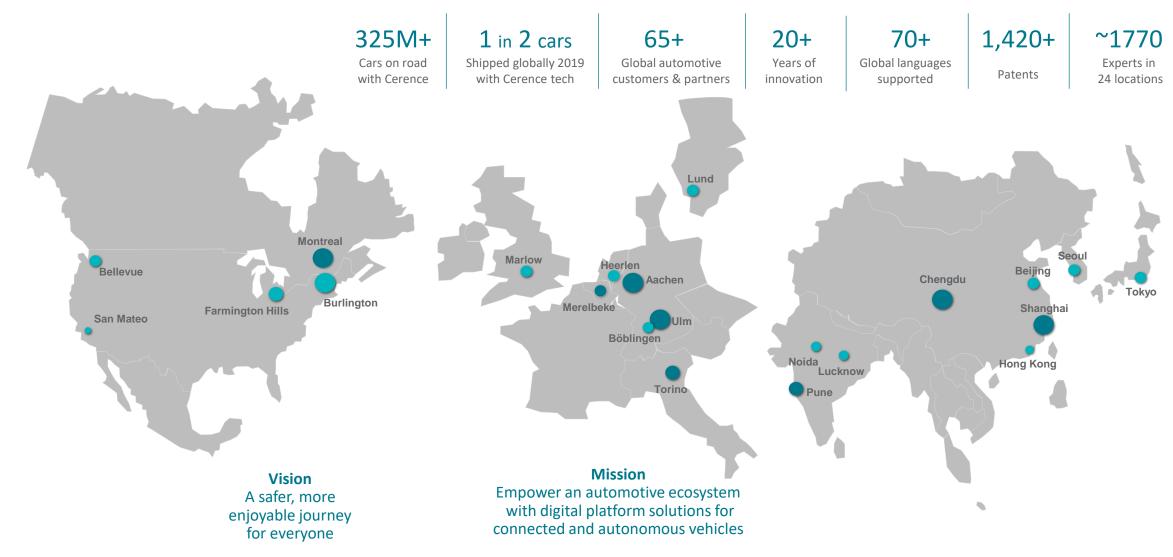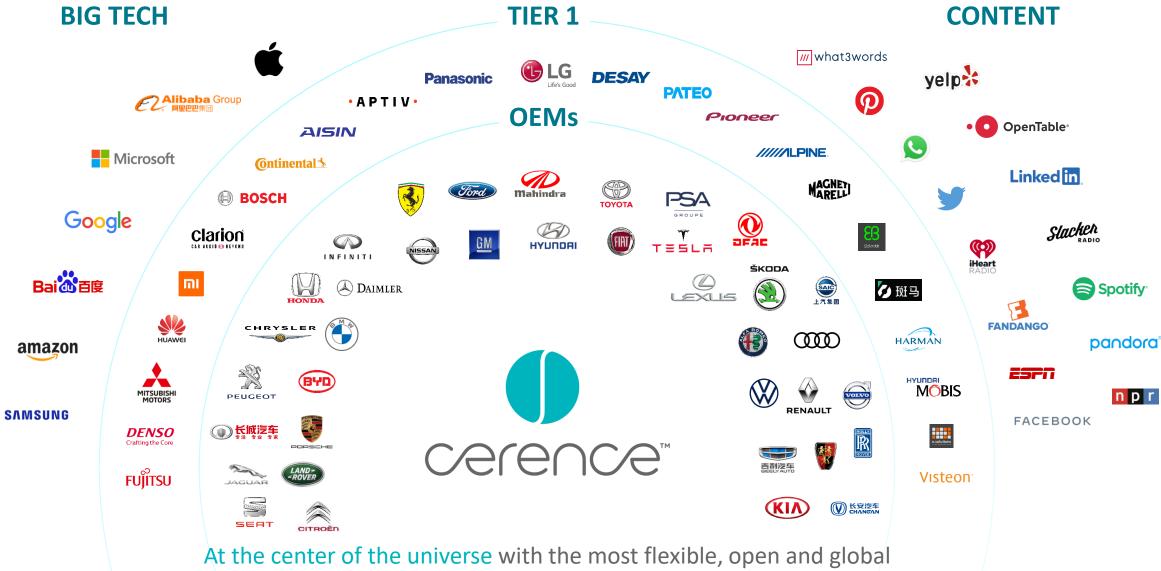# On the road to turning a boring car ride into an exciting theme park ride

Dr. Nils Lenke, VP and GM Apps BU

Cerence: An AI Leader for a World in Motion

325M+	1 in 2 cars	65+	20+	70+	1,420+	~1770
Cars on road with Cerence	Shipped globally 2019 with Cerence tech	Global automotive customers & partners	Years of innovation	Global languages supported	Patents	Experts in 24 locations

Bellevue
Montreal
San Mateo
Farmington Hills
Burlington

Lund
Marlow
Heerlen
Aachen
Merelbeke
Ulm
Böblingen
Torino

Chengdu
Seoul
Beijing
Shanghai
Tokyo
Hong Kong
Noida
Lucknow
Pune

Vision
A safer, more enjoyable journey for everyone

Mission
Empower an automotive ecosystem with digital platform solutions for connected and autonomous vehicles

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BIG TECH TIER 1 CONTENT

OEMs

At the center of the universe with the most flexible, open and global provider of AI and voice-powered assistants for the automotive industry.

A New Era of Innovation

2016 Customer AWARDS

2017 Customer AWARDS

SAIC Alibaba Partner Excellence Award

Fujitsu Ten Excellence Technology Award

斑马

Digits Dialing	Names Dialing	Spelled Destination Entry	1-Shot Destination Entry	Music by Voice	Cloud Speech	NLU	Automotive Assistant	Cognitive Arbitration	Next Gen Artificial Intelligence	Nomadic Computing Environment	Mobility Assistant
1996	**1998**	**2002**	**2005**	**2008**	**2012**	**2014**	**2016**	**2017**	**2018**	**2019**	**2020**

Digits & Commands

Digits & Names Command & Control

First Destination Entry by Voice

Large Item Lists 1-Shot Address Entry

Multi-Linguality Meta Data

Message dictation POI Search Online News Reader

Natural & Intuitive All-in-One Top Menu

AI Contextual Knowledge Personalization Hybrid

3rd Party Assistants

Dynamic Behavior Pattern Predictor

Modeling of Complex Linguistic Constructs

Transfer of Control

2011 AWARDS

CNET: Best in Show at CES

iSuppli

Int'l Telematics Update

Popular Mechanics: Editors Choice at CES

Detroit Telematics: Best Cloud Based In-Car Application

2014 AWARDS

Global Mobile Awards: Best Mobile Product or Service for Automotive

2015 AWARDS

CES Innovation Awards

2016 AWARDS

CES Innovation Awards

2018 AWARDS

CES Innovation Awards

BOSCH Invented for life

Bosch Global Supplier Award 2019 Transforming Together. Staying Ahead.

2019 Global Supplier Award

AI for a World in Motion

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The Automotive Benchmark powered by Cerence

Voice recognition on all seats

Have a chat with your S-Class

Take a geoquiz with your MBUX

Extensive personalization &
biometric authentication
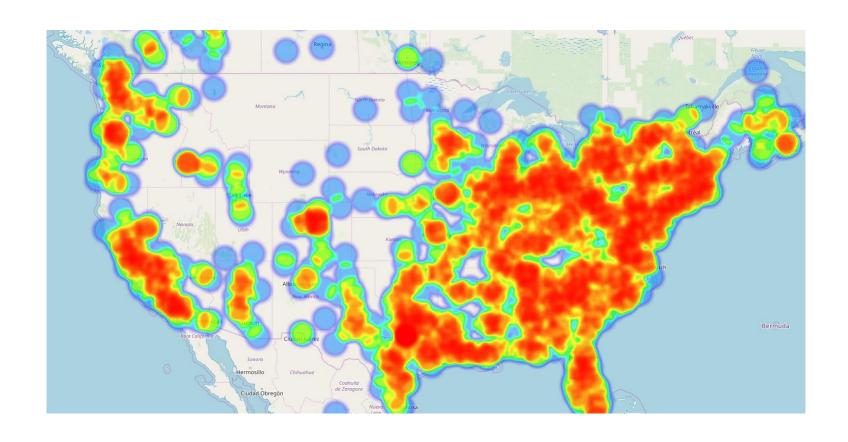
Explore the functions
of your MBUX

Explore your S-Class
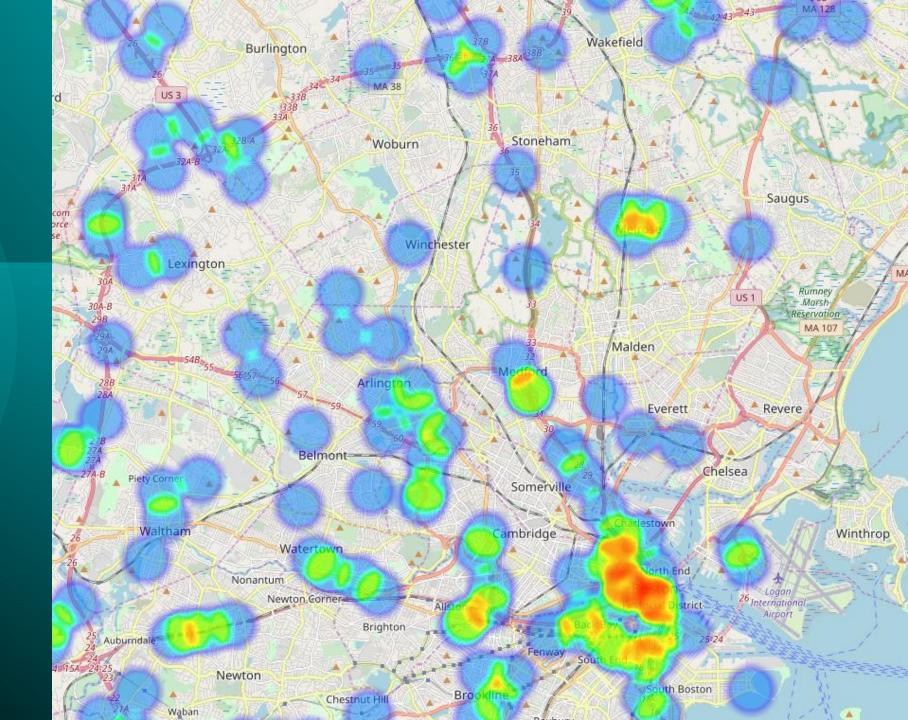
Let's get emotional

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In-lab Nuance anger/frustration detection on real, multi-OEM cloud audio

Anger/Frustration "Heat map"

In-lab Nuance anger/frustration detection on real, multi-OEM cloud audio

Anger/Frustration "Heat map"

EMMI

Automated vehicles are about to make a big breakthrough and bring unimagined opportunities to make better use of the travel time. At the same time, however, many people have a low level of acceptance for this technology because they are afraid of losing control, for example.

That is exactly what we want to change with the EMMI project.

9

But now, let's move beyond Speech

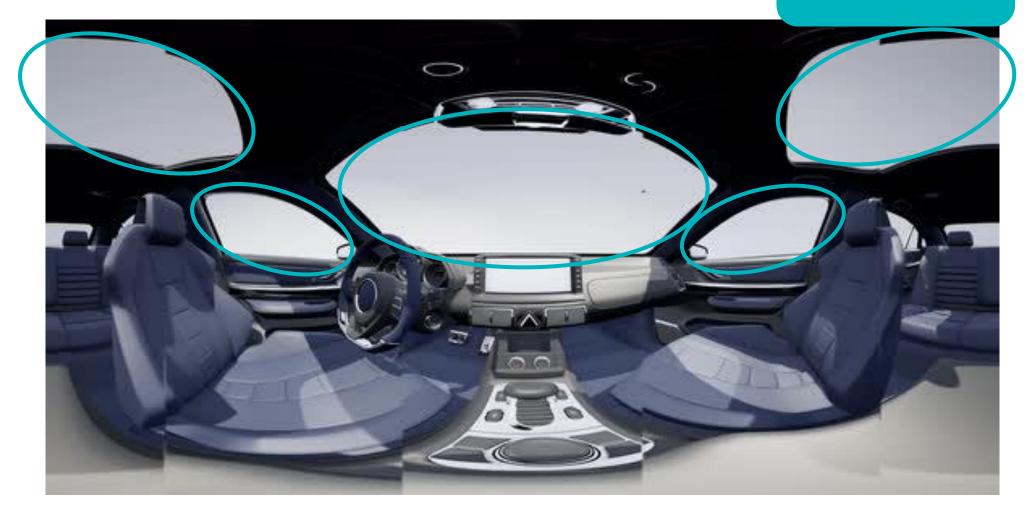# Often overlooked ....

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Can we make use of the "holes" by putting something onto them?

Or can we make the exterior part of the interior?

The surroundings do matter

TRAVELING IN STYLE... AND WITH PLENTY OF POWER

The brand new BMW M5 is the car of your dreams. Combining a 5.0l V10 with a luxury sedan is the perfect combination to win the heart of your dream girl. Just a slight touch of the throttle will both scare you and everyone else in a radius of 50 meters. Both suspension and engine are ready for you to test out the limits of the brand new BMW M5. The only car in its class that drives like a BMW.
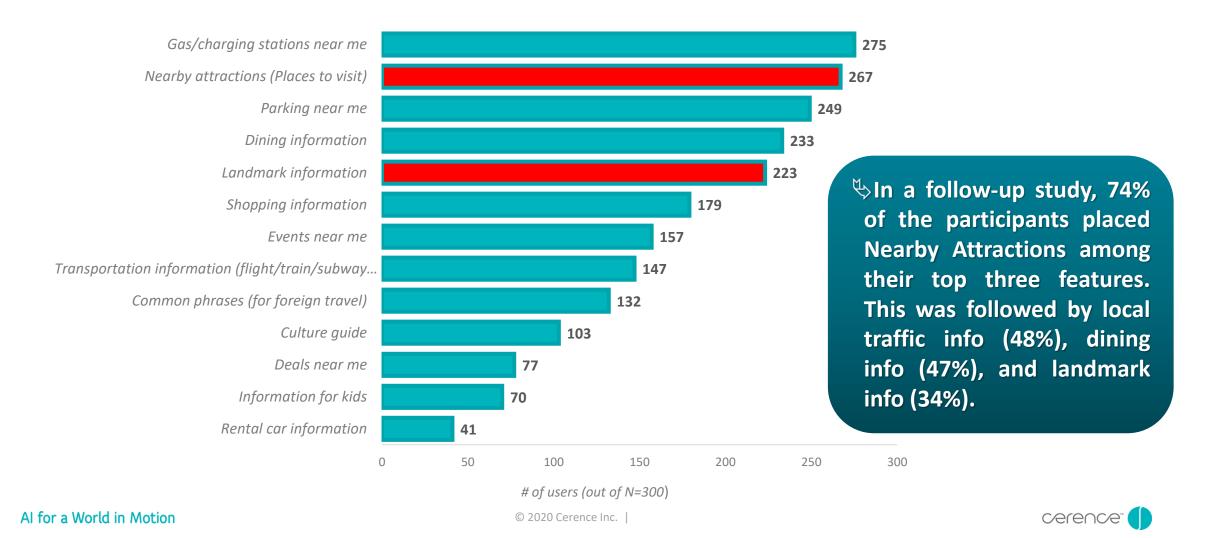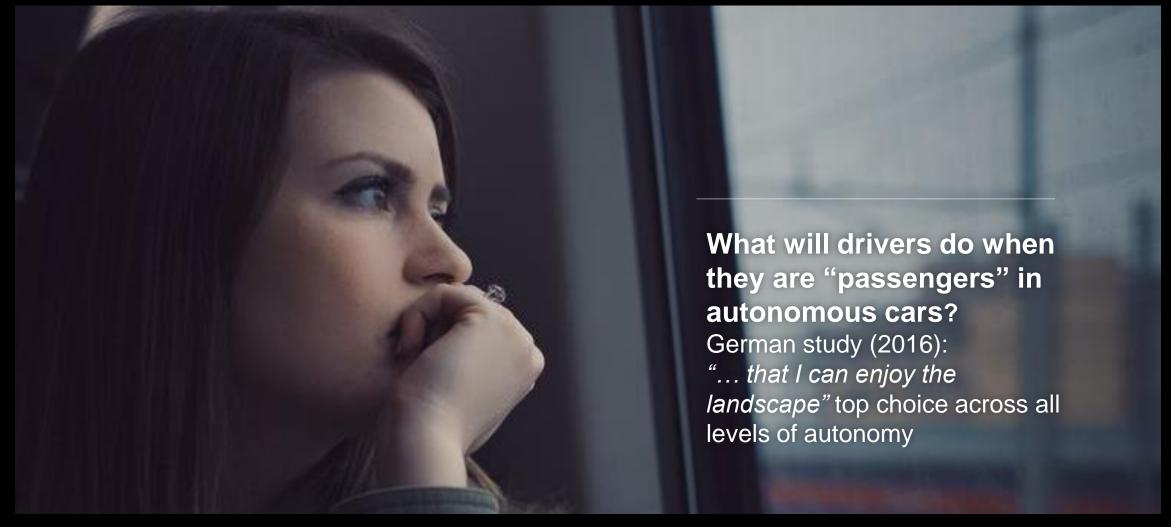

G.O.A.T.
GREATEST OF ALL TIME

Top Features of Travel App by User Choice

"What information would you like your vehicle's travel app to share with you?"

Feature	# of users
Gas/charging stations near me	275
Nearby attractions (Places to visit)	267
Parking near me	249
Dining information	233
Landmark information	223
Shopping information	179
Events near me	157
Transportation information (flight/train/subway…	147
Common phrases (for foreign travel)	132
Culture guide	103
Deals near me	77
Information for kids	70
Rental car information	41

# of users (out of N=300)

In a follow-up study, 74% of the participants placed Nearby Attractions among their top three features. This was followed by local traffic info (48%), dining info (47%), and landmark info (34%).

AI for a World in Motion

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Enter the L4/L5 Autonomous Vehicle ....

What will drivers do when they are "passengers" in autonomous cars?
German study (2016):
"… that I can enjoy the landscape" top choice across all levels of autonomy

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Cerence Tour Guide and Cerence Look as Sister Apps

TourGuide: "On the righthand side you see the Eiffel Tower"

CerenceLook: "What is that building on the righthand side?"

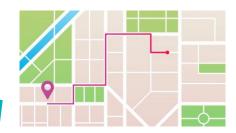**2D/3D model as index to the world around**

Navigation

What to see

lonely planet

Tripadvisor

Experience local cuisine

thefork
a Tripadvisor company

Quandoo

What to do

viator
A TripAdvisor® Company

OpenTable nce

AI for a World in Motion

How could the interior help to enhance the experience of the exterior?

Integrating Outside and Inside:
Research Project DFKI & Cerence

- Project with the DFKI Smart Textiles Lab (Berlin)

- Exploring what can be done with sensors and actuators embedded in the car seat

German Research Center for Artificial Intelligence
Deutsches Forschungszentrum für Künstliche Intelligenz

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Workshop Goals

In participative workshops with potential users we developed and discussed ideas for the application of sensor and actuator technology in car interiors in the context of emotion recognition and autonomous driving. The results of the workshops form the basis for the creation of application scenarios and the definition of (user) requirements.

Our goal is to develop new exciting interactions and user experiences in the car cockpit, especially focussed on the seat.

Focus of the workshop and research topics:
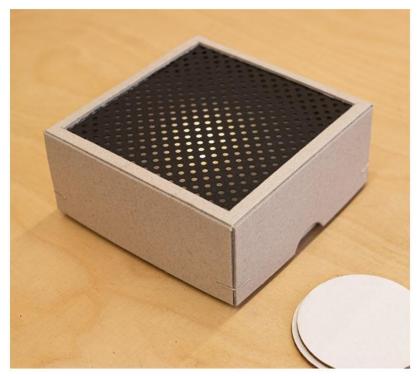
_ Insights into the mobility behaviour of the participants

_ Possible application scenarios for actuators and sensors in the cockpit in the context of emotion recognition and autonomous driving.

_ Specific application and implementation ideas for actuators in car interiors

Multisensory Interactions

People usually interact with their environment through their five senses. These do not only define whether we perceive something, but also how we perceive it. Our senses are challenged to varying degrees depending on the type of information we receive. In order to enable the participants to consciously bring all their senses into the idea process, a sensory parkour was set up. The parkour invited the participants to actively experience different sensory impressions and at the same time served as an inspiration for the creation of scenarios.

The sensory parkour was divided into four sensory areas: Smell, visual sensations, haptic sensations and acoustic sensations.

User Research – Szenario-Artefacts
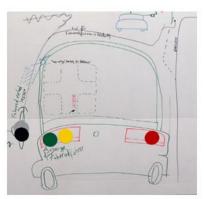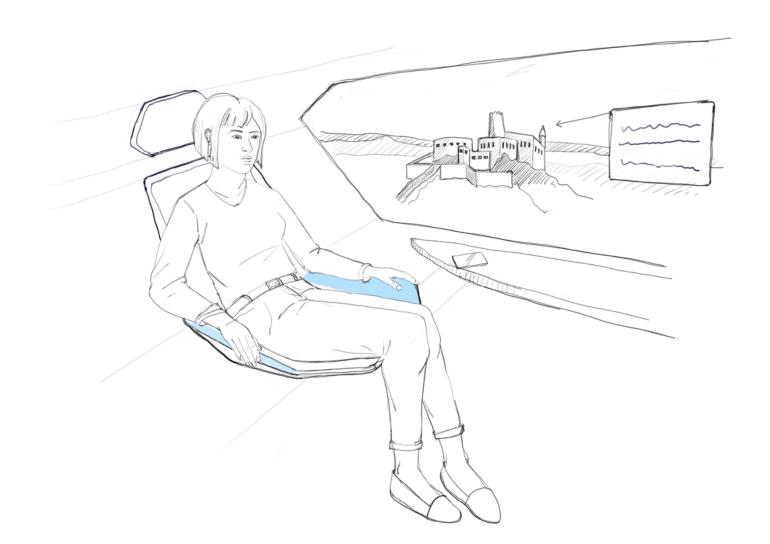
Nine Szenarios for Driving in the Future

Altogether the participants developed 9 exciting scenarios in the work-shops. Using simple methods and with the help of various materials, the participants visualized their ideas in a physical artifact. In a following presentation the groups introduced their concepts. Most concepts included multisensory enriched interactions.
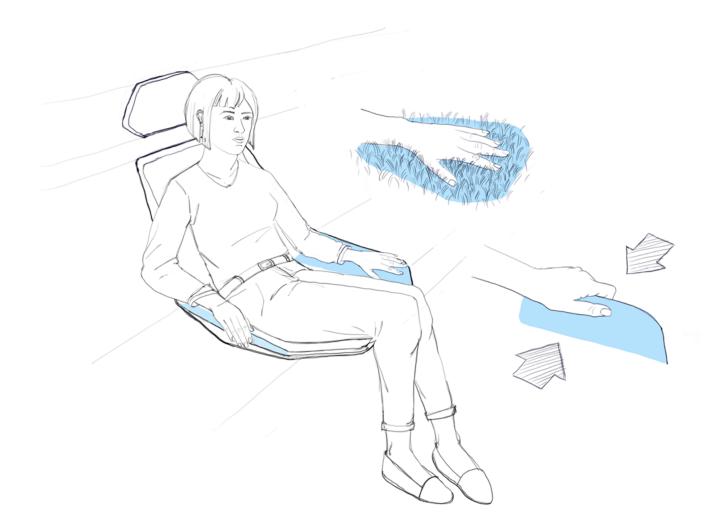
Concept – Get Actively Involved in the Journey

Feel & Shape the Journey by Interacting with the Seat

In the Exploration-Mode the journey becomes an exciting and entertaining experience. Whether informative or an imaginative story, each traveller chooses the form of entertainment himself. Through an exciting audio narrative combined with augmented reality, everyone dives into the experience of their choice. The seat supports the experience by changing shape to direct the passenger's attention in different directions, to wherever the action is. However, the passenger does not have to remain a passive listener or spectator; on the contrary: By interacting with the seat, the occupant can influence the route and thus the story. Wasn't there a dinosaur just off to the left of the road? A slight pressure on the left side of the seat and the vehicle recalculates the route and makes a short detour there. Maybe there's even something to see there that's worth getting out of the car for a short while and stretching out your legs? Or how about a scavenger hunt along the way? Through interaction with the seat, exciting games can be played with the surroundings. An AI adapts the story to the journey in real time, i.e. not the story dictates the route, but the passenger influences the story by his or her choice of directions.
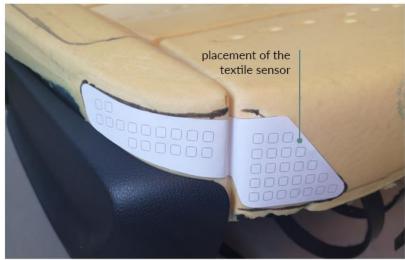
Concept – Let the Vehicle Know How You Feel

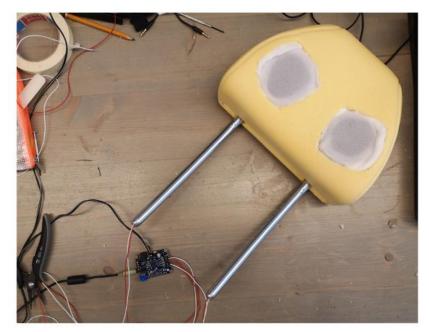## Communicate with your Personal Assistant via Haptic Communication

Imagine that your car knows how you feel and reacts to it in order to create the best possible atmosphere of well-being for you. Using a sensor integrated in the seat, the car can do just that by contactlessly measuring vital data and deriving information about the driver's emotional state. And even more: the personal assistant in the car „understands" a series of natural gestures that we make for example as a reflex to stressful or tense situations. This form of direct communication with the vehicle enables the system to react particularly fast to the condition of the passenger. If, for example, the passenger reacts to the vehicle's driving behaviour with a gesture of tension, such as clinging to the seat, the assistant could then immediately adjust speed and driving characteristics, emit a soothing scent or directly address the passenger if necessary.
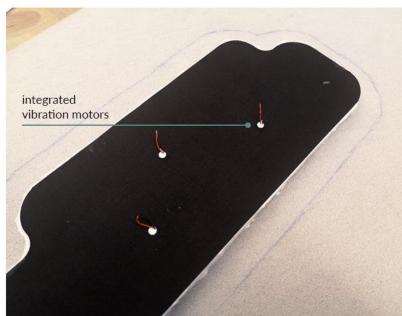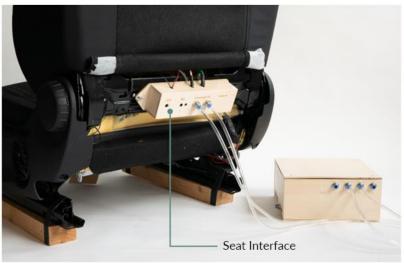
Making-of: The Seat

Integration of the loud-speakers in the headrest

placement of the textile sensor

pneumatic element on fabric

placement of the pneumatic elements

integrated vibration motors

The Interactive Car Seat

integrated loudspeakers

pneumatic elements integrated in the seat

Control box

textile sensors integrated in the seat

Seat Interface

textile sensor

12 V   Box   Compressed Air   Audio IN

New Features of the „Old" Seat

From the outside the seat looks almost unchanged, but on the inside some new features are hidden: The car seat has been modified to include an exciting new level of interaction: pneumatic elements in the side panels of the seat can inflate and deflate, thus creating a haptic communication channel between the vehicle and the passenger. Vibration motors are embedded in the pneumatic elements to model and enhance the effect. Textile pressure sensors are integrated in the front edge of the seat, which on the one hand can be used consciously for the interaction between vehicle and passenger, but on the other hand can also perceive unconscious (stress) reactions of the passenger, such as clinging to the seat edge as a reaction to an unpleasant driving style of the vehicle. In the headrest of the seat are integrated loudspeakers, which offer a further possibility of interaction.

The seat is connected via a simple interface located on its back. This is where the compressed air and external power supply are connected. At this point another important element comes into play: the pneumatic controller box, which is described in the next section.

Working prototype

More haptic & olfactory options

Soothing Scent Output Through Microencapsulation

The haptically appealing textile surface, designed in the form of lamellae, invites possibly stressed passenger to touch it, knead it and run his fingers through it. This movement alone has the potential to calm the user. However, this effect is additionally supported by an innovative technology: the textile is coated with micro-encapsulated essential lavender oil. Touching the textile causes the microcapsules in the textile to burst, allowing the scent to be emitted and develop its additional calming effect. The textile surface consists mainly of wool. On the one hand, this material is very well suited for an attractive and comfortable car interior, on the other hand the microcapsules adhere particularly well to it. The structure has a high total surface area, so the surface on which the capsules can burst is very large and the process can be repeated many times.

An additional capacitive sensor detects touches, so that the textile enables both analog interaction and digital communication with the vehicle assistant.

Textile material: 70% Wool, 30% Polyacryl
Textile Technology: Segments sewn close together

Sample 2 – Shape Change

Adapting Shape and Climate

This pneumatically actuated textile surface reacts to touch and thus changes its shape. This can be used to trigger certain haptic sensations, to adapt to the passenger's body or to provide feedback on previous interactions. However, the textile does not only change in shape. By incorporating an innovative PCM climate fiber, Cell Solution® Clima, the textile adapts to the comfort temperature of the skin. It can absorb excess body heat and release it again when the temperature drops.

The woven textile structure is designed in a way that it creates waves in a relaxed, non-inflated state. The wave structure and the dense processing of the material result in a high material density of the PCM fiber. This density is important for good temperature regulating properties. If the silicone structure underneath the textile inflates, the wave structure offers sufficient space for expansion, but also limits this expansion from a certain degree.

In addition to PCM, wool was processed as well. This material is dirt-repellent, flame-retardant and sustainable and is already used in car interiors.

Textile materials: Wool, Spandex, Climate Fibre (PCM)
Textile technology: Woven, attached to silicone body
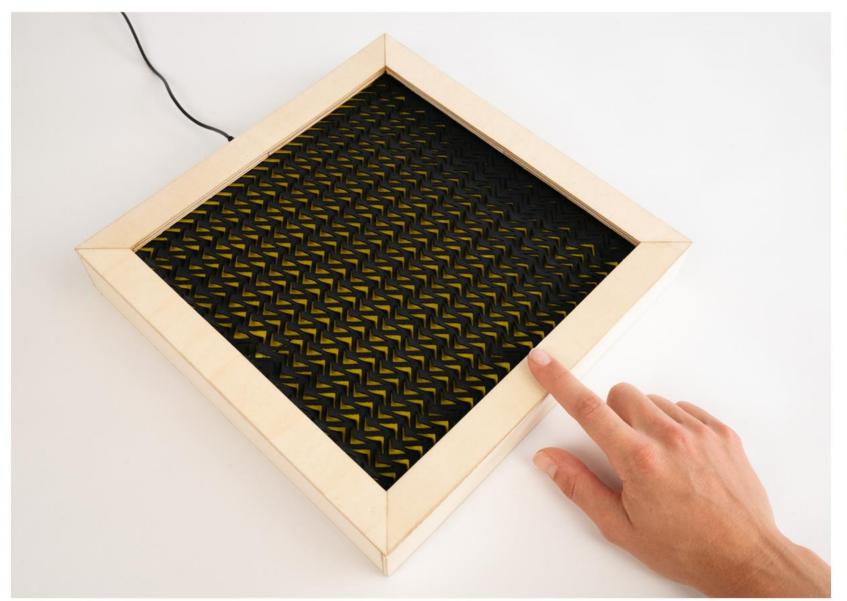
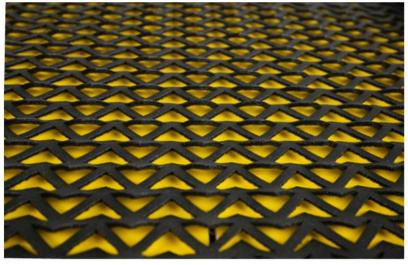# Making-of: Sample 2 – Shape Change
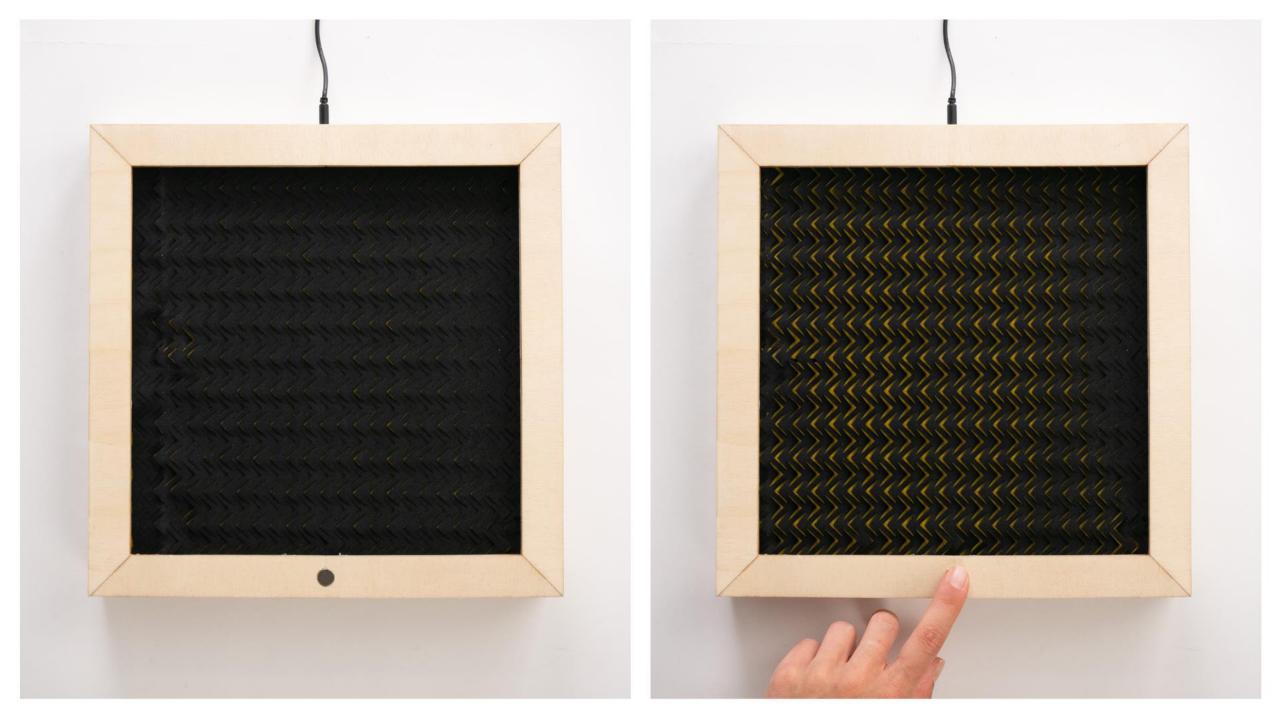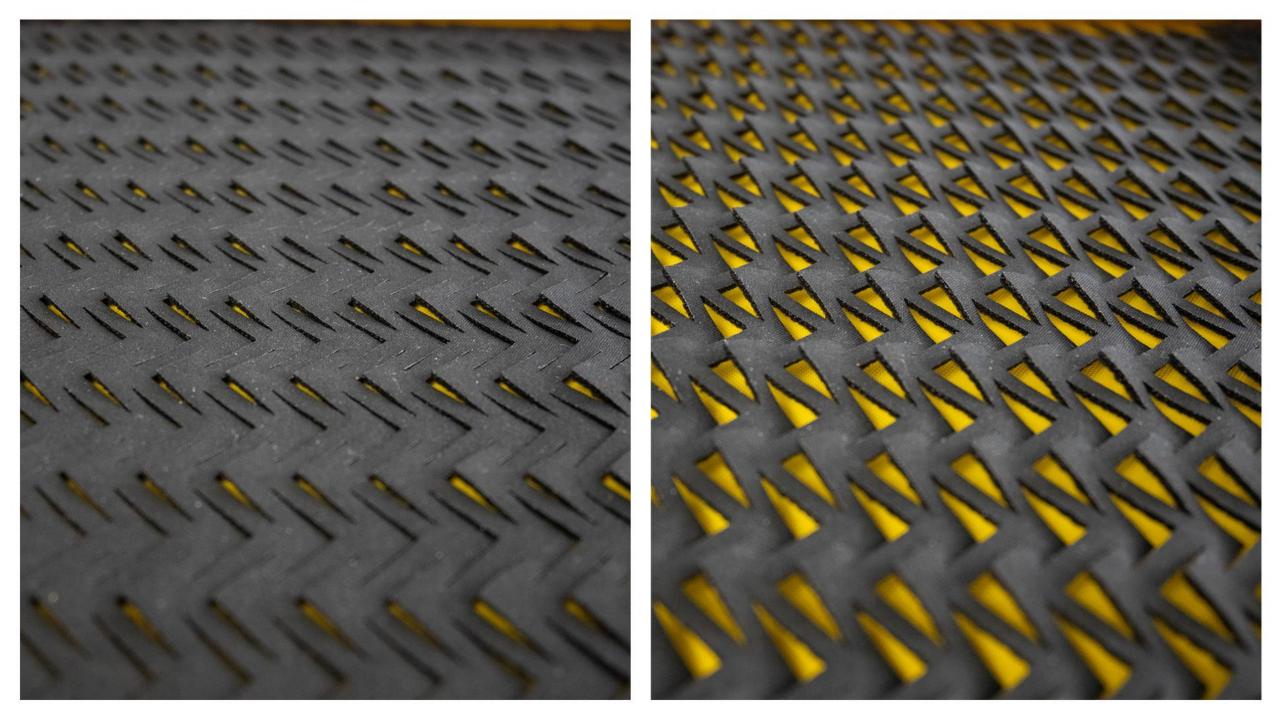
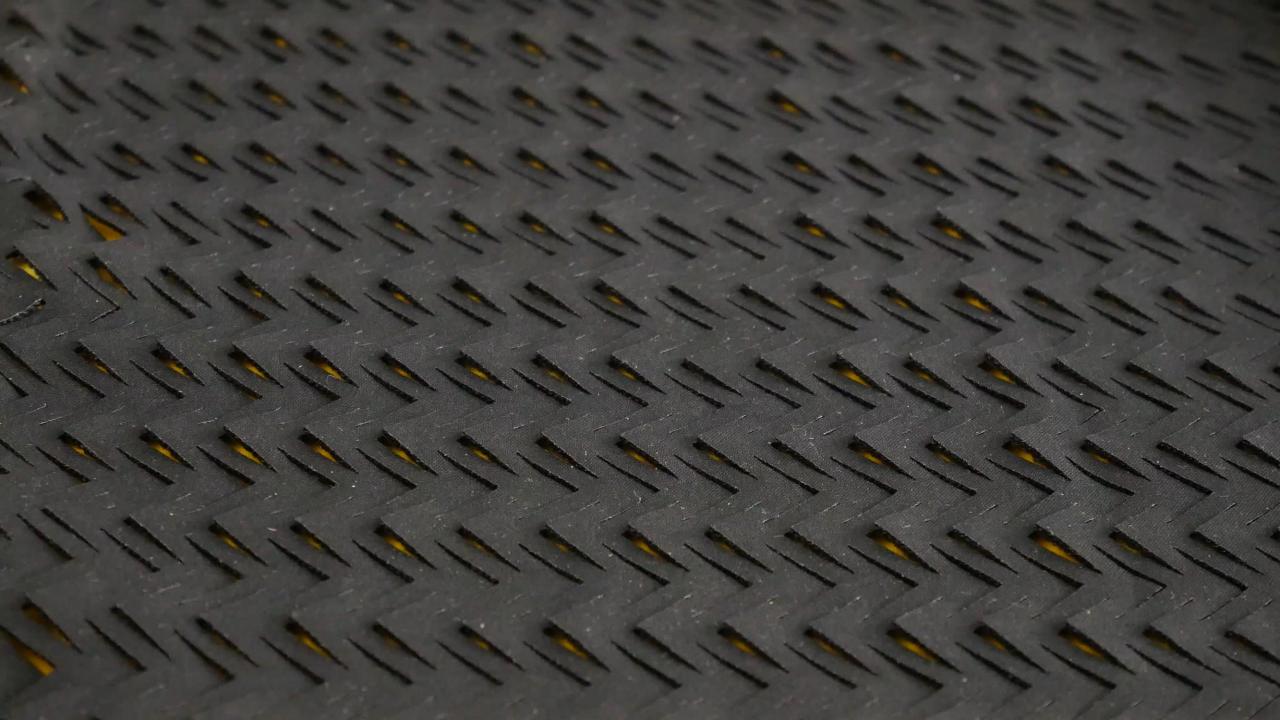# Sample 3 – Surface Change

The Adjustable Atmosphere

This textile surface is defined by its organic laser-cut slits and the colored background behind them. When touched, the black surface stretches and allows the light background to shine through. The color of the surface seems to change, which can be used to create different lighting moods and atmospheres in the interior: While the black surface creates a rather sterile, elegant atmosphere, a warm, cosy atmosphere can be created by bringing out the yellow color. Additional backlighting could further enhance this effect.

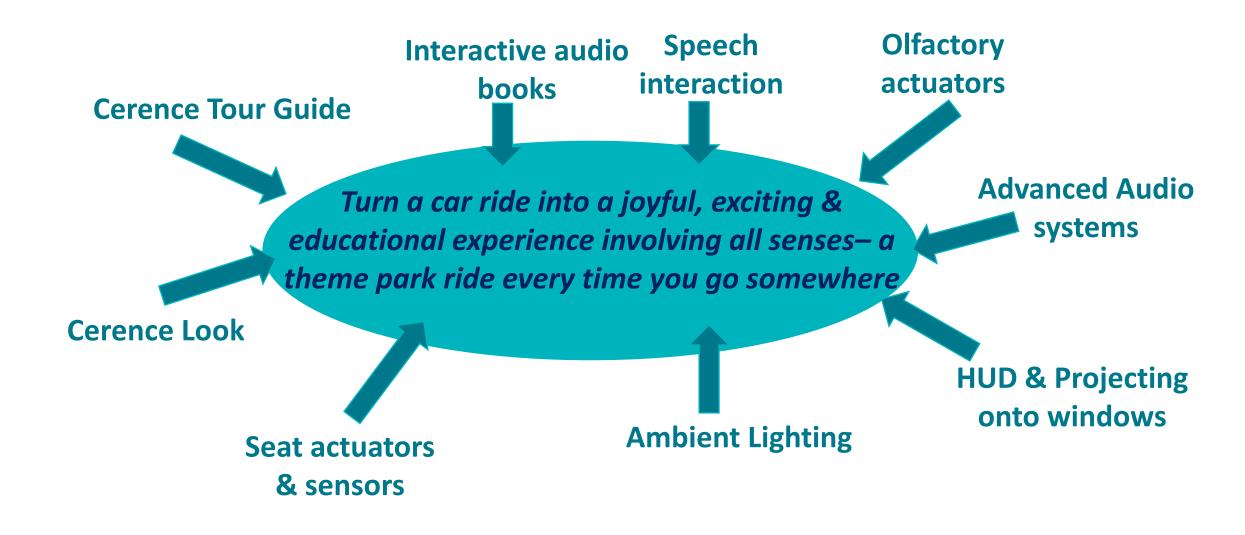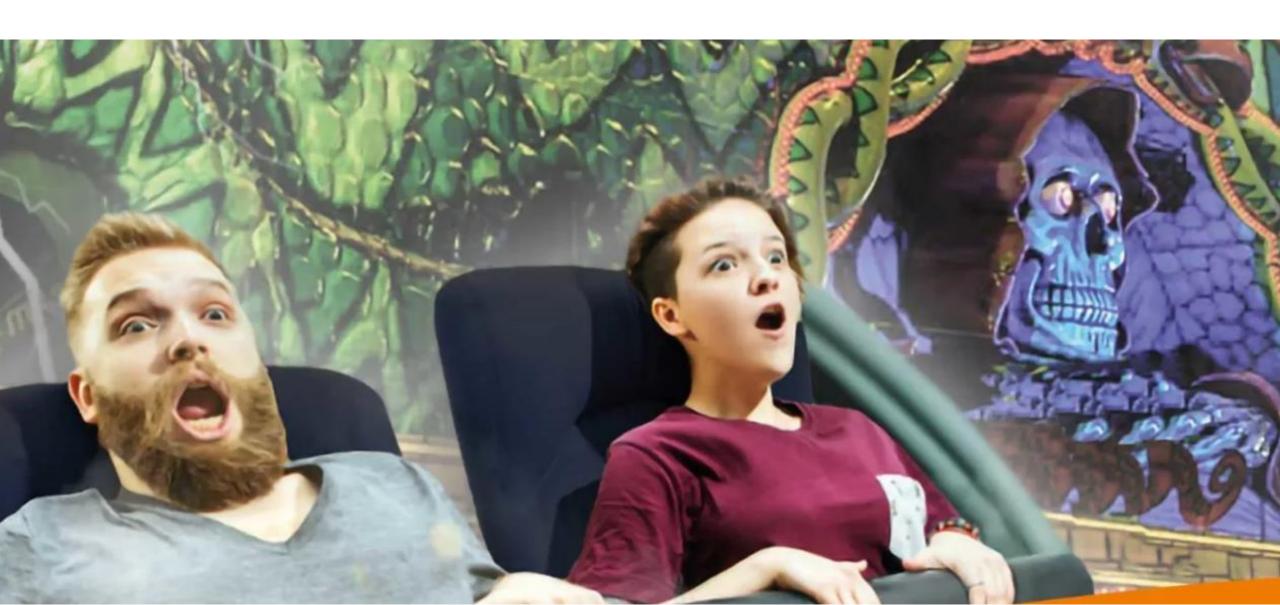Textile technology: Laser-cut textile, second fabric layer attached behind

So where is this headed?

Interactive audio books

Speech interaction

Olfactory actuators

Cerence Tour Guide

Advanced Audio systems

Turn a car ride into a joyful, exciting & educational experience involving all senses– a theme park ride every time you go somewhere

Cerence Look

Seat actuators & sensors

Ambient Lighting

HUD & Projecting onto windows

Questions?

Thank you!