DVN-I
Automotive Interior

Thu, 11 February 2021 Weekly Newsletter NEWSLETTER #47

Editorial

Tomorrow's Car Interior Is Electronic And Digital

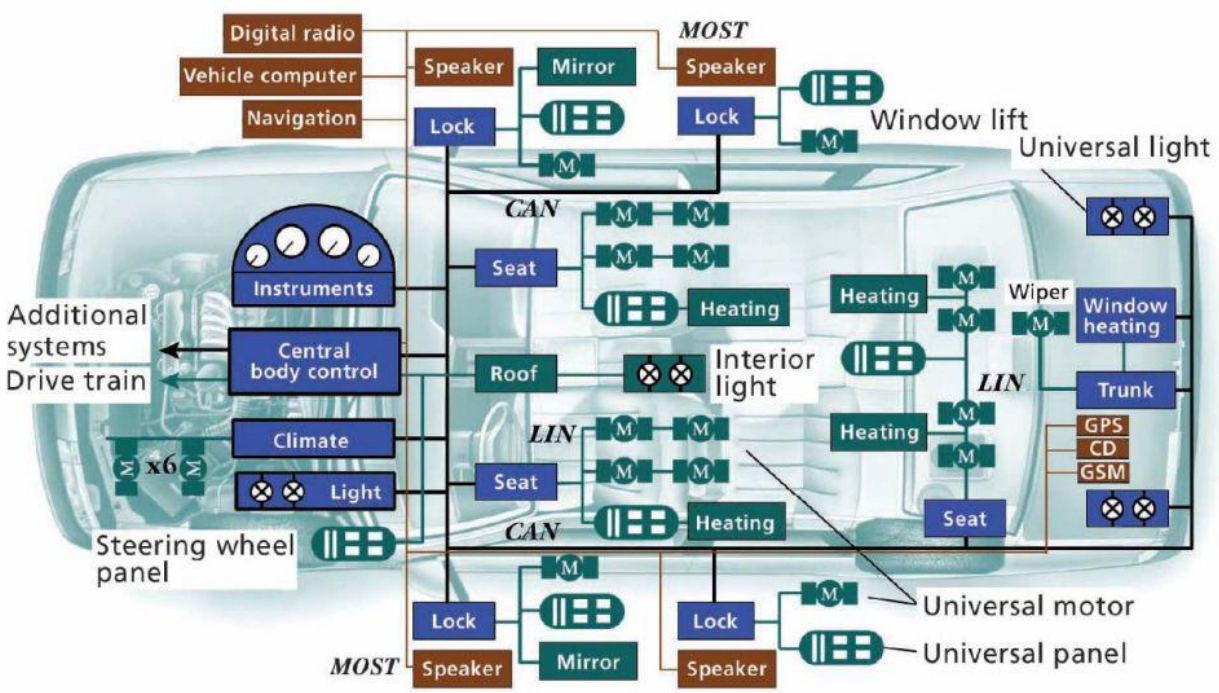


IMAGE: GABRIEL LEEN FOR RESEARCHGATE

Starting now, the DVN-I Newsletter comes to you every week—that's twice as often as before. It's an upgrade to keep DVN Interior subscribers constantly in step with the fast and accelerating pace of relevant innovation and news, despite today's travel constraints imposed by the pandemic. We're here to provide the visibility you need to leverage this market and its burgeoning technologies.

This week's newsletter looks at high speed communication networks (Melexis), single-chip platforms (Vayyar), Cockpit digital platforms and electronic architecture (Qualcomm), vocal assistant platforms (FCA and Alexa), sound systems with algorithmic active noise control, and much more—all of it demonstrating the rising centrality of electronics and software in car interiors.

Analog elements have been on the way out for years, and now the digitalization changeover is galloping along faster than ever. Instead of buttons, switches, levers, knobs, dials, and discrete little readouts, everyone's moving toward a cleaner aesthetic with an

HMI (human-machine interface) of touchscreens, voice and gesture interaction, with increasing driver assistance and monitoring and driving automation for accident-free travel.

All this means a strong shift in technology and skills for existing industry, and newly-open doors for startups as well as established companies who have already developed their technologies in other sectors—consumer electronics, aerospace, or medical, for example—to apply now in the automotive world.

If you're not yet a DVN-I member, take the opportunity to join this new world with us. Subscribe **here**.

Sincerely yours,

Philippe Aumont
General Editor, DVN-Interior

In Depth Interior Technology

Smart Electronic Interior Lighting From Melexis

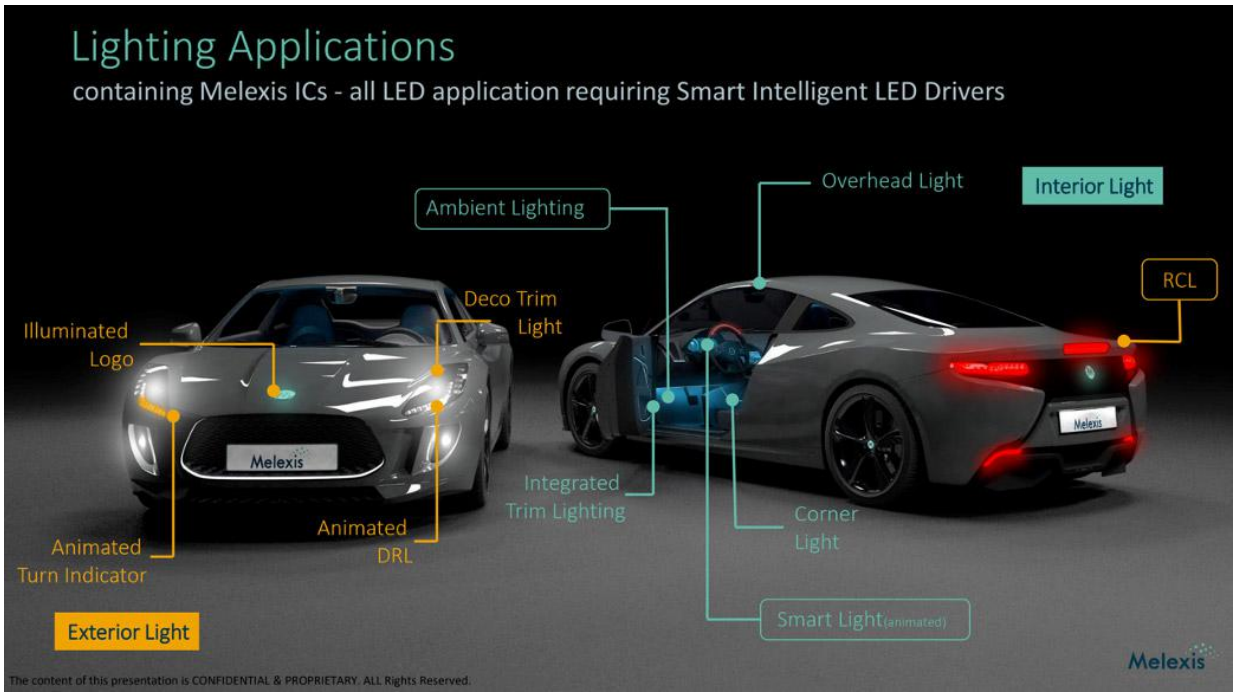


IMAGE: MELEXIS

With unprecedented consumer interest in interior lighting, automakers are accordingly specifying complex, multifunctional, and dynamic lighting in their vehicles.

Whether for styling, for communication, or for both, smart lighting effects bring technical challenges, and present CAN and LIN communication protocols are insufficient to meet them. CAN (Controller Area Network) is a bus that allows components in an automobile to talk to each other seamlessly. LIN (Local Interconnect Network) is a supplement to CAN which allows for further expansion to peripheral devices. Tomorrow's cars are likely to contain too many LEDs, changing color too rapidly and too frequently, for the current CAN and LIN technologies to control efficiently.

The latest CAN protocol, CAN-FD, has sufficient bandwidth, but its bill-of-materials costs are high, and it's too limited as to the maximum number of connected LED drivers. The communication speed and architecture of LIN makes it a feasible solution for slow animations, but not for high-speed ones.

And the number of RGB-LEDs is increasing as well, making system integration even more complex. Automakers don't wish to limit exciting, flashy new features to their high-end cars, and so are looking for high performance at a low cost.

Further challenges include ensuring the necessary flexibility in the car architecture for smart lighting without reprogramming the BCM; managing safety-critical applications; ensuring overall system EMC and ESD robustness in the harsh automotive environment, and fulfilling space requirements to fit smart lighting anywhere and everywhere within the car.

The Melexis solution for smart automotive lighting

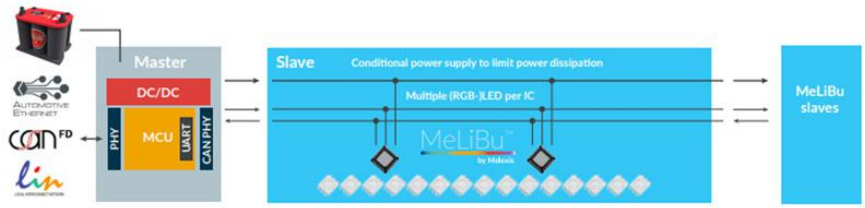


IMAGE: MELEXIS

Melexis is a global supplier of microelectronic semiconductors. They presented a virtual booth at CES this year, and they have developed what they call the Melexis Light Bus, or MeLiBu™. It combines LIN and CAN—the easily usable, extendable protocol and hardware architecture of LIN with the speed and robust communication system of CAN. The result is a fast, robust communication system specifically designed for applications with many LEDs and high levels of animation, complexity, and dynamic range. It's a license-free system based on the existing CAN-FD physical layer and UART communication with self-synchronization. MeLiBu ensures the seamless integration of LED systems from different tier suppliers, and is suitable for safety-critical applications up to ASIL Class B.

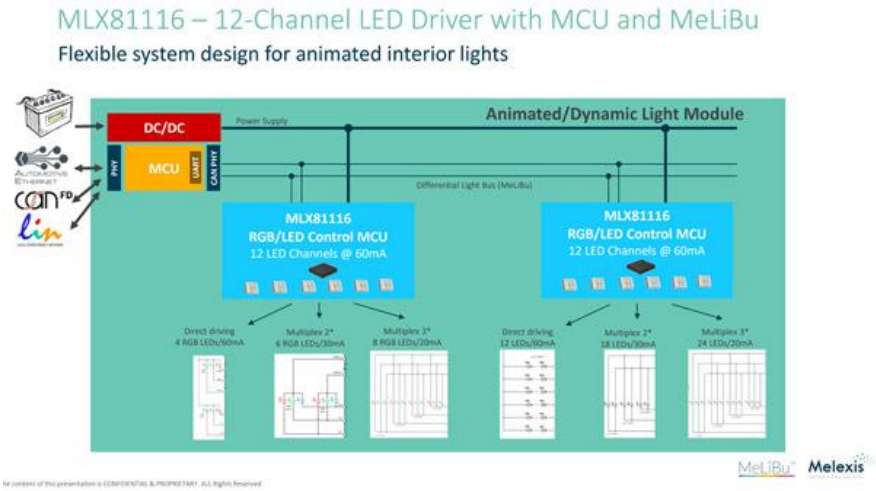
MeLiBu's real differential bus structure facilitates a simple wiring harness and easy synchronization of light animations over the whole car, with no-delay communication among many hundreds of LEDs. It also enables numerous bus segments to be distributed over the full car. MeLiBu offers ESD and EMC robustness, low cost per light node, and is ISO 11898 and ISO 26262 compatible.

MeLiBu is highly suitable for smart lighting applications in the overhead module and instrument pack; interior and exterior decorative lighting, and warning lights. Another key application is the integrated dashboard light for improved communication between car and driver in a similar way to virtual assistant AI technology. Each lighting element can be added into the overall vehicle lighting concept selectively by brand, model, platform, feature, or function. Implementation of any color coding, color changing and blinking sequence is simple and scalable.

The versatile high-speed automotive bus facilitates the car manufacturers towards more complex smart lighting without having to redesign the complete BCM. Multiple automakers have already validated and implemented MeLiBu, and equipped models are already on the road. An **online video** demonstrates some of the lighting effects MeLiBu allows.

Depending on the application and space requirements, Melexis offers single- and multi-channel control modules for the different system solutions.

The MLX81116 is an intelligent automotive LED driver with robust high-speed communication (1-2 MB/sec) between multiple LED drivers to enable high RGB LED count applications for dynamic in-vehicle lighting. All components for LED driving and communication are integral, enabling development of affordable animated lighting systems. The embedded intelligence of the MeLiBu communication system enables highly accurate RGB color mixing as well as support for ASIL B applications.



Some features and benefits of MLX81116 module

- MCU for advanced LED control algorithm, color mixing, and full diagnostics
- LED temperature compensation without need of external components
- Color mixing accuracy of 1% ∂UV
- 16-bit color/intensity control
- Storage of LED calibration data directly in the LED driver
- Low side programmable calibrated current sources for LED control
- Direct and multiplexed LED drive without need of external components
- LEDs fully diagnosable (short circuit, broken wire, threshold monitor)
- Real-time updating of >250 RGB LEDs without delay

A variety of additional MeLiBu LED driver products are soon to be released.

Interior News

Interior Monitoring System on Single Chip Platform

INTERIOR NEWS

Israeli semiconductor specialist Vayyar Imaging has introduced a 4D imaging platform for monitoring vehicle interiors. The radar-based single-chip system reduces complexity compared to existing solutions, lowers costs, and offers more application options.

The Vayyar platform is designed primarily to ensure safety of vehicle occupants. It can monitor that all passengers are wearing their seatbelts correctly, and help prevent child-left-in-hot-car incidents. Target groups are vehicle manufacturers and tier-1 suppliers.

As part of the global effort to increase safety in cars, EuroNCAP is introducing stricter assessment criteria for all protocols from 2023. Child presence detection will earn up to four points in the Euro NCAP rating, while the existing requirement for front and rear seatbelt reminders will become a prerequisite for achieving a further three points for occupant status. Thanks to Vayyar's solution, vehicles can be awarded these important seven safety points all in one go.

To make it affordable, Vayyar has designed their single-chip platform such that it can implement numerous functions without much cost increase. The ready-to-use combination solution is based on a single RoC (radar on chip). This allows for both presence detection of children and an improved seat belt reminder. The solution replaces several existing sensors in the vehicle, covers the entire passenger compartment, and detects and classifies all occupants, so detecting the presence of children with high precision. It works effectively in all lighting conditions due to the application of the radar principle, without the need for a clear line of sight, and can even detect a baby sleeping under a blanket in a car seat or a child in the footwell. As it does not include cameras, the sensor also preserves user privacy.

Qualcomm Fourth-Gen Cockpit Platform

INTERIOR NEWS

IMAGE: QUALCOMM TECHNOLOGIES

Although the third-generation systems have not yet been integrated into OEM production vehicles, Qualcomm Technologies has released details of their fourth-generation Snapdragon automotive cockpit platform.

According to Qualcomm, the digital automotive cockpit is evolving into a zonal E/E (electronic/electrical) computing architecture driven by complexity, cost, and the need for centralized computing consolidation. The fourth-generation cockpit platforms will serve as a central hub for high-performance computing, computer vision, AI (artificial intelligence), and multi-sensor processing with a flexible software configuration to ensure computation, performance, and power functional safety requirements for this zone.

The platforms are fully scalable and support all three automotive Snapdragon performance levels: Performance, Premiere, and Paramount for entry-level, midrange, and supercomputing platforms. Using 5-nm processing technology, Qualcomm will offer high-performing SoC (systems-on-chip) that meet the user experience demands of the next-generation cockpit with low power consumption and car-to-cloud communications to enable OTA (over-the-air) updates throughout the life of the vehicle.

The platforms also offer flexibility of software, as well as real-time support for multiple operating systems in hypervisor and container software configurations. This supports multiple ECUs and domain consolidation, including cluster and cockpit, AR-HUDs (augmented reality head-up displays), infotainment, rear seat displays, mirror replacement screens, and in-cabin monitoring services. It also provides video processing capabilities to integrate drive recording and monitoring functions. The same software architecture and framework is used at all levels, to reduce development complexity, commercialization time, and maintenance costs for automakers.

Qualcomm Senor VP Nakul Duggal says "The digital cockpit has become synonymous with automakers' intension to deliver a unique, differentiated and branded experience to their customers. With our fourth-generation Snapdragon Automotive Cockpit platforms, we aim to reinvent driver, passenger and rear seat entertainment and to regard the automakers' shift to zonal computing architectures with the fusion of computing, performance, AI and safety.”

Qualcomm plans to begin production of their new digital cockpit platforms in 2022, while automakers could start development in the second quarter of this year.

SAFER Occupant Protection To The Next Level

INTERIOR NEWS

New Mobility and its new occupant use cases generate new safety and occupant protection challenges in the vehicle. The SAFER project has been set up to address the issue, under Volvo Cars' lead with partners including Autoliv and Academicals.

The target of the project is to create new knowledge and develop assessment tools and methods for real-world shoulder- and lap-belt interaction for car passengers aged 4 and older, to enhance crash protection of the heterogenous population in a variety of sitting postures, seat positions, and seating configurations. It will take into account self-selected sitting postures and effects, and a variety of new postures and seat positions. Belt use, its position and function during a collision for car passengers in different sizes and seating positions are the main scope in this project. Child seating will be a particular focus point, because children typically don’t sit like crash test dummies.

The research will be carried out through observational studies and tests of how different passengers sit in cars, development and use of virtual human body models in different sizes, ages, and genders, as well as international cooperation and close work with industrial applications.

The project started last November and will continue until October 2023.

NIO EC6 Ultrasuede Luxury Interior

INTERIOR NEWS

IMAGE: TORAY

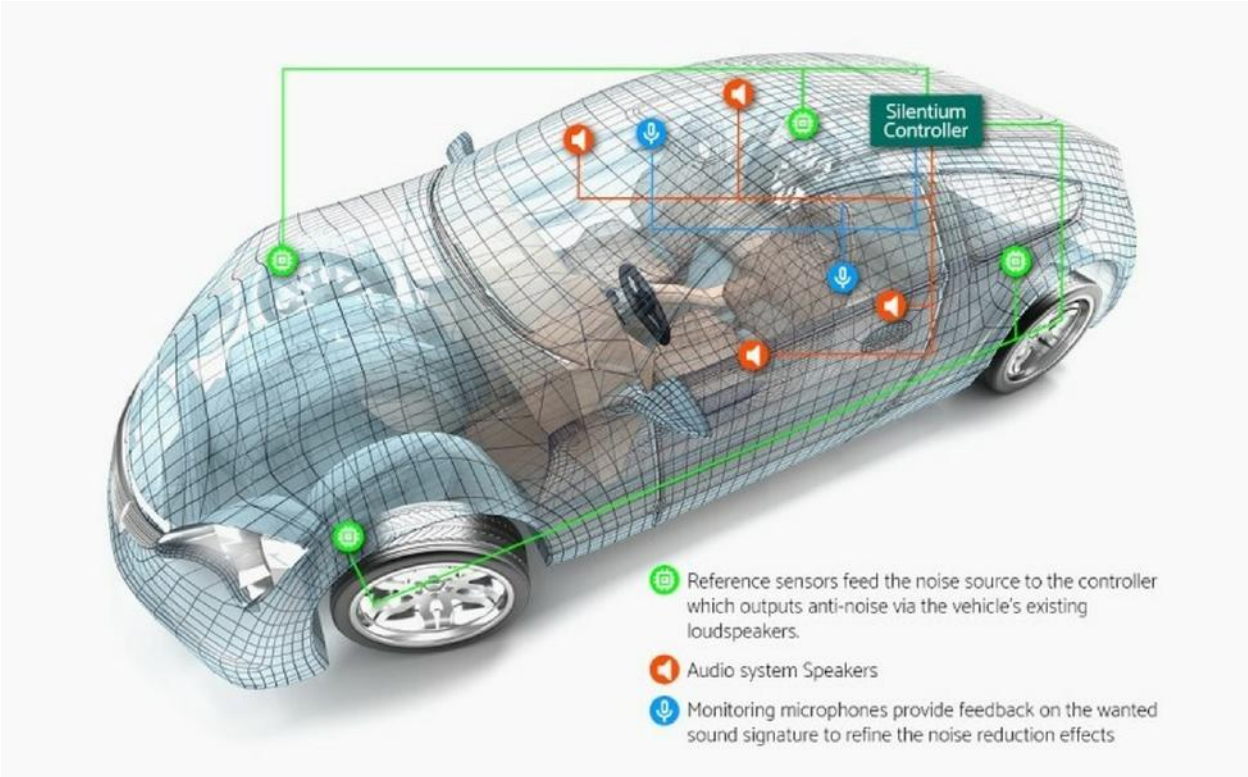
Ultrasuede™ is the trade name for a synthetic ultra-microfiber fabric invented in 1970 by Toray from Japan. It is often described as an artificial substitute for suede leather, resistant to stains and discoloration. It is 65 to 80 per cent Polyester, and 20 to 35 per cent non-fibrous polyurethane, depending on the grade. It includes recycled and plant-based polymers.

The Ultrasuede brand has cooperated with Chinese EV makers Nio on their EC6 electric SUV, launched at the 2020 Chengdu Auto Show, and selling now. Ultrasuede material is used on the ceiling, pillars, and sunvisors, resulting in an enhanced level of detail and refinement. The ultra-fine non-woven fabric and its suede texture creates a nice touch, and keeping a perfect color match with the rest of the interior and its other materials. The panoramic roof has been designed to maximize natural light and roominess perception in the cabin. Ultrasuede almost runs into the glass, making the whole interior looks purer.

A two-tone layered dash is finished in leather and a microcloud material said to offer "downlike blissful comfort"), with several lines of graphite chrome also running from door to door. The "Himalayan brown" leather continues on the center console, seats and doors. All these surfaces are easily reachable for occupants, so commonly subject to touch and feel.

Silentium ARNC Commercialized by Hyundai Mobis

INTERIOR NEWS



Israel-based Silentium is an innovator in high-performance active noise cancellation. Hyundai Mobis is the component and systems-and-services arm of the Hyundai Group; they do cockpits, seats, air bags, multimedia, lights, and many others components.

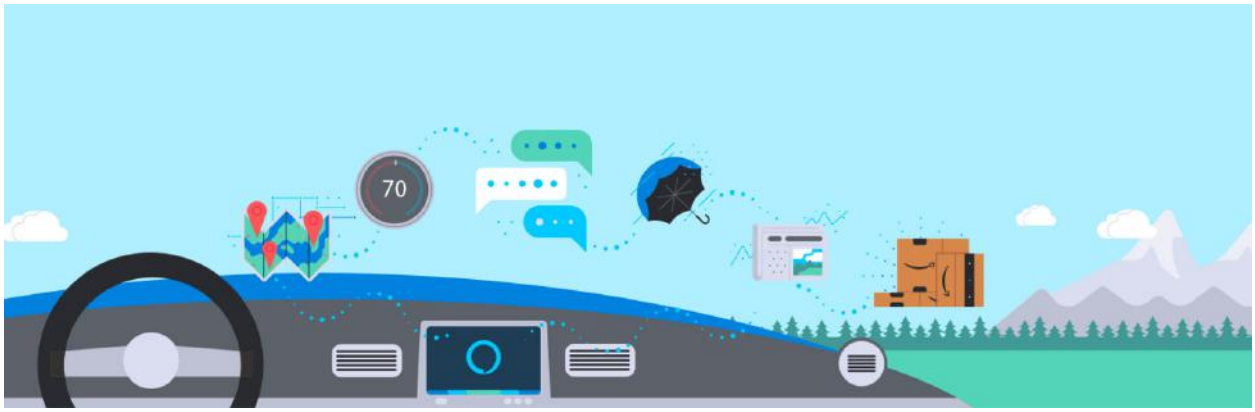
Jaguar Land Rover was the first car maker to announce integration of Silentium's ARNC (Active Road Noise Cancellation) in three new vehicles last Ocrober. Having signed an MoU last year, Silentium and Hyundai Mobis are now collaborating on a global vehicle production program for an unnamed vehicle brand.

ARNC eliminates up to 90% of a sound, no matter if it's rolling noise, engine noise, aerodynamic noise, buzz, squeak, or rattle. It works by dint of algorithms that adaptively follow the changes in the noise spectrum, a highly effective solution for low and medium-frequency noise. Up to 6 accelerometers on a vehicle's chassis monitor unwanted road noise and send a signal to an onboard control unit, which plays an equivalent anti-noise signal through the vehicle's speaker system. The pressure waves from the noise and the anti-noise reach occupants' eardrums at exactly the same time and cancel each other out.

Solutions can be configured for deployment at the source of the noise or by creating personal PSBs (private sound bubbles), which the company calls Quiet Bubbles™. A single PSB system uses an array of loudspeakers deployed in the environment and an advanced signal processing method. PSB results in focused sound transmission towards the desired zone, while minimizing the sound intensity elsewhere. Applying several PSBs in a homogeneous environment such as car results in a respective number of sound zones with independent audio content. Each listener can enjoy their own choice of music.

FCA First With Alexa Virtual Assistant

INTERIOR NEWS



Fiat Chrysler is the first Alexa Custom Assistant customer, and they've already begun the planning process for the development of an FCA-branded intelligent in-car assistant. The company’s work builds on existing Alexa integrations in their vehicles around the world.

Amazon's Alexa Custom Assistant is a scalable platform to create intelligent assistants tailored to a brand and specific needs. It is built directly on Alexa technology, based on voice AI technology, to be customized with unique wake words, voices, skills, and capabilities. It is based on constantly-improving spoken-language understanding, intent routing, and response orchestration to provide a natural, intelligent, conversational interface. It reduces the cost and complexity of adding an in-car virtual assistant.

FCA will use the Alexa technology in their Uconnect system, a connected-vehicle platform built into all FCA vehicles for advanced connectivity, entertainment, and communication features. To create natural voice responses, each brand can choose their own unique voice.

The Alexa system cooperates with the automaker platform in a way that if you ask to open a window or change the HVAC settings, the automaker platform will do, and if you ask for a gas station or an itinerary, that request will be routed by Alexa to Amazon and the rest of the net.

The Design Lounge

Steering Yokes? Part 2

THE DESIGN LOUNGE

Following up from last week's Design Lounge, let us dive into how Ferrari let the industry and evolved the steering wheels usage and function. From Formula 1 motorsports into their street car line up with the most recent evolution being the 2021 Roma.

2021 Ferrari Roma is Ferraris latest iteration of their steering wheel design that now incorporates ‘black-out’ switches and a fully digital cluster display. Though difficult to realize unless you are sitting behind the wheel, Ferrari has eliminated the use of traditional stalks. All the switches are incorporated into the steering wheel using a mix of rocker switches, rotary dials and capacitive switching with backlit icons.

Ferrari is well known to lead with their motorsport efforts, specifically Formula 1 racing. It is here where we can see the steering wheels evolution form the 1980s to today.

Pointer gauges and the traditional stick shift dominate the cockpit but introduce chassis set-up controls on the drivers left side and one toggle switch onto the steering wheel.

The wheel is removed by pulling a lever behind the wheel, allowing cockpit entry and exit.

The introduction of an LCD digital display and now two steering wheel switches contrast greatly with the wooden shifter to the drivers right.

The wheel is still removed by pulling a lever behind the wheel, allowing cockpit entry and exit.

Although the steering wheel is still round in shape, it only used two integrated switches. The complexity for the driver can be seen with the variety of rotating and pushbutton switches just behind the wheel. Note that reverse and neutral are push-buttons located on the dash.

This was the introduction of ‘paddle shifters’ eliminating the shift lever previously used in motorsports forever.

With the integration of ‘paddle shift’ levers behind the wheel opened the door to have all driver information and adjustment functions now integrated into the steering wheel.

A LCD display, neutral and reverse functions in addition to LED shift lights onto the wheel itself required by the use of the latest Formula 1 technologies and the electronic adjustment it necessitates.

The wheel is removed by pulling a lever behind the wheel, allowing cockpit entry and exit.

Evolution into the modern age of Formula 1 racing has seen the reduction of the traditional display.

Although still attached to the steering wheel, its main use if more of a warning function.

Notice that this the first introduction of a steering ‘yoke’ type design that flattens the top of the wheel.

The further reduction of the Formula 1 steering wheel/cockpit/display can be seen above.

The bottom of the steering wheel is also flattened now, create a ‘yoke’ instead of a wheel form and function.

Ferraris approach in applying their Formula 1 racecar features to their road cars was also evolutionary. As seen above, traditional gauges are used but the steering wheel now incorporates the engine start button, a rotary ‘drive mode’, horn switches in the ‘thumb grips’ of the steering wheel and a flattened wheel top with a stripe indication the on-center position.

This was to be Ferrari last usage of traditional stalks also. And the introduction of a ‘paddle shifter’ instead of the traditional Ferrari gated shift lever.

Their evolution now eliminated the traditional stalk by incorporating thumb turn signal switches along with the wiper and ‘flash to pass’ light functionality.

Notice that the ‘roundness’ of the wheel has also further evolved. Harshly cut at the bottom of the wheel now while also using a flattened upper.

A mix of digital and analog displays can also be seen through the wheel.

More information and functionality in incorporated with the engine ‘shift-light’ at the top of the steering wheel. Also, the use of various switch types including two rotary type

switches. One for the driving modes and another for intermittent wiper functions can be seen on the right-hand side.

The turn signal switch type has also evolved from a simple push button to a toggle type rocker switch that now protrudes slightly from the steering wheel spokes.

Notice also the addition of ‘hands free’ and voice activation switches under the horn pad that has been relocated from the outer rim to a more traditional center pad.

The latest Ferrari Roma expanded not only the switch types that are used, but also the interface to the UX/HMI and large full screen cluster display.

For next week’s Design Lounge we will go into a detailed overview of the functional interaction of the steering wheel to the UX/HMI that includes the types of switches used in the design.

News Mobility

_Car interiors Unplugged

NEWS MOBILITY

5. ‘Sleepless in Detroit’ II

(this story is part of an ongoing series introducing automotive interiors as an evolution of our habitat)

“Anyone who can handle a needle convincingly can make us see a thread which is not there” (Art & Illusion, E.H. Gombrich).

Since 2008, the dynamism of global economy is on hold and new tech applications, boosted by financialization often found prosperous grounds in simplistic virtual products hitting instantly the screens and the market. New screen-based inventions repeatedly suited the upcoming business model by lack of reaction time in otherwise knowledgeable supplier networks. ‘Couch products’ are derivate of a cultural change inside corporations. Passing around papers or shuffling ions in digital space to invent new forms of financing, has shifted R&D resources, in times altering OEMs into hedge funds. Utopian economic models gave birth to products as broad as pointless on the long run, difficult to improve upon due to limited or inexistent visionary approach, that only science-fiction could entertain and render desirable. Besides the huge poetic deficit, we could perhaps revisit, put more emotional value and creative energy in our future developments and find again the glamour of making.

Marketing new soft-products on present-day hardware, the part that takes the longest to develop alone, does not bring innovation. Change always meant progress. The feeling

however of an endless 10cade transition that brings constantly nowhere, feels more like a slow burning crisis. In this struggle to strike a balance, make vs buy, optimizing for predictability vs adjusting for uncertainty, we experienced moments of disorder; the syndrome of a secluded broadcaster that is not anymore centered in real life practices.

During this everlasting transformation, we should rather avoid “prisoner’s dilemmas” sitting in our car interiors amplifying all evils of technology inefficiency. Given the extended economic austerity and the lack of aggregate demand, there should be a way, a green way, to make our economy resilient based on real values. We objectively need to do better with what we have and without doubt, we have enough to be eclectic and knowledgeable about products put in the market. Automobile is not about invention, but about time spent to develop what was an expensive curiosity into a practical convenience by deeply restructuring our social model. It might be that this is what will embody technological reforms instead of a blind pile-up of digital tools developed to serve our average self.

We are about to discover what car interiors can do more and better. What we learned over the past 100 years of mobility business is concentrated in only one representation, the automobile. Now, disassembled into its million technologic facets the forecasted amount of virtual is such that mobility wishes to be redefined. Innovation is subject to the means and outfits we use. Anything virtual has to be virtuous.

The process enables making and braking infinite times with no immediate consequences; if driven by wider vision, then this is a match made in heaven!

_to be continued…

_____*INDUSTRIOUS_*

Arrival's Delivery Van: Disruptive Design and Production

NEWS MOBILITY

Arrival is a London-based technology company developing electric vehicles, primarily lightweight commercial vehicles. Its capital is supported by investors including Hyundai, Kia, UPS, and Blackrock.

Their first product is a bus / delivery van, in the same segment as a 2-ton Ford Transit. Interior technology is strongly driver-centric, with e-mirrors and a well-developed ADAS package, great visibility and ergonomics. It has been designed around user experience within UPS operations. So, for example, if a driver is holding a box, they can use their elbow or facial recognition to open a door.

Arrival's intent is to be best in class in terms of weight and total cost of ownership, with a purchase price comparable to conventional vans. They're working toward that goal with a unique construction and production model. The body is polypropylene. It comes to the warehouse as a fabric, then is molded (with integral color) into panels lighter and more durable than steel. That takes out the paint shop and metal stamping, removing the two biggest capital expenditures. Power cells come in from suppliers, and are built into battery modules on site. All components are plugged into a skateboard chassis. They use micro factories that can be deployed in six months with reduced investment.

With no stamping, welding, or painting, the number of operations is reduced; everything is organized in cells, each one having a set of robots performing a particular function. The cell is like a product that can be optimized over time, and not a static line that operates at one speed. It supports a model highly customizable to create vehicles optimized for specific markets, easily upgradable after first sale. Low investment and high automation help local production, with shorter, cheaper, and cleaner distribution channels.

The bus goes into production this year; the van next year.

General News

GM-Cruise-MS Team for Autonomous Vehicles

GENERAL NEWS

Cruise and GM have entered a long-term strategic relationship with Microsoft to accelerate the commercialization of self-driving vehicles. The companies will bring together their software and hardware engineering excellence, cloud computing capabilities, manufacturing expertise, and partner ecosystem to to create safer, cleaner, more accessible transportation.

To unlock the potential of cloud computing for self-driving vehicles, Cruise will leverage Azure, Microsoft's cloud and edge computing platform, to commercialize autonomous vehicle solutions at scale. Microsoft, as Cruise's preferred cloud provider, will apply Cruise's deep industry expertise to enhance customer-driven product innovation and serve transportation companies through continued investment in Azure.

Microsoft will join GM, Honda, and institutional investors in a combined new equity investment of more than $2bn in Cruise, bringing the post-money valuation of Cruise to $30bn.

Microsoft CEO Satya Nadella says: "As Cruise and GM's preferred cloud, we will apply the power of Azure to help them scale and make autonomous transportation mainstream." GM Chairman and CEO Mary Barra, for her part, says "Microsoft will help us accelerate the commercialization of Cruise's all-electric, self-driving vehicles and help GM realize even more benefits from cloud computing as we launch 30 new electric vehicles globally by 2025 and create new businesses and services to drive growth."

Ford, Google Team Up To Power Infotainement

GENERAL NEWS

Ford is the latest automaker to turn their vehicle operating systems over to Google. Ford says they will use Google's Android to power the infotainment systems in millions of cars starting in 2023. That means Google's voice-activated Assistant, Google Maps, and other automotive-approved Android apps will be available in Ford's cars without requiring the use of an Android smartphone.

The deep integration of Android will allow drivers and passengers to use Google Assistant to change things like comfort settings, and it will also enable OTA updates that can add new features or address some kinds of maintenance issues. Ford's system will still be compatible with Apple CarPlay, and Ford will continue to offer Amazon's Alexa as an option as well.

Ford hasn't said which vehicles will get the Android operating system first, only that vehicles under the Ford and Lincoln brands will have it. The Google-integrated vehicles will be available around the world, except in China, where Google is not available by government decree.

Ford will build a new version of their Sync operating system on top of the Android-powered software, instead of the current Blackberry QNX. In addition, Ford is signing a six-year partnership to use Google as the preferred cloud provider for their connected vehicle services. And Ford and Google will create a new group called Team Upshift, comprising employees from both companies and tasked with finding other areas for innovation.