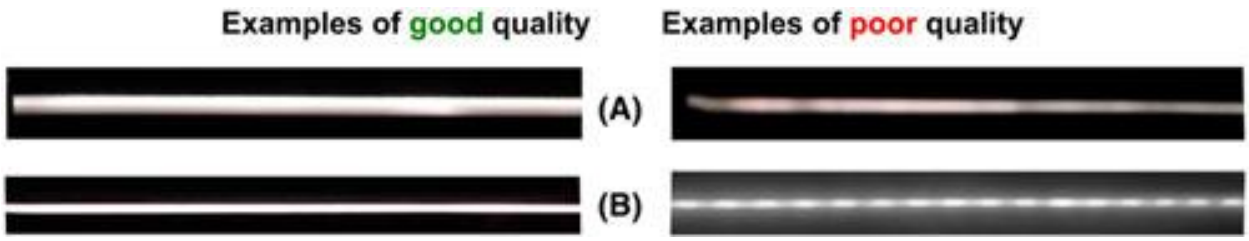


Figure 4: Test setup of structured surface with adjustable backlight luminance

· Adaption of display uniformity "contrast sensitivity function" (CSF) to backlighted pixelated light guides for end-of-line check, e.g. direct-lit light guides are more sensitive than edge-lit light guides to luminance variations in LED intensities.

Figure 5: Uniformity comparison of edge-lit (A) and direct-lit (B) light guides:



· Human centric lighting (HCL) by RGBW LEDs for optimized control of color temperature from cool to warm white

The publication is a very interesting contribution to the art and science of advanced interior lighting hardware and software, calibration, compensation, integration, and costs.

All Figures from: Blankenbach, K; Hertlein, F; Hoffmann, S: *Advances in Automotive Interior Lighting Concerning New LED Approach and Optical Performance*. [J Soc Inf Display 2020; 1–13

Interior News

PACE Award for Marelli 3D Display

Automotive News has given Marelli a 2020 PACEpilot award for the supplier's Glasses-Free 3D Display technology.

With modern vehicle technology becoming more and more complex, driven by the evolution of the cockpit, it is imperative that displays and control systems become simpler and more intuitive. 3D displays can ensure critical alerts catch the attention of the driver without requiring them to look away from the road.
A key enabler in Marelli's winning innovation is auto-stereoscopic 3D screen technology (AS3D). Marelli developed AS3D in partnership with Alioscopy, a French company known for pioneering glasses-free 3D displays for the digital signage, communications and professional imaging markets. AS3D enables a 3D effect without the use of glasses, allowing the viewer to perceive depth through the naked eye.

Marelli's innovation incorporates an array of magnifying lenses laminated on top of a standard display. The result is extremely thin, occupies minimal space and is up to 50% less expensive than competitive solutions that use multiple displays to achieve a 3D effect.

With 3D technology, parking cameras can present increasingly accurate views to the driver. During navigation, 3D depth perception will take the guesswork out of when and where to turn, by virtually immersing the driver in the surrounding environment.

The benefits of 3D extend beyond the driver. As automated driver assistance system (ADAS) and autonomous driving development progresses, and the trend towards large immersive display integration continues, 3D technology can be used to entertain and inform passengers during transit.

2020 Pace Awards

The 2020 Automotive News PACE Awards have now been bestowed for 26 straight years to suppliers that have successfully commercialized new ideas in auto manufacturing. The winners were announced via video from Detroit on 26 April, as the global auto industry is shut down and in-person gatherings aren't possible on account of the coronavirus pandemic. Innovations in lightweighting, advanced communications, and better visibility dominated this year's PACE Awards. Within the winner list, winning interior/occupant related products included:

The **Stoneridge MirrorEye** camera monitor system replaces traditional rear and side mirrors with five digital cameras to remove blind spots and enhance visibility in difficult driving conditions. An advanced image-rendering system blocks direct sunlight reflections, and an infrared color night-vision display improves maneuvering at night.

Gentex's mirror-integrated toll module provides a single, universal hardware and software system to manage different toll protocols across the United States. Drivers benefit from a clear line of sight and have unencumbered toll road access without the need for multiple transponders cluttering the windscreen or multiple accounts to manage. But could it work in Europe or Southeast Asia with such a variety of countries?

The **Lear Xevo** commerce and service platform for automakers, suppliers, and merchants to get services through apps that consumers download to their vehicle through proprietary software. The platform allows people to safely and conveniently perform simple tasks with third-party merchants through their vehicle, such as ordering coffee or finding the nearest preferred-brand fuel station, while on the road.

The **Continental Virtual A-**Pillar removes the pedestrian-critical blind zones created by today's thick A-pillars. Drivers are used to compensating for lack of forward vision by adjusting their position while driving. The Continental Virtual A-Pillar tracks these movements using an interior camera mounted just above the steering wheel. At the same time, Continental's Surround View camera, mounted on the vehicle's exterior, feeds a live video of the vehicle's external environment to the OLED displays embedded in the A-pillars. By tracking the driver's head movements paired with the exterior live image, the Virtual A-Pillar offers a dynamic perspective for the driver, giving the driver an experience more like looking through an extended window rather than at a live video feed.

Eyesight Sees Through Masks

Eyesight Technologies says their computer vision and artificial-intelligence algorithms have been trained to detect distraction and drowsiness even when the driver is wearing a mask and glasses. The supplier has adapted their Driver Sense driver monitoring solution's ability to detect distraction and drowsiness among drivers wearing face masks to protect them from COVID-19. Essential workers such as truck drivers, municipal workers, bus drivers are driving even more nowadays, and drowsiness may happen to them even more often.

MIVI Steering Wheel Is Vehicle UI

Driver Monitoring can be managed from the Steering Wheel as well. The new **Origo Steering Wheel concept** is the first joint demonstration and research platform to emerge from the Multimodal In-Vehicle Interaction and Intelligent Information Presentation (**MIVI**) consortium launched last October. The two-year MIVI research project is coordinated by the University of Tampere and funded by Business Finland. Participants include multiple Finnish companies Canatu, Siili Auto, Rightware and TactoTek, all operating in the global automotive industry.

Canatu provides its fully transparent Carbon NanoBud (CNB) film -based touch sensors that are integrated into the steering wheel. CNB sensors can be formed and molded into any shape providing design-freedom and usability.

Siili Auto designs and implements User Interface (UI) of the smart steering wheel. UI and the steering wheel physical form and innovate controls are seamlessly integrated.

Rightware is providing its HMI software tools including Kanzi UI, Kanzi Connect, and Kanzi Maps to enable rapid design, prototyping, and development of intuitive interaction models for this new concept.

TactoTek® applies their Injection Molded Structural Electronics (IMSE™) technology to design and produce smart surfaces that include circuitry, touch controls and illumination in 3D injection molded designs.

The wheel replaces multiple controls from different cockpit locations with integrated 3D touch sensors providing smartphone-like interaction. A driver can also access information, and control non-driving functions in a safe hands-on-wheel driving position.

“Billions of people are using their smartphones daily naturally with their thumbs. We wanted to provide the same familiar touch user experience to the tomorrow’s cars,” said Juha Kokkonen, CEO of Canatu. The wheel’s user interface features media, navigation, contacts, climate and cruise controls. Tero Koivu, COO of Rightware, added, “The touch-based gestures enabled by the combination of technologies in this concept will introduce a heightened level of fluidity to user interaction models while also helping increase safety on the road.”

Nio's Nomi Says Hello

For centuries, travelers from around the world have placed small figurines on and about their vehicles. Good-luck charms, saints, imaginary friends and tree air fresheners put passengers at ease—helping to ensure safe passage. Chinese automaker Nio brings this into the 21st Century with their Nomi dashboard robot.

Purpose of this robot is to create a connection between car and driver. The cute rounded digital figure is only about half the size of a baseball, but the entire cabin experience is transformed by its presence. Nio wanted to turn the car into a living thing, and developed the robot's form and interactions using their team of technologists and UX specialists, specifically with Chinese customers in mind, with not only a voice and light, but also a face-like screen and personalization, the "soul" of the car. For example, when rain is expected, Nomi carries an umbrella.

Adding two graphical eyes immediately heightened the emotional connection with passengers. When that was combined with swiveling movements, the Nomi Mate established a "feeling of another living thing", according to Nio.

For example, when you open the door, Nomi turns toward you, says hello, and blinks at you with good humor. The device was designed in Munich but had to be tailored to Chinese cultural standards. The face is slightly cartoonish. But movements have been designed to be as a humanized machine.

Nio had to overcome engineering obstacles to manufacture Nomi. “Having moving parts inside a vehicle is very challenging for productization,” explained Liang. The team went through 40 different motors, and nearly as many metal and plastic gears, before finding the right combination for fluid movement. The motors needed speed and precision to achieve a person-like motion.

Challenge was to develop it at automotive grade level, including temperature and vibrations constraints, all within in a very tiny package. Mechanics has been designed at clock scale!

Fengsheng Maple is Low Cost Chinese EV

Fengsheng Automotive Technology, an affiliate company to Chinese auto giants Kandi and Geely, announced their new Maple 30x last week.

The new electric crossover's price starts under C¥70,000 (about €9,000). Compare this to inexpensive EVs in first-world countries, which start at around 30,000 Dollars or Euros (except the Renault Dacia Spring coming soon).

The 30x has a trendy two-tone exterior design with a contrasting roof in black. It looks similar to the Tata Nexon EV, very popular in India. Equipped with the GKUI intelligent

system inside, the integrated infotainment system provides a combination of entertainment and information for an enhanced in-vehicle experience. The manufacturer says there'll be a standard digital gauge cluster and an "intelligent infotainment system".

Claimed range is 306 km (190 miles) on a charge. The car entered production earlier this year, and Fengsheng says it's ready for customer purchase and delivery. It's their first model under the new Maple brand, but several more vehicles are expected later this year.

Xpeng Promises L3 Autonomy

Xpeng Motors' P7 "smart electric sports sedan" officially rolled out in China on 27April with big promises including a 700 km range on the NEDC cycle (versus the Tesla 3 in China's official rating at 670 km). Xpeng wants to offer their EVs at about half the price of a Tesla in China. The P7 starts at C¥ 240,000 (€31,000) for the base model and goes up to C¥370,000 (€48,000) depending on options and trim levels.

The P7 uses Nvidia technology to enable L^3 autonomy for highways, city streets, and valet parking. This autonomy level would be a China market first. The car has 13 autonomous-driving cameras, 12 ultrasonic sensors, 5 radars, and one in-car camera. The computer is powered by Nvidia Drive AGX platform, system-on-a-chip.

Xpeng uses its own self-driving neural networks and related proprietary autonomous driving software, which are capable of continual over-the-air updates. Since L^3 still requires a driver to be available and alert to take over at any time, the car's driver monitoring system watches the driver through the in-car camera.

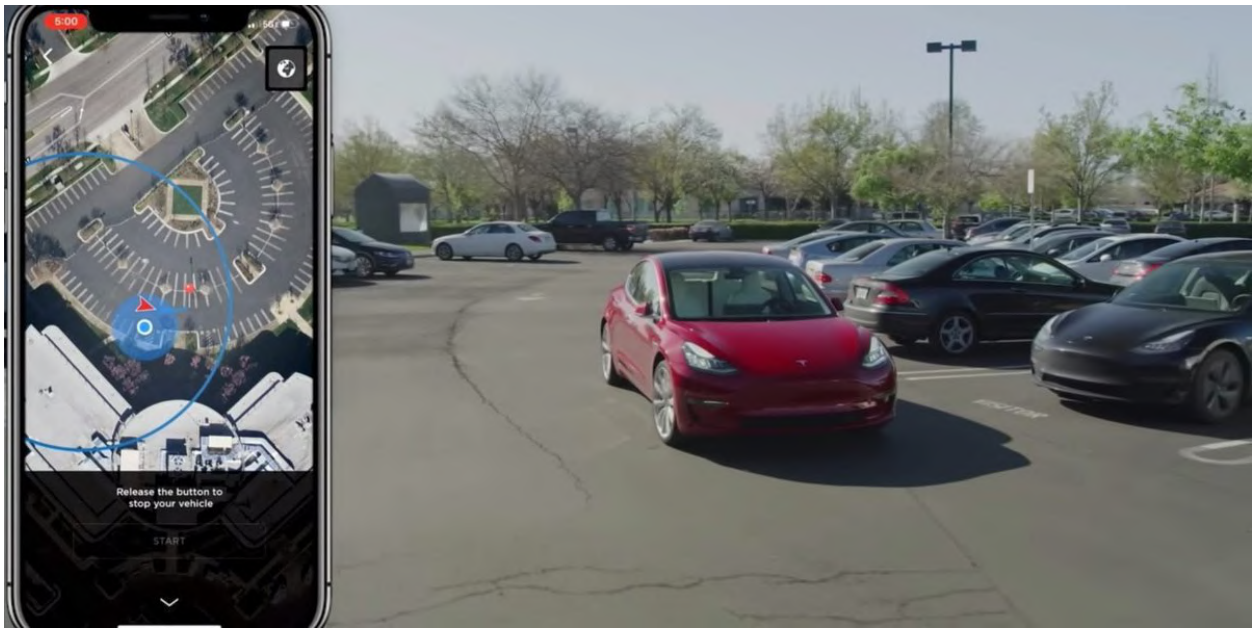
Xpeng has received permission from NHTSA to test-drive the new P7 EV on U.S. roads; the company already has a permit from California. However, they say their focus is on selling vehicles in the Chinese domestic market.

In 2019, Tesla filed a lawsuit against one of its former engineers for stealing Autopilot source code and bringing it to Xpeng, here named XPilot.

Xpeng Motors launched its first production model, the G3 SUV, in Dec 2018.

News Mobility

“Summon” Your Tesla in a Parking Lot



Tesla vehicles are going to be able to drop you off and park themselves later this year, according to a new comment from Tesla CEO Elon Musk.

With Smart Summon, Tesla introduced a significant upgrade to its capacity to remotely and autonomously move its car, which the automaker refers to as "summoning".

Tesla owners can "summon" their car when parked in a parking lot—the vehicle then drives to them at the door, or exit of the parking lot.

It works for the moment only one way. A feature which would enable owners to be dropped off in a convenient location within a parking lot, and then the car could go find its own parking spot, would perhaps be a much more useful feature. Musk says they're working on it (and also that his controversial truck will float on water; it's to be hoped that feature, if it materializes, works better than the shatterproof glass).

The CEO added that Tesla could map parking lots using its fleet of hundreds of thousands of vehicles and better understand where it can and can’t park.

GM Shuts Down Maven Car-Share

Maven, the General Motors ride-sharing and long-term rental service that showed early promise four years ago but had cut back more recently, has shut down operations. GM said the COVID-19 pandemic was the deciding issue, but 11 months ago the automaker had cut the service in half, closing it down in eight cities, including New York City and Chicago.

The car-sharing platform was launched in 2016. It was originally intended to compete against services such as ZipCar in which people rent vehicles—such as the Chevy Bolt EV and Spark— for hourly or daily use. GM said that year that it had more than 11,000 members whose average loan was for about 12 hours and 100 miles.

In 2017, Maven added a pilot program for 28-day or longer rentals of the Chevrolet Volt and Tahoe at a flat subscription rate. It also added Maven Gig, a program that lets Uber or Lyft drivers and delivery-service workers lease GM vehicles to drive. Those customers will be allowed to continue using the vehicles temporarily while they make other arrangements, GM said.

Automakers have been trying out subscription and ride-sharing models for several years, with mixed success. Cadillac's Book by Cadillac service, which let customers swap out vehicles multiple times per year on a subscription basis, is currently on a break with plans to relaunch, and Ford's Chariot shuttle service was closed down in 2018 after a brief pilot program. In late 2019, BMW and Mercedes closed down their ShareNow app-based car-sharing program in the U.S. Now, as the industry responds to the financial and logistical challenges of the pandemic, it would not be surprising to see them place renewed focus on their core business rather than making additional forays into mobility experiments, at least in the short term.

The Design Lounge

The Center Console/Floor Console Space - Part 2

(Following From Part 1 in DVN-I Newsletter April 23)

Button shifters are a new technology/innovation, aren't they? Moving the shifter out of the center console is not a new idea, as this freed up space previously for 3 across bench seating, or a narrower overall packaging between the front occupants.

1963 PLYMOUTH FURY

2014 ACURA MDX

1961 MERCURY TURNPIKE CRUISER

The idea of a pushbutton-actuated transmission is really nothing new—Chrysler Corporation's pushbutton controls were two years old when this **1958 Dodge commercial** ran. But back then, the pushbuttons were in service to an atomic-age, science-happy trend that saw pushbuttons as futuristic. Today it's more in service to interior space optimization.

When pushbutton transmissions were first introduced, only a basic AM radio and heater/defogger was available, which starkly contrasts with the UX/HMI, systems that are defining the center consoles of today. Even before the advent of the modern UX/HMI systems, the increase content required a complete rethink of the design and packaging of the interior layout, as seen in this Renault 4 example below.

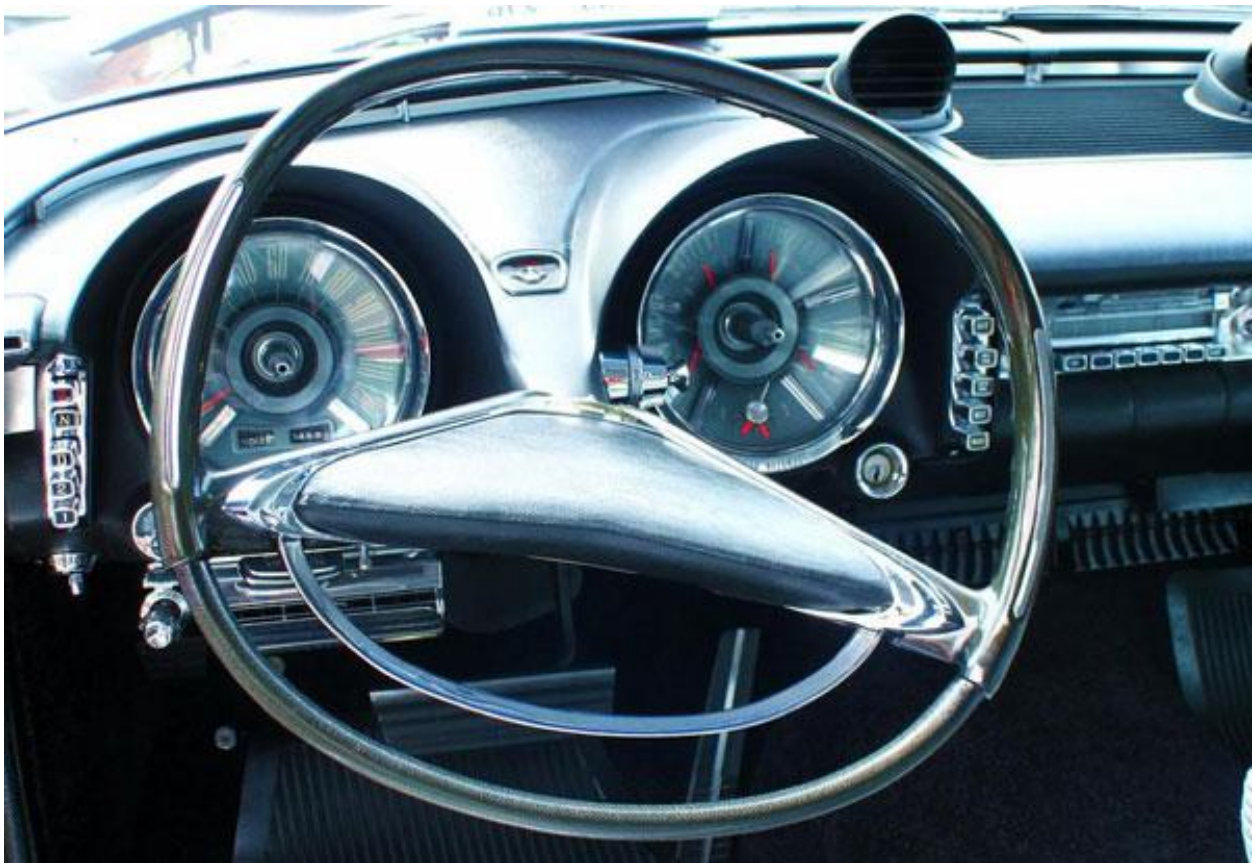
1967 RENAULT 4

1980 RENAULT 4

1989 RENAULT 4

In its early stages, the button shifters were used to help create a more luxurious interior feel and aesthetic.

1963 CHRYSLER IMPERIAL



1961 DODGE

This also had a profound effect to free up the center/floor consoles for comfort and storage opportunities.

1961 CHRYSLER 300 WITH A PUSHBUTTON TRANSMISSION AND A FULL LENGTH CENTER CONSOLE (YES, THOSE ARE ALSO SWIVEL SEATS)

1961 CHRYSLER 300 THE REAR CONSOLE ALSO INTEGRATED ARMREST AND…. ASHTRAYS. IT WAS THE 1960S

Only later it was free up and unique interior space by eliminating the center/floor console, but another technology, the column shifter also achieved this effect without the technical difficulties of mechanical pushbutton actuation.

1967 OLDSMOBILE TORONADO WITH A COLUMN SHIFT AND A TUNNEL FREE FLOOR ENABLED BY ITS FRONT WHEEL DRIVE

1969 CADILLAC ELDORODO WAS THE PLATFORM SISTER-CAR TO THE TORONADO

1966 BUICK RIVIERA

Eventually the transmission shifter came to define the functional and visual aspect of the center/tunnel console area. Designers further integrated it into the instrument panel while simultaneously attempting to package more content in the limited space provided.

1969 BUICK RIVIERA

1967 CHEVY CHEVELLE

1974 ALFA ROMEO SPIDER

1990 TOYOTA SERA

1991 MAZDA COSMO

1991 LEXUS COUPE

2004 VOLVO V70

Also, the possibility of 3 across seating was also explored, though not as successful as the previous generation of vehicles.

2004 FIAT MULTIPLA

2010 HONDA FR-V

The modern era began with the need to integration the UX/HMI controller that continues to this day in the center/floor console area. This has freed up not only the UX/HMI controller

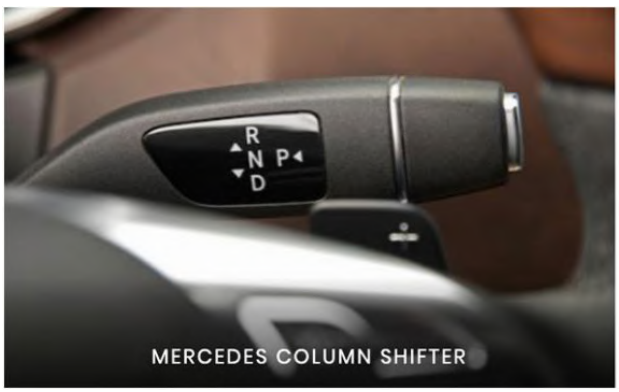
space required for today's vehicles but also cellphone storage and charging areas.

2012 AUDI S4

2010 BMW Z4

2015 AUDI R8

Today, with the electrification of the transmission and parking brake along with the emergence of EVs the column shifter has been reborn as we will also look how this created complex hybrid center/floor/UX/HMI area in today's vehicles.



MERCEDES COLUMN SHIFTER

TESLA COLUMN SHIFTER

General News

Faurecia Xuyang in Display Tech Pact

旭阳集团
XUYANG GROUP

Faurecia recently announced a new joint venture with Xuyang Group, which marks another milestone in the strategic cooperation between Faurecia and Xuyang Group. The two companies make, assemble, and sell automotive display products, as well as relevant after-sales services for OEMs. The joint venture will be consolidated by Faurecia.

In recent years, Faurecia has accelerated its electronic transformation in particular through the creation of its fourth Business Group, Faurecia Clarion Electronics, which has the ambition to become a global leader in cockpit electronics. This latest partnership will strengthen its position in the automotive market in China.

François Tardif, Executive Vice President and President of Faurecia China, declares: “We are pleased to broaden our relationship with Xuyang Group, with whom we already collaborate on Seating and Interiors as well as in R&D along with the University of Jilin. By regrouping our expertise, we will reinforce Faurecia’s Cockpit of the Future strategy and accelerate its deployment for the Chinese market.”

Founded in 1999 and headquartered in Changchun, Xuyang Group has become one of the leading manufacturing companies in Jilin province with four core business units: intelligent cockpit, intelligent manufacturing, high-end equipment and new energy. In 2001 Faurecia and Xuyang Group started working together and over the past years have deepened their strategic cooperation by jointly setting up twelve plants for seating and interiors in Changchun, Tianjin, Foshan, Chongqing and Chengdu.

Recticel Divest Interior Business

Recticel, from Belgium, has entered into a binding agreement in order to bring its automotive interiors business in a joint venture under the control of Munich-based privately owned investment company Admetos.

In addition, Recticel has reached a binding agreement with Greiner AG to divest its 50% participation in the Eurofoam joint venture. The ventures follow the divestment of the Proseat activities last year.

Recticel portfolio is organized around four application areas: Flexible Foams, Insulation, Bedding and Automotive; within automotive it includes interior trim activities and seating solutions.

Chief executive officer, Olivier Chapelle, says, "Both transactions are essential and transformational steps to realize our strategic objectives. Divesting from the automotive business, simplifying our group structure and constituting a solid financial base will enable the execution of our growth strategy."