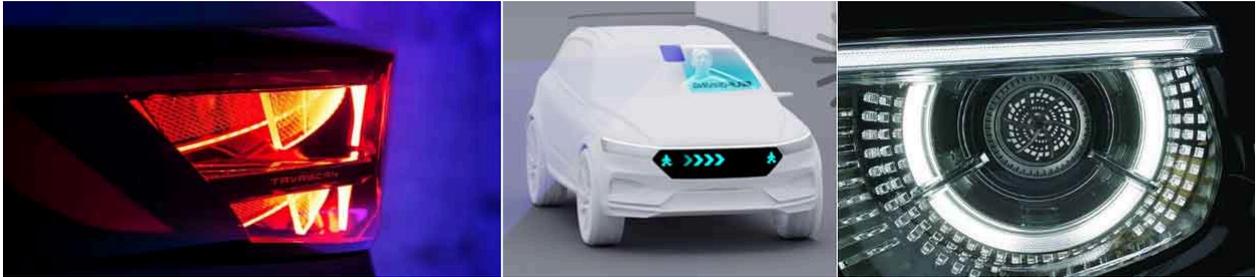


# Editorial

## Innovation: The Key To Success



In this week's DVNNewsletter, we are talking a lot about lighting innovation. Innovation led by design, innovation led by research institutes, and innovation pushed by governments and automakers realized by suppliers and universities.

We bring you an in-depth interview where you'll learn from Cupra's design and R&D team how they created the brand's new lighting signature. Pre-development duration was 3.5 years between automakers and suppliers to find the right concept.

We tell you about the INITIATIVE Project, which gathers 10 companies and institutes to work on V2X communication with light. Results will be certainly useful for a new possible lighting regulation evolution in Europe.

And setmaker Mind have a new mechatronic concept, including 30 patents, embodied in their headlamps on the new Great Wall Tank 700 just launched in China; you'll read all about it.

This cannot be done in one day. This cannot be done alone. This cannot be done in a short development schedule (what European CEOs call the Chinese development speed). You need to dedicate people and teams, you need time and partners. We do not talk here about copying, we talk about real engineering. This is why we are engineers and why we like the job: innovation!

Sincerely yours,

**Paul-Henri Matha**  
DVN Chief Operating Officer and Lighting General Editor

# In Depth Lighting Technology

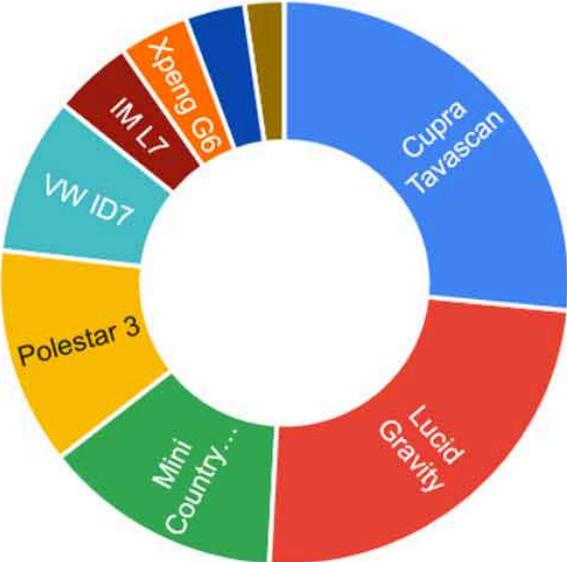
## DVN Interview: Tony Gallardo, SEAT-Cupra Design Leader



***By Paul-Henri Matha***

During the DVN Munich event, I was very happy to give Carlos Elvira's Cupra team the award of the best rear lamp design of 9 nominees.

465 voters participated, and Cupra got more than 25 per cent of the votes—just a bit ahead of the Lucid Gravity rear lamp, which very well might be the largest rear lamp on the planet.



That was not the first time the Cupra lighting team was nominated for an award. In December 2023, they were nominated for the best design lighting team during a CDN (Car Design News) event in London. Volvo Cars' lighting design team won that award (and got the best front lighting design at DVN award ceremony). It seems that the design and R&D communities are aligned when we talk about lamp design.



Then i decided to talk and listen with Tony Gallardo, SEAT - Cupra's Exterior Components and Illumination Design Leader. Here he shares his thoughts with us:

**DVN: Hello Tony, nice to meet you. First of all, congratulations for the award and the great job you did. Tell us about yourself and your background, won't you please?**

**Tony Gallardo:** Thank you very much, and thanks to the team as well. My background is in industrial design engineering and product development from the University of Girona. One of the final projects I completed was for LEGO. I was selected among the students to work in Denmark, where I spent a year working on a dream job, quite literally playing, but my true passion was designing automobiles. Following that, I pursued a master's degree in vehicle transportation design at Elisava while simultaneously interning at R cker - Lypsa. I spent 10 years at R cker - Lypsa (EDAG Group) designing products—yachts and business jets—and in the final phase, I worked as Design Manager. It was an incredibly enriching experience. I have been working at SEAT / Cupra for over 15 years as a design leader for exterior components, focusing specifically on exterior lighting and wheels.



**DVN: The award is for you and your team's work on the Tavascan rearlamp. Tell us about that.**

**T.G.:** The Tavascan rear lamp is the first of many products from the new Cupra generation, representing a culmination of knowledge acquired over many years. We have emphasised the main signature through the intensity of light, understanding that not all elements need to shine at maximum brightness. Through this prioritisation, we highlight the message of the three triangles foremost. The gradual fading of light enables us to create a rich three-dimensional ambiance. While homogeneity was previously emphasised, we believe that transparency combined with homogeneity represents the

future. This concept was successfully implemented in the Tavascan show car, resulting in a captivating atmosphere. The Tavascan taillamp features a precise line that connects the main elements: the triangles and the illuminated logo. The V-shaped line supports the logo, providing identity even when the rear lamp is switched off. To differentiate ourselves from other brands, our running TI also includes illuminated surfaces in the upper area, enhancing safety by improving visibility.



**DVN:** it looks as though you moved from triangle lines to a triangle shape. Is this a new lighting signature we will find on all new models?

**T.G.:** Our new Cupra signature is inspired by the number 3, which is considered perfect according to Pythagoras. We've also chosen the triangle as the iconic shape that represents dynamism and direction. Our logo is triangular, and we break it down into three triangles to apply them to our signature. It's true that we are enhancing surfaces as a logical evolution in lighting. In the past, we had points, then came lines, and now we are exploring surfaces to generate technological value, inspired by OLEDs, but with much lower cost and significant visual impact.





**DVN:** you have selected laser graining technology to have this really homogeneous appearance. How long did you work with your suppliers to realise the vision?

**T.G.:** The effect that we present in the rear lamp of the Tavascan is the result of three and a half years of joint work with the supplier Microrelleus until the start of the project with Xingyu, the setmaker. During this research period we experimented with different depths and types of engraving, evaluating the efficiency versus the durability of the injection molds and the homogeneities of the 3D surfaces.



**DVN:** What's the efficiency like? How does the power consumption of the rear position lamp compare between a Born and a Tavascan?

**T.G.:** Our current rear lamps, such as those of the Cupra Born, are made up of a line of LEDs soldered on a non-flexible PCB—that is, not a light guide. For this reason, the comparison of our current models in terms of efficiency compared to illuminated surfaces is practically the same.



**DVN:** in Europe, we can have lit logos since January 2023, and you are one of the first brands to do so. You might have it easier than other brands, because your logo is smaller than 100 cm<sup>2</sup>, which is the lit-logo area limit in the UN regulation.

**T.G.:** I agree. It's indeed an opportunity for increased visibility for us. Our logo is highly iconic, and for that reason, as well as strategic considerations, we have opted to illuminate it.

**DVN:** Coming to the front of the car now, it seems to follow the same strategy. From triangle lines to triangle surface.



**T.G.:** That's correct. Our philosophy is global and applies to both headlights and taillights.

**DVN:** Do you use laser etching on the front, too, to realise that triangle surface?

**T.G.:** In the DRL, we use laser technology in various areas of the surfaces to enable the animations of 'opening and closing the eye', which is a fundamental aspect in humanising exterior lighting.



**DVN:** Can you talk a bit about the very thin lit line between the hood and the bumper? Is it for design or regulation purposes? Should we push to change this regulation and its 75-mm rule (which does not exist in USA), for example?

**T.G.:** It's a deliberate design intention. Here we have another example of differentiation. We are among the few brands that use ambient light to connect the DRL with the logo in the front area. Cupra is characterised by being more progressive and mysterious; the

connection itself is not the most crucial aspect—what truly matters is the signature and the logo. Of course, a bit more flexibility would benefit us all in achieving greater differentiation between brands.



**DVN:** Do you intend to totally differentiate SEAT from Cupra, while keeping the same DNA? I was working for Volvo the last five years, and what you are doing feels a bit similar to Volvo and Polestar: a step-by-step evolution with more and more differentiation.

**T.G.:** The intention is to differentiate one brand from the other; they both have distinct characters. SEAT features one triangle, while Cupra incorporates three triangles. Moving forward, each brand will have its own lighting identity. Our principles are applicable to each brand, but every model possesses its unique personality. Despite their differences, they are all consistent with each other.

**DVN:** As an R&D engineer, I know this sort of innovative project can be done only together, designer + engineer. Can you explain how you work with Carlos' team?

**T.G.:** Firstly, I want to highlight that we have an exceptional design team consisting of Oscar and Adrián, who bring talent and experience to the table. We collaborate closely to maximize synergies between us.



Working alongside Carlos and his team is essential. Understanding the design requirements and technical constraints is crucial for the success of the project. Our teams are highly motivated and open to innovation, guided by a strong desire to excel and stand out.

Our fundamental approach is always to push projects to their limits, aiming to achieve the maximum design impact with the available technology.



**DVN: What else might you share with us?**

**T.G.:** I'm excited to share what the future holds, but unfortunately, I can't disclose anything at the moment. However, exterior lighting will always shine brightly.

**DVN: Thank you, Tony, for your time.**

**T.G.:** It was a pleasure to be able to share our work with you and the readers.

# Lighting News

## INITIATIVE for Smart AV-VRU Interaction

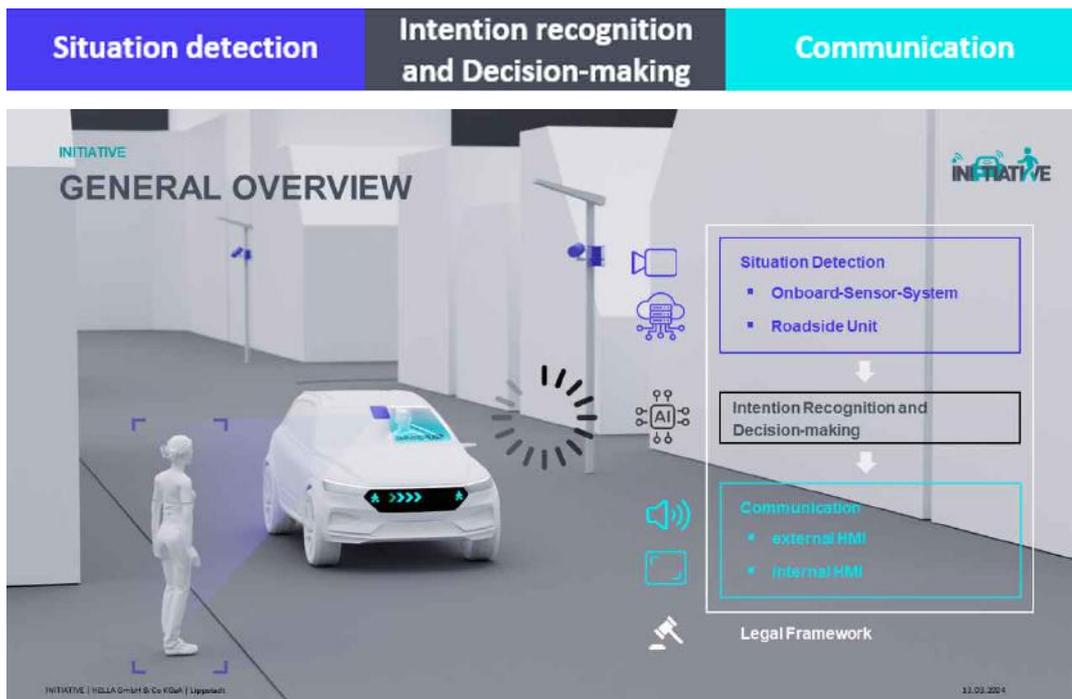
LIGHTING NEWS



**Special to DVN by M.Sc. Maximilian Baumann & Prof. Dr. Cornelius Neumann, Light Technology Institute at the Karlsruhe Institute of Technology**

INITIATIVE is for **I**ntelligente Mensch-Technik **K**ommunikation im Gemischten **V**erkehr, German for Intelligent Human-Technology Communication in Mixed Traffic. It's being worked on by a consortium led by Hella's Dr. Mathias Niedling.

The aim of the project is to enable AI-supported, intelligent interaction between highly automated vehicles and (mainly) vulnerable road users—VRUs—such as pedestrians and cyclists. Due to the expected proliferation of AVs in road traffic, there will be more and more encounters with interaction between AVs and VRUs. Bottlenecks or crossroads where the right of way is not clearly regulated and communication between road users is required, for example. For such situations to be solvable by an AV, three central problems must first be addressed, which specify the work scope and roadmap of the project:



INITIATIVE sub-aspects: situation detection, intention recognition, and decision making, communication (image © Hella)

The aim of the project is not only to investigate one specific situation in road traffic, but to develop generally applicable solutions in a variety of traffic situations where communication between road users is needed.

Within the outlined project scope, a variety of special traffic situations was defined, all including the necessity of communication between road users. Several exemplar situations ensure generally applicable solutions for problem solving communication in mixed traffic, thereby making the project valuable in a broad and future oriented context.

### **Situation detection**

This part of the project is about recognising the situation based on various sensor systems. The sensor technology is divided into two areas: onboard sensor technology installed in or on the AV itself, and external sensor technology, like a roadside unit (RSU) attached to fixed infrastructure such as street lighting. The sensor system mainly consists of camera systems which detect road users and estimate their position in their own coordinate system.

The RSU, designed, developed, and built by Electric Special Photonics system from Oldenburg, uses defined criteria to determine whether a detected road user could be relevant to the situation or not. The entire processing and evaluation of the image data takes place within the camera. A data string in the .json format contains all relevant data for each road user and is provided via various, wireless interfaces. This ensures no personal data leaves the camera.

The sensor system of the vehicle was developed by the Fraunhofer Institut für Optronik, Systemtechnik und Bildauswertung (IOSB). It consists of an outward facing stereo camera to monitor the surroundings as well as a depth camera to monitor the interior. With the stereo camera objects and VRUs in front of the vehicle can be precisely located relative to the vehicle. In addition, pedestrians are further analysed using human body pose estimation to determine their gestures as well as their intent to cross the street. The interior-facing camera enables 3D body pose estimation of all passengers for hand and pointing gesture detection. The data of all cameras including the RSU are finally combined to create an overview and relevance prediction of all actors for the decision-making process.

### **Intention recognition and decision-making**

The data from the onboard and external sensors is merged and transferred to the onboard computer for AI-supported decision-making. The model predictive control (MPC) running on this data uses a simplified interaction model and is intended to predict the movements of individual road users and their behaviour. Various concepts are used to decide how the AV should behave in this situation. The work was carried out at the Institut für Regelungstechnik (IRS) at the Karlsruhe Institute of Technology (KIT).

Initial concepts were evaluated using simulator studies and implemented on the project's test vehicles. In addition, various pedestrian gestures given as a reaction to a signal by a vehicle were analysed in real-life test drives. These and other studies were carried out by the Würzburger Institut für Verkehrswissenschaften (WIVW). The WIVW also acted as coordinator for the subject studies within the project to guarantee a standardised study design across all project partners.

### **Communication**

Next, the decision reached by the algorithm is communicated both to the passengers inside the vehicle and to the road users outside. The communication should be light-based. Depending on the road traffic situation, one or more messages may be necessary to resolve the situation. These messages were developed based on the pre-defined situation catalogue and listed in a message catalogue. A solution strategy is available for each problem situation, which can be driven by sending the messages to the addressed recipient.

**Hella** have investigated interior communication possibilities including a 180° light strip beneath windshield and front side window in combination with a 2" LCD in the middle of the dashboard. The latter displays symbols giving more detailed information on what is happening outside. They also set up the final demonstrator-vehicle which is used to do various subject studies. This vehicle has a fully integrated display in the front which could be displayed with font- or symbol-based messages.

For communication with external road users, a display at the front of the vehicle and a turquoise signal lamp were also investigated. This took place within the framework of various subject studies, which were carried out both online and in real life. The prototype design of the HMI systems for the exterior (eHMI) and some of the studies conducted with them were carried out by the Lichttechnisches Institut (LTI) at KIT. All systems were measured photometrically.



Symbol display on the prototype vehicle (L) and fully integrated on the demonstrator vehicle (R). (image © Hella)

To ensure the displayed messages are understood by the recipients, studies were carried out both in the simulator and in real life. The content displayed on the HMI systems was created by Version1 from Karlsruhe, who also designed all the graphics and format templates used in the project as well as the [project homepage](#), which also hosted parts of the online studies.

In addition to the technical implementation of the entire chain from situation detection to communication on the HMI systems, the Institut für Rechtsinformatik der Universität des Saarlandes analysed the legal framework and questioned data privacy and the liability of individual parties involved, such as the manufacturer or owner of an AV.

The entire system was tested using the scenarios defined at the beginning of the project as part of an overall validation. To create the impression of a real AV, a 'Wizard-of-Oz' method was used—research participants interacted with a mock AV actually controlled by hidden humans. Results showed that the concepts developed work and can close the gap in future mixed traffic that has arisen due to the loss of the human driver. The system developed was able to solve the problem situations and increased trust and acceptance in the interaction with an autonomous vehicle.

The results of the project and all created publications as part of the funding programme will soon be available on the project website. The consortium is grateful to the Federal Ministry for Economic Affairs and Climate Action (BMWK) for the funding.

# New Renault Captur Facelift

## LIGHTING NEWS



***By Paul-Henri Matha***

The Captur is one of Renault's best-selling cars, and ranked as one of the 10 most popular hybrids in Europe last year. It is expected to remain on sale in this form until around 2028. Renault revealed the facelift last week, with orders starting today, 9 April.

The design update follows the trend we have seen on the Clio, Scenic and Rafale, inspired by Gilles Vidal's team: a new logo and grille; slim headlamps; a new kite-shaped DRL which plays with positive and negative space. Radar is still in the bumper; there's no radome behind the logo.



L-R: new Clio, Scenic, Rafale

Headlamps are becoming markedly slimmer, with reflector height down to about 30 mm from about 60 mm before. Renault haven't released information yet about what's available in advanced lighting functions on this car (AFS, ADB, matrix...?).

With this design, we see a possibility to illuminate the grill and the logo without major disruption. Maybe that will be an upgrade for a future model year?

The rear lamps aren't all that different; the lens is now colourless instead of red—not so simple as it looks, though, because this usually means having to test and re-homologate.

# Mahle, Hella Sell Off BHTS Shares to AUO

## LIGHTING NEWS



Mahle Behr and Hella completed the sale of their respective 50-per-cent stake in the joint venture Behr-Hella Thermocontrol to AUO Corporation. The sale, based on an enterprise value of €600m, was agreed last October; now it has been approved by the appropriate authorities.

The sale of the BHTC shares is the result of constructive discussions between Mahle and Hella regarding the future positioning and orientation of BHTC. These talks were initiated against the background of a change of control clause in the joint venture agreement after Forvia took over the majority stake in Hella.

BHTC, headquartered in Lippstadt, specialize in climate control and HMI system solutions. They currently employ around 3,100 people worldwide, and in 2023 generated €634m worth of sales.

# Mind's Mount Bromo Eye Headlamp on Great Wall Tank 700

## LIGHTING NEWS



For the new Great Wall Tank 700, Mind devised a unique headlamp design. Drawing inspiration from the shape of Mount Bromo—a volcano in Indonesia—Mind developed a spiral headlamp motion technique, resulting in the 'Mount Bromo Eye' headlamp. It is the world's first combined headlamp that features an illuminated 3D spiral motion mechanism and a dynamic hidden illumination module scheme. The motion mechanism provides a special effect which, when combined with a high-performance illumination module, adds 'mystery sensation' and scientific and technological elements to the vehicle's headlamps.



The design of the headlamp is quite fascinating. It features a motion mechanism that sits in front of the illumination module. The decorative blades of the motion mechanism remain closed when the vehicle is locked, giving the impression of a sleeping Mount Bromo. When the vehicle is unlocked, the blades 'wake up'—they gradually open in a spiral manner, like the iris of a camera lens, revealing the hidden illumination module. This motion mechanism headlamp has over 30 patents' worth of innovation in it.



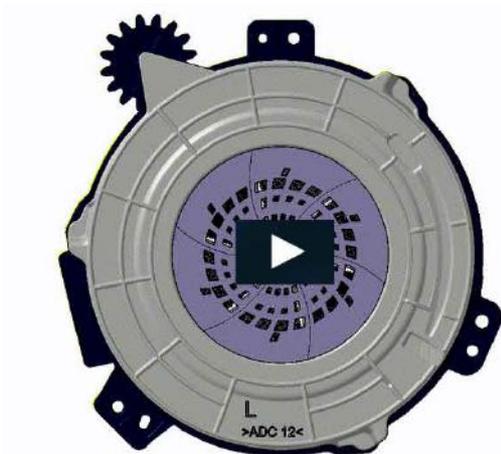
Mount Bromo in Surabaya, East Java, Indonesia



There are four scenarios:

- When the vehicle is motionless, the blades are closed, shielding the main lights behind.
- When the vehicle is unlocked, the blades light up and engage in the welcoming function of ambient lights of the entire headlamp.
- After the welcome scenario, a motor drives the blades to rotate and open, revealing the main light.
- When the vehicle is locked, the blades rotate and close, hiding the main function lens and engaging in the welcoming function by lighting up ambient lights.

During the whole process from lighting to extinguishing, those luminous rotating blades can be seen opening or closing. The headlamp can also meet a wide array of illumination needs, such as driving in town, driving off road, bad weather conditions, and driving at high speed. The motion mechanism—the innovative mechanical-movement elements—improve the scientific and technological impression of the headlamps and add elegance and sophistication. Mind say the motion mechanism has paved the way for a more diverse range of headlamp designs, providing creators with a wider range of options and new avenues for experimentation, enabling designers to create headlamps that are both aesthetically pleasing and highly functional.



The motion mechanism has customizable options, too. Blade count to OEM desire at the development phase, and the hollowed-out illuminating zone for decorative blades may also be customized with different patterns. Other lights paired with the entire lamp can mimic other scenes, such as a robot which gradually opens its eyes or a cartoon figure flashing its eyes.

**Paul-Henri MATHA comments:** really interesting concept with mechanical solution including mechatronics, stepper motors, gears. Nice engineering design!

# General News

## Li Auto Hit 700 Sales

### GENERAL NEWS



Li Auto are now the first NEV startup in China to surpass cumulative sales of 700,000. During March, Li delivered 28,984 cars, a year-on year increase of 39.2 per cent. This took their cumulative total to 713,764 since sales began in 2019. The company aim to sell 800,000 cars this year.

Li Auto was founded in 2015 by Li Xiang, which is also the Chinese name of the company, and until recently only sold extended-range EVs. Like Nio and XPeng, they are listed on a US stock exchange. Their focus on extended-range cars has propelled them past Nio and XPeng in terms of sales volume.



Li L6, due to launch this month