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Editorial

Interior Lighting Is The New UX – DesignLED Interview

This week, we bring you an interview with Faurecia DesignLED's CEO and CTO. It's all about interior lighting and what automakers want to orchestrate inside the vehicle. Software-defined vehicles focus on user interface and experience; how light is communicated to the occupants in-context of weather conditions, driver demographics, and other suchlike. Display and light, how information is communicated, all should be choreographed for the better. Read the interview to learn more about Faurecia's interior lighting strategy.

Coffee Corner features Athanassios Tubidis' musings on LED interior lighting, as analogous to music.

Both perspectives reflect the huge potential of interior lighting as it evolves from static to dynamic. The DVN Interior Workshop in Köln this coming 25-26 April includes an important interior lighting session, where top speakers from the likes of Volvo; Osram; Technoteam, and more will address this dynamic lighting perspective. Don't miss it—**register here**; I'm looking forward to meeting you all there!

Sincerely yours,

Philippe Aumont
General Editor, DVN-Interior

In Depth Interior Technology

## DVN-I Interview: DesignLED · 'Lighting is the New UX'

L-R: P.AUMONT, DVN; S. BAIN AND DR. J GOURLAY, FAURECIA DESIGNLED (DVN IMAGE)

Today we bring you DVN Interior General Editor Philippe Aumont's interview with Dr. James Gourlay, Faurecia DesignLED's technical director, and the company's general manager and director, Stuart Bain.

DVN: Where did DesignLED come from? How was it created?

Stuart Bain: Coming from an academic and OLED optics background, Dr. James Gourlay had an idea 20 years ago: is it possible to reach and beat the homogeneity and illumination performance of OLEDs, using low-cost commodity inorganic LEDs?

That's the journey DesignLED have been on since then. The technology itself is simply brilliant: a super-slim flexible light guiding system with printed optics in different layers, manipulating light to optimise system thickness; LED count; cost, and—critically as we move to EVs—power.
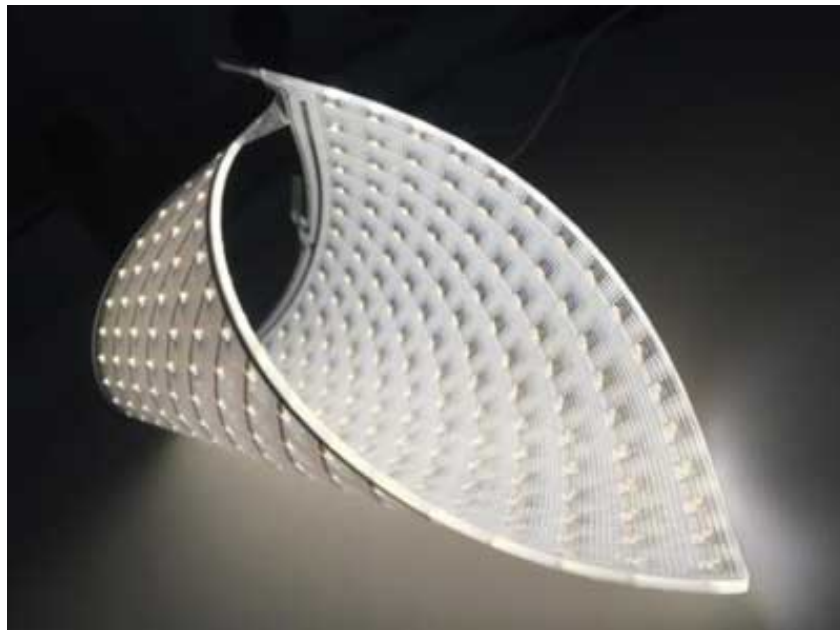
DESIGNLED'S THIN, FLEXIBLE LED LIGHT TILE (FAURECIA IMAGES IN THIS ARTICLE)

I joined James as CEO some years later to help him realize maximum market potential. From day one, it's been a chemistry experiment that has worked very well. Business is usually about chemistry (and mathematics) and the chemistry in our team is extremely strong where we complement each other very well at a professional and personal level.

Initially the focus was on large area, low-cost LED backlighting for LCD TVs, but soon [we] migrated to architectural and consumer lighting with significant help from investors Siemens; Osram, and Ikea. Osram and Siemens provided expertise and validation of the technology, but Ikea brought the technology to mass production. The biggest buzz you can have as a startup is seeing your product in the market—something James and I will never forget as several members of the audience in a Japanese Automotive automaker proudly told us they already had our technology in their homes when we presented to them in 2019.

DVN: Stuart, what was your background?

Stuart Bain: The global electronics and printing industries—quite helpful if your new business is all about printed electronics! My background originated in marketing, then onto international strategy and general management. I have been lucky to develop and lead some fantastic teams having lived and worked in Eastern Europe; China; Mexico; the US, and of course my native Scotland. My great passions are my country; my family; business; and people, although perhaps not in that order.

When my last business was sold, I decided to go back to basics and work with small startups with big potential and that's when I met James. The big observation I had was that most startups at that time had scientists or technical people or academics running them, and with respect to all (especially James) they are perhaps not the best at leading and growing high potential businesses.

DVN：How are you working with your customers?

Technology itself can be quite boring and difficult to explain, so what we do is not just invent great technology but visualise it in a way that is meaningful to the customer and show them the problems it can solve; the use cases, and—critically—the value it can deliver.

Part of our core strength is how we present technology graphically or virtually, often as a physical demonstrator to give the customer something to play with. We need to put something on the table, very tactile, very visual. It's not boring to talk about technology when you can see and touch it. Once we have identified the need, we take customers on a journey through a feasibility study, then a proof of concept and on to physical demonstrators tailored to their requirements, even if we have to invent a new way of doing things to solve complex optical challenges. We do this from our state-of-the-art design, development, and rapid prototyping center near Edinburgh where the team are predominantly optical and product design and development engineers

'QUADRO' LARGE-AREA MATRIX ADDRESSABLE RGB BACKLIGHTING

DVN: What kind of customers do you serve? Automakers? tier-1s?

DesignLED: Since acquisition by Faurecia in 2021, they are predominantly automakers. On the acquisition, we came to a point where the automakers were becoming a little bit frustrated that we couldn't take them to the next step in the journey. We raised their excitement levels, we solved their complex problems, and they loved the technology, but we didn't have the credibility or the resources to move to serial production.

The strategic question was, do we continue to be an innovation/design/prototype house? Or do we partner or be acquired by somebody who can solve this problem? The obvious answer to scale the business and realise its full potential was that we had to be acquired. In 2020, just a month or so before the Covid pandemic really hit, we initiated an M&A process to find the perfect acquirer.

DVN: Where do you sit within the Forvia organization?

designLED：We are part of the Faurecia HMI & Display Product Line which sits in Forvia's Electronics business group. Unbelievably, we have gone from 15 people in Scotland to being part of the world's № 7 tier-1 supplier in the world with 150,000 new colleagues.

DVN: How do you relate interior light with performance factors such as safety and comfort?

DesignLED: The first lighting system inside a car was functional—courtesy lighting, for safety and convenience. It evolved to create ambience and mood, perhaps highlighting design features or reflecting basic personal preference. Recently, though, there are two main drivers: UX is now a key factor in consumer decision making; light is the easiest way to allow the user to quickly and simply change their personal environment. Secondly: cognitive overload—bigger displays; too much information; too much distraction, and too much opportunity for accident. By mixing high-resolution displays and low-resolution lighting, data and information can split into critical and non-critical; active or passive; and central or peripheral, even subliminal communication. For me these two topics are the most exciting and the ones we are working hardest to deliver as they will sell more cars and prevent more accidents.

From a design point of view, we now talk about 'design on demand'. In the past, the IP designer would control what information we see; where, and when. Content design is moving further away from automaker towards the user. In the future, the display and even the interior may be a blank canvas with the end user designing the lighting schemes and the content they experience when they want to see it. Exciting for hardware and software!

DVN: That's what already possible on a smart phone, are you sure that users use this capability?

DesignLED: Yes, I am convinced. We live in a time of instant information, and for me the key is around simplifying the user interface…making it easy. The one thing that you'll find about your smart phone is that it's intuitive—we need to work harder as an industry on the HMI element to simplify and to declutter, to make it a little bit more intuitive than it is today

DVN: What do you think about open innovation?

DesignLED: A necessity. However, we see more of a collaboration on specific topics rather than open innovation. automakers are coming to us with a problem or an opportunity that they don't know how to solve. We use our knowledge; skills, and experience to solve that problem in a mode of co-innovation. We also take part in wider topics such as being part of the ISELED alliance, and are participants in funded programs most recently looking at the topic of integrating sensors into light and display systems for safety and wellbeing.

DVN: What is your Strength?

DesignLED: The strength of our organization is the depth of knowledge, where the value of the team is greater than the sum of the individuals. Technically, it's all about optics, and how you manipulate light for different scenarios and different applications—here we are world class, and that's why we are selected by customers for the most challenging projects. Add to that the critical mass of Forvia, and it is frightening what we can achieve!

DVN: What is your main innovative direction?

DesignLED: We are led by the Forvia mission statement—which, in over 30 years in business, is the best I have ever seen—and it very clearly defines our direction: *to pioneer technology for mobility experiences that matter to people.* In practice for us that means to redefine the immersive experience for interior lighting and display to enrich people's lives and help the automaker sell more cars!

DVN: What can you tell us about your development process?

DesignLED: Time to market is becoming a key factor in the industry today alongside cost of development. What was previously measured in years is now measured in months. So key to us is to engage early; be fast; be right the first time, and be flexible. From the ideation phase through to production readiness, we iterate quickly and as we use a cast (not molded) process, our development costs are quite minimal.

DVN: How is lighting really enhancing user experience?

DesignLED: Lighting can be adapted to the user scenario, to the context. What is the purpose of the journey? Who are the occupants? Is it a business discussion, or is it a romantic evening with your partner? How do you want to use valuable time, especially in autonomous driving? Light also opens

more doors for a more immersive engagement—gaming, virtual reality; the opportunities are tending to infinity.

DVN: Can you describe a specific project for us?

designLED: We worked on a project recently that was all about using sensors to monitor and identify stress and then use light to monitor and maintain alertness of the driver. Using our human-centric knowledge from consumer and architectural lighting, we studied the influence on circadian rhythms where there is lots of interesting work being done. Given our technology is a PCB-based lighting platform, it is quite nice to visualize as a source of collecting data and then using that data to change the environment using light.

DVN: You're talking about interior lighting much more intricate and complex than in the past. How does cost figure in?

DesignLED: Cars are more and more loaded with new features that cost money. Automakers must be sure the user values these features; that's probably the biggest challenge the industry is facing. If it is just feature overload, nobody will pay. If it adds value by solving a problem or creating enhanced experience, people will pay. We must remember that we are in an industry that exists to sell cars, so if the lighting solves a problem or adds value, then the relative cost differences between technologies are not so wide.

DVN: It is said that 'light is the new chrome'. Do you agree?

DesignLED: This claim was maybe used five years ago and at that time, I think it was true. Now, though, we've moved on from that. Chrome was purely decorative; light has a far greater role to play than just decoration. Safety is paramount, and more recent discussions also turn to light for wellbeing. Can light help to feel better and have a higher mood; stay awake longer, enjoy the journey more? So now if I had to paraphrase, I'd say *human-centric lighting is the new UX*.

DVN: It's also said that display specs and dimensions have replaced engine figures like cylinder count and horsepower rating; what do you think?

DesignLED: We are indeed the iPad generation. But for me, the bigger the display is (or the more data displayed), the bigger the opportunity for disaster. We like to work on the basis of information when you need it from hidden sources including the use of peripheral or subliminal display using low resolution, perhaps binary (red bad / green good) type communication for less detailed information.

DVN: Software-defined car: what does it mean for you?

DesignLED: We believe the user might want to orchestrate or choreograph what happens inside and possibly also outside the vehicle from a lighting and display point of view. That means there needs to be an intuitive user interface and valuable content, and both need to be facilitated by software The customer must have the opportunity to use default settings simply and quickly; use pre-loaded options, or even be able to download personal content like favorite football team colors.

Then we have the delivery of Mr. Hasselhoff's vision of the future from the 1970's and the digital assistant (the KITT car from Knight Rider). More and more we are asked not just for the hardware to facilitate such capabilities, but also the software.

On another level, our focus is on working with software colleagues to enhance display images for safety and comfort. Driver age and demographics; eyesight, and weather conditions are huge variables that all impact image quality on displays, and we are working hard to develop hardware and software on this topic—[with several products] already in the market on vehicles today.

Critically, the value the HMI and Display team brings to this particular topic is having the knowledge and expertise to create the technical solutions to what are often human challenges that can then be translated into software.

DVN: What about sustainability in your products?

DesignLED: Along with UX; cost; and performance, this is one of the fastest-growing needs to be met for the buyer. At a corporate level, Forvia is right at the forefront of sustainability in the industry. At a technology level, we can really impact power consumption. There is a conflict internally at the customer today in marketing teams all over the world: [they want] more light; bigger visual impact, and greater UX, but less power and more sustainability. Combining the efficiency of our optically optimized system to use less LEDs with a greater understanding—for example of optical transmission of various substrates and A surfaces—means we can deliver on both fronts.

Second, it is simplifying the lighting system by using less components and packaging which our technology again facilitates.

I believe there may also be ways to significantly impact sustainability in the manufacturing and supply chain. There's an argument to suggest that installing platform light and display capabilities across multiple models then activating functionality over the air on demand would allow standardization of component and then manufacturing processes to minimize costs; increase efficiency, and decrease waste. This is an area I am personally very keen to explore, as it has sustainability and cost benefits.

DVN: When you think of the future, what do you imagine?

DesignLED: The future we see has more data, but less information displayed at any one moment in time. More light but the lowest possible power and cost and as inobtrusive as possible. Light for comfort; safety; wellbeing, and fun. A need to facilitate more personalization for the user over the emotional and practical use of the interior space at point and time of use. A mobility experience that adds real or perceived value with the simplest and most intuitive human machine interface. And obviously, a future facilitated by some outstanding Scottish lighting technology!

Interior News

NHK Spring Seat Minimizes Motion Sickness

NHK SPRING SEAT WITH RETRACTABLE OCCIPITAL BONE SUPPORT AT THE HEADREST (NHK SPRING IMAGE)

People who suffer from car sickness may grimmace at the prospect of long rides where the autonomous vehicle does most of the driving. This year, about 120,000 vehicles capable of at least L^3 autonomy will be made in Japan alone, according to the Fuji Chimera Research Institute, and that number is expected to climb to 10.13 million vehicles by 2030.

Japanese seat supplier NHK Spring says they have a seat that minimizes motion sickness for passengers in autonomous vehicles. The headrest supports the occipital bone behind the ear from both sides, steadying the head front-to-back when the vehicle speeds up or slows down, and steadying it side-to-side on curved roads.

Motion sickness results when visual information does not match motion detected by the inner ear. Minimizing the motion at the head postpones the onset of symptoms such as stomach discomfort, nausea, and yawning—by about thrice the normal length of time, NHK Spring claims, among other benefits including being 40 per cent thinner than other car seats while providing the same level of cushioning and comfort. The thickness reduction comes from vibration-resistant urethane material and springs to save up to 3 centimeters under the seats—space which can be used in EVs for larger batteries and longer driving ranges. The seat is shaped to distribute pressure evenly from the hips to the buttocks, and there's a touch panel at the armrest for operating dashboard dials and displays.

Sabelt, Bcomp Technology in Sustainable Seats

ALFA ROMEO GTA SEATS BY SABELT—SABELT IMAGE

Sabelt, a company based in Moncalieri, Italy, specializes in lightweight seats for high-performance cars. As part of their Carbogreen Project initiative, they're developing a seat made from Bcomp's flax fiber solutions. The initiative aims at developing sports car seating systems made of newly designed; renewable, and/or environmentally low-impact materials.

Founded in 1972 by Piero and Giorgio Marsiaj, Sabelt specializes in the development and production of car seats for performance road cars; racing products for motor racing, and seatbelts for aerospace. They've developed a range of premium seats for automakers including Ferrari; McLaren; Alpine; Abarth; Alfa Romeo; Jaguar; Maserati, and Aston Martin.

In 2019, Sabelt began their commitment to the Carbogreen Project, with the aim of producing a new range of seats with more sustainable materials. Three years later, the effort continues with financing from Finpiemonte and support from the European Fund for Regional Development.

Thanks to the collaboration with Bcomp **as we've previously reported**, Sabelt is currently validating the use of flax fibers to make seats. This would mean replacing carbon or glass fiber materials with renewable ones to significantly reduce CO_2 emissions without compromising performance.

Next steps include the use of thermoplastics reinforced by natural fibers, which are more easily recyclable at the end of life.

Dätwyler's Electro-Active Polymers for Seat Massage

DÄTWYLER IMAGE

In a massage seat, pneumatic systems driven by stacked actuators control air flow in and out of bladders located within the seat. These are connected via tubes with a valve system and a pump that creates a permanent overpressure of air. The system is filled with air at a carefully calculated pressure and the valve blocks make sure each cushion is inflated or deflated at a certain frequency in order to create a massage effect.

Swiss company Dätwyler supply high-quality elastomer components crucial to making it all work, which they're promoting with a built-in massage function, as an alternative to mechanical massage. Their 'electroactive polymers' convert electrical energy into mechanical motion through elastic deformation. Dätwyler's patented process has enabled production of stack actuators on an industrial scale for the first time. Thanks to the unique stack design, conventional actuator technologies can be replaced by this technical solution in various applications.

With these stacked actuators, virtually noise-free pneumatic systems can be realized. They also are more energy-efficient, lighter, and more compact than mechanical alternatives—especially beneficial for EVs—and they cost less.

Dätwyler CEO Dirk Lambrecht says his company's electroactive polymers "in a unique stacked design are a promising future technology that will enable completely new and diverse applications in the car of the future". Additional potential applications include thermal management (pump actuation) in EV batteries; actuation of dashboard vents, and haptic feedback and morphing surfaces in human-machine interfaces (displays; steering wheel, and plain surface becoming active when approached).

Dätwyler is currently working to build a highly automated production line at their existing Swiss plant. Lab samples are already available, and delivery of the first industrial prototypes is planned for early 2024.

RTW Aachen's Interior Acoustics; Drive-Motor AVAS

CONTINENTAL IMAGE

Annoying noises aren't exclusive to cars with combustion engines. Classic flow-acoustic issues also occur in cars with electric drives—even more perceptibly, because these cars are very quiet at low speeds. This is not just a deficiency perceived by drivers who love the sound of an engine, but also a very real safety threat to pedestrians (especially those with impaired eyesight) and cyclists who need to be able to hear a car rolling along. Starting 1 July 2021, all new cars with electric or hybrid drives had to start coming with an AVAS (acoustic vehicle alerting system), which mandatorily makes noise containing a specified mix of frequencies and amplitudes at road speeds up to at least 20 km/h. Now acoustical engineers have to figure out how to make cars appropriately louder, not just appropriately quieter.

As the high-frequency noise components of the electric drive train are often perceived as unpleasant in the interior, a method for efficient analysis is essential. In the project "eMSI—Noise in the Vehicle Interior with Electrified Drives", a method for the automated separation of the interior noise of electric vehicles as well as for the allocation of the noise components to the causative components was developed at RWTH Aachen University.

The aim of the project is to break down the internal noise of electric and hybrid vehicles into individually perceptible noise components, which are then automatically assigned to the engine and drivetrain components responsible. In view of the current market introduction of vehicles with electrified drive systems, this project quantifies the comfort of the noise components of electrified drives based on customer expectations and using psychoacoustic parameters. In addition, depending on the level of comfort, concealing noise for component noises should be designed in such a way that the latter are perceived as being as pleasant as possible. The results are to be made usable for the application in a development tool.

Vehicle acousticians are facing up to these new tasks, and are expanding their focus beyond the dB level to include the annoyance. The electric motor becomes a loudspeaker, and can thus serve as an AVAS. Without additional hardware, the developed applications can not only generate the required warning signals for electric vehicles, but also brand-specific sounds. To support the AVAS integration process into the vehicle, an interior and exterior noise simulation software is used.

Elektrobit Software for Afeela Cockpit

SONY HONDA MOBILITY IMAGES

Elektrobit, a software specialist involved with previous Sony car prototypes, is also involved in Sony Honda Mobility's Afeela prototype.

Elektrobit, a Continental subsidiary, developed the software architecture for the Afeela's cockpit system—including the software for Qualcomm's high-performance processors and the software through to the UX design for the cockpit displays. Integration services for the cockpit system include all software and hardware components as well as applications from Sony and their partners.

Sony wants to bring software to the forefront. The Cockpit enables the manufacturer to integrate their latest audio and camera sensor technology as well as a wide range of gaming; film, and music content.

Elektrobit CEO Maria Anhalt says the enormous computing power makes a wide variety of user experiences possible, and her company took a much more central role in the project than is usually the case in automaker-supplier relationships, she said: "The Afeela prototype impressively demonstrates the potential benefits of this new software-first approach".

Li L7 Interior: Full of Technology

图片：理想汽车

Chinese EV manufacturer Li Auto has launched their L7 5-seater SUV.

At the back of the front passenger seat is an electric footrest; a central armrest, and electric seats which can be adjusted to provide a back recline of between 25° and 40°. Furthermore, the seats have been designed with a 270° embracing design, and the right second-row seat can be converted to a 'Queen's Seat' with the press of a button to provide what the maker calls a 'strain-free riding experience'.

The SUV has 26 storage spaces, and a trunk over a meter deep. There's a 'double bed mode', which can be activated by taking off the headrests and turning on 'camping mode'.

For infotainment, the cabin can be turned into an audio-visual room or game room. The Li L7 Max comes standard with a rear row screen, consisting of three 15.7" 3K LCD screens, all with an ultra-thin antireflective coating for unperturbed viewing regardless of ambient light. Low-blue-light technology protects eyesight. The interior features a surround sound system consisting of 21 speakers and amplifiers with a maximum power output of 1,920 watts.

A panoramic sunroof with electric sunshade is standard equipment, and there's a double-layered, silver-plated, heat-insulating front windshield; an independently-controllable rear climate system; five heated seats, and ventilation and lumbar massage for four seats. For additional safety, the L7 comes with a variety of airbags covering 10 positions in the vehicle, including rear seat side airbags. To

improve air quality, there's an air quality system and interior real-time monitoring to ensure a clean cabin environment.

Li Auto's in-car voice assistant, Li Xiang Tong Xue, has been developed with a new-generation device-cloud integrated architecture, featuring the company's self-developed inference engine for in-car scenarios—LisaRT. The MIMO-NET algorithm can accurately isolate different human voices in multiple zones. Aided by Li Auto's self-developed voice recognition algorithm, MSE-NET, Li Xiang Tong Xue's activation and recognition accuracy both reached 98 per cent in vehicle field tests. These rates reached over 90 per cent under the three key scenarios of high noise; low voices, and voice commands from children. On the vision side, the automaker's self-developed MVS-NET algorithm can realize accurate gesture recognition for all occupants. Combined with gesture wake-up technology, it helps achieve easier interactions through gestures in a more natural way.

The Design Lounge

Led by LEDs
By Athanassios Tubidis

BMW E39 LED WELCOME LIGHTS (WIKIMEDIA IMAGE)

Rock music performances are not about the riff, but about the pause. Penned in triple meter, the silent 3/4 or 12/8 [time signature] favoring a range of 100-140 beats per minute, and one unexpected stop amplifies the adjacent theme. On any electric guitar, bass, drum kit combination, the silent rock-signature appeals every single time as a short and sudden blackout before and after surging and propulsive moments of brightness.

Engaged in a highly performing job, visually, while sketching car interiors and listening to rock music, I have always pointed out the obvious similarities. Unlike to car exteriors, that tension is given by highlights and core values, car interior design is a completely different solo. It is all about artificial, indirect light and contrasting dark shadows; slick, glossy or transparent surfaces versus soft, textured and concave dark matter.

Interiors obey to very specific sets of optical-cerebral laws. Empty space, interrupted forms, perceived but not actual continuity, floating elements, all interpreted under intentional contrast of light and dim. While the features of the cognitive design roller-coaster evolve with new tech, parameters are so vast and interweaved that it is difficult to judge what is right or wrong. Yet the car situation is such that it asks to really open the door and get in a universe where reflections and light are handled differently than the outside world. It is almost like a composition, a symphony of design features, visually played to a specific light script. Car interiors are the theater set of our private mobile lives.

What would be a rock theater set, let's say the jimmy Hendrix equivalent in a car interior ambiance? There is so much still to be done…

That's all-good fun, but what happened during the latest car show? Let's focus on experience alone, how do the individual cars showcase this? Currently, **they don't.** The most we saw people do was getting in cars, touch a few touchscreens, and then leave. Besides, car interiors are never properly displayed in car shows. Lights are bright and sparkling with a myriad reflection (highlights) and no shadows, emphasizing strictly exteriors and only from a certain distance.

In addition, maybe as a countertrend, varieties of LEDs are now blinking on any translucent surface, often with no reason or aesthetic cohesion to the rest of the vehicle, interior or exterior, generating clichés and connotations such as Christmas or disco lights. We cannot help thinking someone has got a lot of time on their hands, or we are running out of use case scenarios.

From objects to experiences, design is the immediate instinctive evaluation of anything that triggers emotions, and whatever mobile can be highly emotional. Car interior light design today feels like only sound with no music. For the time being screen lights steal the show.

Audis of the Future Will Be Interior-First, Exterior-Second

Audi is prioritizing interior design above all else in their future cars, according to their design chief Marc Lichte, who spoke at a preview of the Audi Activesphere concept: "In the past, the process was always the same; in the beginning there was the combustion engine and platform. Then together with sales and marketing, we decided two-seater, or four-seater or six- or seven-seater, then we start designing the exterior design and, in the end, interior.

"The future is exactly the opposite. And that's why I put UI/UX design department in the center of our design activities. It starts there and it ends there, because they focus their thoughts about the use cases.

"So, it's a 180-degree turn. If you want to be ahead in this transformation, this is the future."

Did Odedra, head of UI/UX Design, says Audi's new approach is "the complete opposite to what it used to be in the old world—we start with 'what are the human needs?' Human centricity is at the core of what we do. What does the user need? And then we build an interface because that's the relationship between the user and the vehicle. And then we build an interior around that, and then we build an exterior".

News Mobility

TUM Algorithm Makes AD Ethical Decisions

EDGAR RESEARCH VEHICLE (TUM IMAGE)

Software developed at the TUM (Technical University of Munich) for autonomous driving is the first algorithm to consider the 20 ethics recommendations of the EU Commission. This enables it to make significantly more differentiated, weighted decisions than previous algorithms.

It's not just technical challenges which need to be solved before autonomous cars can get on the world's roads in significant number; ethical issues also play an important role in the development of algorithms. For example, the software must be able to deal with unpredictable situations and make the necessary decisions in the event of an impending accident.

Researchers at TUM have now, for the first time, developed an ethical algorithm that does not act on an either/or basis, but rather divides risk with more granularity. Around 2,000 scenarios with critical situations were tested—distributed across different types of roads and regions such as Europe; the USA, and China. The research, which was published in the Nature Machine Intelligence Journal, was carried out in collaboration with the chairs of automotive engineering and business ethics at the Institute for Ethics in Artificial Intelligence (IEAI) at TUM.

The ethical framework that guides the risk assessment of the software was defined in a letter of recommendation by a panel of experts commissioned by the EU Commission in 2020. It includes principles such as the protection of vulnerable road users and the distribution of risk throughout road traffic.

An example illustrates the approach: an autonomous vehicle wants to overtake a bicycle, and a truck is coming toward it in the opposite lane. All available data about the environment and the individual participants are now consulted. Can the bike be overtaken without driving into the oncoming lane and at the same time keeping enough distance from the bike? What is the risk for which vehicle and what risk do these vehicles pose?

When in doubt, the autonomous vehicle with the new software will always wait until the risk is acceptable to everyone. Aggressive maneuvers are avoided, and at the same time the autonomous

vehicle does not fall into a state of shock and brake abruptly. A weighing takes place that includes many options.

The researchers emphasize that algorithms programmed to act according to risk ethics can 'decide' based on ethical principles, but they still cannot guarantee accident-free road traffic. And further differentiations such as cultural differences would also have to be considered in ethical decisions.

In the future, the software will also be tested on the road with the EDGAR research vehicle. The code, which incorporates the findings of the research work, is available in open source.

Remote-Controlled: First Driverless Car on Europe's Roads

VAY IMAGE

For the first time, a remote-controlled car is now driving through Hamburg without a safety driver. For three years, Vay has been testing the technology, which has had an exemption from Hamburg for use there since December 2022.

The route includes a predefined area where remote-controlled driving will be tested. "This is a huge success for our entire team, but also for Hamburg and Europe," says Vays CEO and cofounder Thomas von der Ohe.

The Berlin-based startup is working on a door-to-door service in which customers order an electric vehicle via app. What makes it special is that a tele-driver brings the car directly to the customer—remotely controlled from the tele-driving center. There, drivers sit at a station with a car steering wheel and pedals as well as all the necessary controls.

They have an overview of the traffic situation via several screens as well as headphones. Once the customers have arrived at their destination, a tele-driver takes over the vehicle again, eliminating the need for a parking space.

A positive expert opinion from TÜV Süd confirmed in particular the functional safety and cybersecurity of the tele-driving system in the context of the ISO 26262 and ISO/SAE 21434 standards. Vay's service is designed to allow fewer electric vehicles to transport more people in inner-city areas than conventional private transport.

General News

Qualcomm: a Full-Range Stellantis Supplier

STELLANTIS IMAGE

Stellantis and Qualcomm have announced a multi-year partnership in which the automaker will use the supplier's Snapdragon cockpit platforms in all 14 Stellantis brands—starting with Maserati's new infotainment system in 2024. For Qualcomm it is another important deal after the recently announced agreement with BMW. Qualcomm thus forms a competitor to Nvidia; both are increasingly becoming competition for established suppliers such as Bosch and Continental.

Qualcomm's technology is expected to equip Stellantis models with telematics systems and 5G connectivity. The automaker also plans to merge all software domains into high-performance computers and use Snapdragon automotive platforms in all major vehicle domains.

Stellantis plans four vehicle platforms that will provide the foundation to decouple hardware and software cycles. Part of this concept is the new software architecture STLA Brain. For the domain controller in the interior ("STLA SmartCockpit"), the automaker is already working with Amazon and Foxconn, from whom Stellantis has secured 80 per cent of their semiconductor needs starting in 2024. Qualcomm's electronics systems are expected to enable various functions such as graphics; audio, and voice communications throughout the vehicle's interior.

As additional features, Stellantis wants to enable over-the-air updates. The user experience is to be more tailored to customers' individual preferences. The goal is to offer at least quarterly updates by 2026. Stellantis wants to invest more than €30bn for the new software strategy by 2025.

In four years, the number of connected vehicles worldwide is expected to rise from twelve million today to 26 million. By 2030, there should then be 34 million update-enabled vehicles from the Stellantis brands; the automaker plans to generate annual sales of around €20bn with their digital services.

Continental, ZF Invest in Software Startup
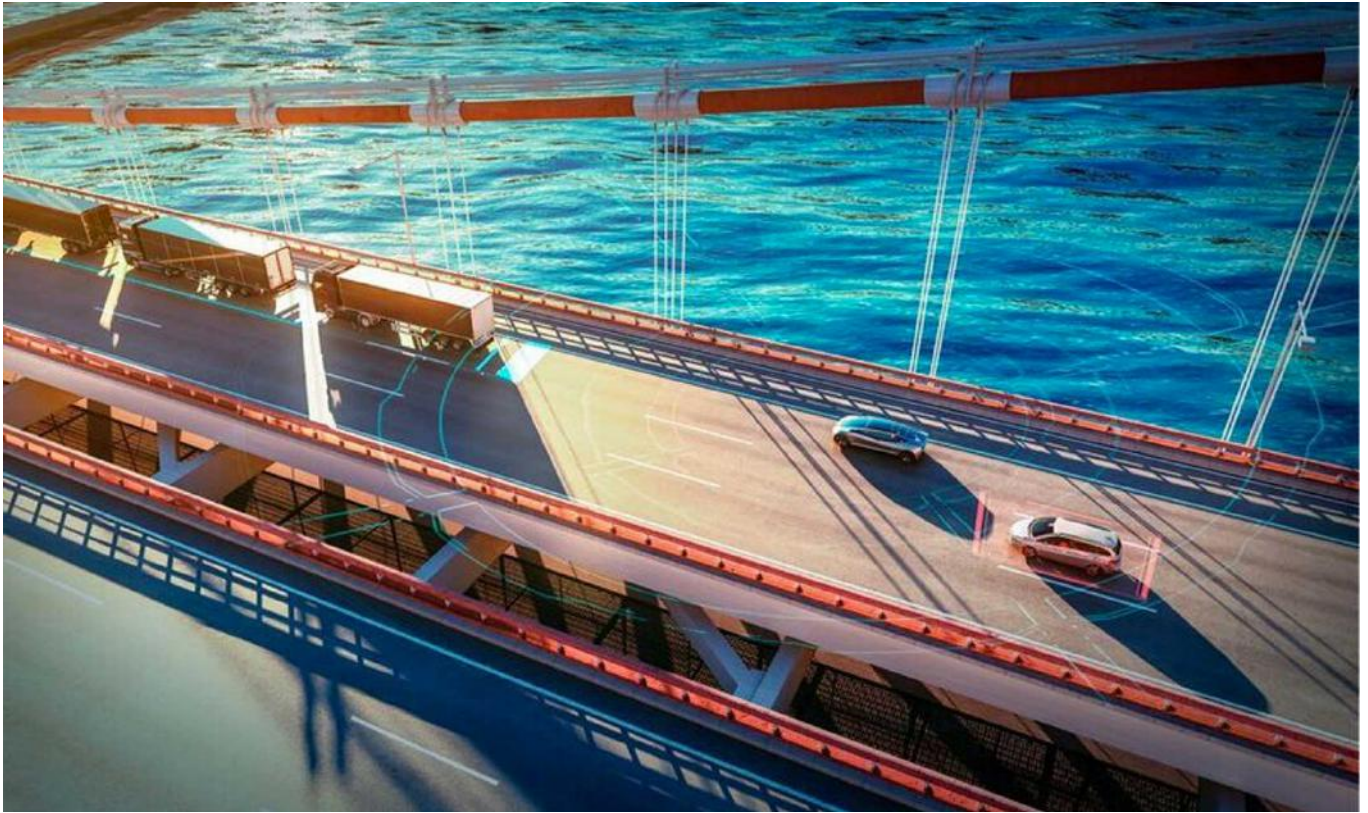
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Software company Apex.AI is getting over USD $56m in fresh capital. Continental; Hella, and ZF are among the automotive suppliers participating, and Jaguar Land Rover; Volvo, and Toyota will also be represented in the future through their respective investment companies.

ZF is acquiring a five-per-cent share in Apex. The German company also plans to develop their own middleware based on the Apex OS. The certification by TÜV "allows us to offer an alternative to Autosar Adaptive," says Nico Hartmann, head of the ZF Global Software Center. The reason, according to Hartmann, is that the operating system is written using the C++ programming language, so individual building blocks of the code could be reused for new projects.

Continental says they have been working with Apex on an operating system for vehicles for about a year. The investment that has now been made is intended to get this product ready for series production quickly. "With the help of Apex OS, we will significantly shorten the development cycles for new functions, especially for automated and autonomous driving," says Frank Petznick, head of the Driver Assistance Systems business unit at Continental.

Apex is developing safety-certified; developer-friendly, scalable software for mobility systems in the software-defined vehicle. Theirs is an OS for automated driving and all the functions that run on domain controllers and high-performance PCs. It is a toolbox for developing software that contains, for example, standardized commands for reading in sensor data. In the vehicle, Apex OS works in the background and is used for basic functions, such as networking hardware with software modules.