Alternatives: Exploring the Car's Design Space from an Experience-Oriented Perspective

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ABSTRACT

Cars play an important role in many individual and social practices, often resulting in positive experiences, such as the freedom of the daily commute, the joys of intensive conversations, or the excitement of a discovered place. In this paper, we use the lens of *Experience Design*, – particularly the notion that meaning and positivity is related to the fulfillment of universal psychological needs – to explore the potential of an experience-oriented approach to design for interactivity in and through cars. Examples of designing for competence, autonomy, relatedness, security, stimulation, and popularity open up a space for novel articulations of cars. We show how each need is already apparent in car-related practices and explore how focusing on a particular need will become apparent in specific conceptual sketches.

Author Keywords

Experience Design, User Experience, Automotive, Design Methods

General Terms

Design; Human Factors;

INTRODUCTION

Cars play an important role in our daily lives [37,38]. In Germany, every inhabitant owns more than half a car [36], often used on a daily basis. Sixty percent of all employed Germans use the car to commute to work [35]. Cars became proliferated consumer goods, provided by manufactures to a highly competitive market. This created an – at least felt – necessity to provide a continuous stream of innovations. However, from *Blind Spot Information Systems* to fully automated parking assistants, most of these innovations serve the same two purposes: to make driving more exciting or to enhance the safety and "comfort" of driving.

Unfortunately, this quite reasonable focus on driving and safety excludes many other meanings and functions cars already have. First of all, the car supports a need for autonomy: it is a materialization of fantasies of and desires

for independence [9]. The car is one of the few interactive technologies, which envelops its users completely. This creates a secluded, highly structured space, which offers security. The car becomes a mobile retreat, an extension of one's house or apartment. It further offers time and room to contemplate. For example, commuters frequently value the time spent in the car and some describe it even as the best time of the day [1]. However, while the car can be a shelter, it can also be very social, for example, by providing a perfect place for good conversations [24].

The car as a perfect place to talk (relatedness), as a shelter (security), or as a way to feel independent (autonomy) hint at a rich set of individual and social practices related to the car – beyond convenient transportation and pleasurable driving. The present paper's objective is to systematically explore the design space of technologically-mediated, positive, meaningful experiences in cars beyond driving and safety. We start with a brief discussion of our experience-oriented design approach to lay the ground for a more in-depth discussion of potential alternative ways to think about in-car interactive systems. Each "alternative" is then illustrated with a brief conceptual design sketch. Note, that our focus is not on particular technical systems (e.g., navigation systems), but on the potential experiences, we may take into account, when designing car-related systems.

EXPERIENCE DESIGN AND CARS

Over the last decade, a number of alternative approaches to the design of technology were developed, mostly revolving around the themes of experience, emotion, story, and meaning (e.g., [4,11,16,27]). *Experience Design* [18] understands experience, albeit intangible, as a crucial part of any artifact. Accordingly, it must become an explicit objective of design, not only an appreciated by-product left to the appropriation of users. In this view, experiences are stories emerging from interacting with the material. And both have to be designed: the experiences as well as the material form, which facilitates and shapes those experiences.

Almost all approaches to an experience-oriented design stress emotion as an important ingredient of any experience – McCarthy and Wright [27], for example, call it the "emotional thread". While, however, most authors will agree that the deliberate design of (or for) experience should result in positive and meaningful moments, they

remain silent about what actually creates positive emotion and meaning.

In the context of research on life satisfaction and happiness, Diener, Oishi, and Lucas [5] highlight "need and goal satisfaction theories" as a major explanation for positive experiences. In other words, an experience becomes positive and meaningful, if it fulfills a psychological need. While a number of models address the content of those needs in slightly different ways [26,31,33], their substantial overlap hints at their universal nature. Sheldon and colleagues [34] reviewed those models and compiled a comprehensive list of the top ten psychological needs. They further provided a questionnaire to measure intensity of need fulfillment in a given episode. A number of studies of satisfactory life events revealed a strong correlation of intensity of need fulfillment and positive affect. Hassenzahl and colleagues ([13,17], see also [29]) replicated these studies, but focused on technology-mediated experiences. They also found a strong correlation between need fulfillment and positive affect. Based on this, they identified a concise set of needs to use in the context of *Experience Design* (Table 1). One may understand these as distinct, empirically tested and psychologically sound sources of pleasure and meaning. Based on this, the challenge of *Experience Design* is to provide need-fulfilling practices, and to create and mediate them through technology [14].

Need	Description
Autonomy	Feeling that you are the cause of your own actions rather than feeling that external forces or pressure are the cause of your action
Competence	Feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective
Relatedness	Feeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared of
Popularity	Feeling that you are liked, respected, and have influence over others rather than feeling like a person whose advice or opinion nobody is interested in
Stimulation	Feeling that you get plenty of enjoyment and pleasure rather than feeling bored and understimulated by life
Security	Feeling safe and in control of your life rather than feeling uncertain and threatened by your circumstances

Table 1. Overview of a set of needs suitable for *Experience Design* [13,14,18,34]

From an *Experience Design* perspective, a car, thus, becomes a bundle of potential experiences (i.e., need-fulfilling practices) created and mediated through its materiality, i.e., form, material, and especially interactivity. For example, imagine driving on a winding, coastal road. You can literally "feel" the power of the engine, the perfect

functioning of the technology, and the "oneness" with the car. This is a specific experience, tied to a certain individual practice involving sporty driving and coastal roads, which ultimately becomes positive and meaningful through the fulfillment of a need for competence. Mastering a demanding driving situation provides a feeling of being "very capable and effective in your actions rather than feeling incompetent or ineffective" [34]. The car itself provides functionality and certain types of interactions, which create and mediate particular experiences. It needs a powerful engine, a tight coupling of the driver's input and the car's response, and many more to finally create at least a potential for a competence experience. In other words, the technology itself "articulates" certain experiences.

In fact, the "driving experience" itself is the major, consciously designed experience articulated by a modern car. Especially premium car manufactures are well aware of the fact that they do not sell cars but a particular driving experience, often modeled as an individual competence experience inspired by practices and images of the racing sport (see [30]). The car is understood as a technology platform articulating individual performance and power. "Power", "speed", "competition" and "aggression" are important attributes of this experience. As Redshaw described in an analysis of a typical car ad: "The grill could be considered a snarling set of teeth and the body mouldings around the wheels suggest well muscled power and grunt. The streets are framed as concrete jungles" ([30], p. 40).

While it seems only natural for car manufactures to focus on the core aspect of their technology – driving – when it is about creating an experience, this must not necessarily be so. As already mentioned in the introduction, and even more apparent when looking at the needs people have, there are certainly meaningful individual and social practices related to the car beyond the mere "joy of driving". But unfortunately, only a few true attempts to provide according experiences exist. Those mainly focus on social interaction – "relatedness experiences" in the terms of needs. Some studies, for example, acknowledge the importance to design for all passengers and not only the driver – the front passengers [10,19] or children in the back seat [39]. Juhlin [20] expanded the focus beyond the interaction among people in the car. Through artifacts, he explored the possibilities of reducing the barrier between the interior of the car and the environment to improve the social interaction between drivers. Knobel et al. [22] recently demonstrated how to explicitly design a technology mediated positive relatedness experience by harnessing the social practice of a "motorcade".

While these attempts to broaden the richness of experiences created and mediated by cars seem promising, they fail to systematically explore the many potential sources of meaningful experiences, suggested by the distinct needs. Drawing on Gaver and Martin's [12] design-oriented work

on information appliances, we discuss the car in the light of each of the six needs, exploring potential experiences and requirements. In addition, a conceptual design is provided to make designing for a particular type of experience in the car more graspable. All in all, this is meant as providing a starting point for an experience-oriented design of interactive in-car systems.

ALTERNATIVE

In the following, we explore potential experiences created and mediated by a car from the perspective of the six different needs outlined above (see Table 1): competence, stimulation, security, relatedness, autonomy and popularity.

Competence

A competence experience is the feeling of being "very capable and effective in my actions, as opposed to the feeling of incompetence and inefficiency" [34]. Individuals experience competence when mastering a situation, that is setting a challenging tasks and accomplishing it successfully. For example, reaching the summit of a demanding mountain will make you feel competent and capable. Note however that competence experiences, like all other experiences, do not necessarily require outstanding activities, such as climbing a mountain. Potential competence experiences are everywhere, be it a deadline, a test at school, or being an expert on all space ships featured in the *Star Wars* saga.

The pleasure of driving a powerful car, being in control, literally becoming one with the car, is a typical competence experience. Interestingly, there are a number of more mundane car related activities, such as parking or navigating to a particular destination, which can be a source of pleasure from competence as well. A competence experience affords providing people with activity and choice. A fully automated parking assistant, for example, may be convenient and reassuring for some drivers, at the same time it removes an opportunity for a satisfying competence experience. Accordingly, many advanced driver assistant systems are at odds with the notion of competence [6].

Especially, navigation systems frame way finding often solely as a problem and overlook the many different shades of support possible to employ to strike a balance between feelings of security and competence. A conceptual design exploring this is *Minimal Navigation*. Typical car navigation systems work on the assumption that drivers do not know the way at all. It ignores the driver's prior knowledge and disregards existing way finding skills. Rather than to provide assistance in problematic situations only, navigation systems take permanent control, actually assuming responsibility for the way finding and issuing commands to the driver. It takes away skills, instead of empowering its user. *Minimal Navigation* (Elisa Böll, supervised student project) is different. It leaves the activity to the driver while providing only subtle hints in the case the driver feels lost.

Minimal Navigation consists of only two vibrating motors positioned at the sides of the seat and felt on the side of the upper thigh (see Figure 1).
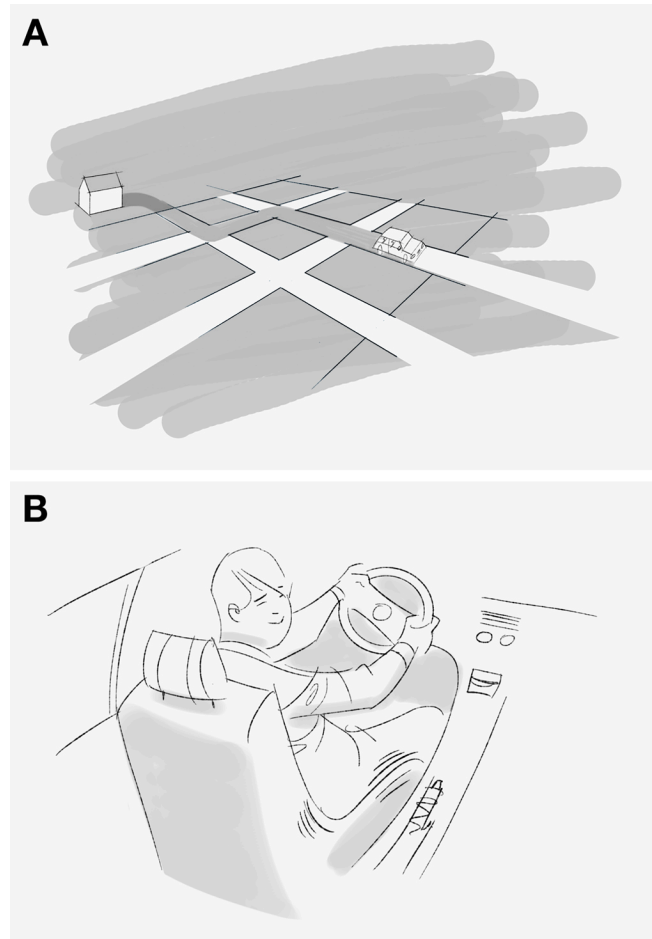

Figure 1. (A) *Minimal Navigation* **creates the feeling of knowing a route and driving proficiently while being guided by the navigation system; (B) Vibrating motors, which are positioned on each side within the seat, prompt the driver to perform the respective manoeuvre (lane change, make a turn).**

The actual side (left, right) provides the direction for an upcoming manoeuvre, a single burst of vibration prompts a lane change, and a double burst prompts a turn. Empirical explorations with various forms of prototypes revealed that this set of simple prompts is sufficient to guide a driver. Deviations from the route are not announced and, thus, not experienced as negative. The system would simply recalculate the route. This may not lead to the most efficient route, but is very unobtrusive and assumes the driver to be in control. In fact, the tactile prompts are unobtrusive and easily ignored in case the driver knows the route. All in all, this conceptual design attempts to provide the feeling of having competently mastered the route while being subtly supported. It provides an opportunity for a competence experience apart from mere driving. In general, competence requires the feeling of being in control, having done something, having faced and mastered a challenge. This is

at odds with interactive systems, which announce themselves to be "smart" or "intelligent" and take control. What is needed is an alternative layer of technology, able to subtly provide support, without corrupting the user's feeling of agency. It needs to be still me, who actually drove, parked or found a way – even when the car played a crucial role in these experiences.

Stimulation

A stimulation experience is about the feeling of getting "plenty of enjoyment and pleasure rather than feeling bored and under stimulated by life" [34]. People experience stimulation, when, for example, curiously eavesdropping on a conversation between strangers [3]. They think: "Isn't this interesting" and come up with stories revolving around what they heard, developing it further in their imagination. Another example is to travel to foreign places or to simply take a new way home now and then [25].

A car provides many options to satisfy a desire for stimulation. Cars allow for traveling through unknown territories in a particularly safe way. Just like romantic explorers, people can use the car to discover interesting places and to get a general feeling of a landscape, they are fond of. Other than by plane or by train, it is easy to spontaneously deviate from a set route. One can sit back and enjoy watching the landscape passing by. And even if the landscape does not offer spectacular sights, a little imagination can forge a stimulating engagement with our surroundings [8].

Globetrotter is a conceptual design for a stimulation experience aimed at intensifying the engagement with the passing landscape. Many people spend considerable time in the car. Imagine a sales representative, travelling hundreds of kilometers alone and isolated from passing places. However, there is much to discover, and while dedicated sales representatives may not spontaneously leave the autobahn, they may spare at least some time to engage and learn about the places they pass. This happens through auditory information about selected places along the autobahn, framed as a location dependent "radio broadcast". This is supported by a vague display in the shape of an abstract pointer (on the heads up display, for example), pointing in the direction of the place currently featured. Other than many available tourist apps, the *Globetrotter* is designed to make travelling through a landscape stimulating. The experience to convey is one of a front-seat passenger, who knows the way around a place, telling amusing, little stories and occasionally pointing out landmarks. It is not about the most convenient coffee shop or Wikipedia blurbs. The objective is to stimulate by telling a located story and drawing attention to the surroundings (instead of, for example, to information or pictures displayed on a screen) to sparkle imagination rather that to satisfy a need for "information" (see Figure 2).

The gist of stimulation is the new and interesting. It is not necessarily about useful or exhaustive information, but about ways to inspire people, to help them to engage with their lives – for example, by making history or other aspects of the no-man's-land adjoining an autobahn more vivid.
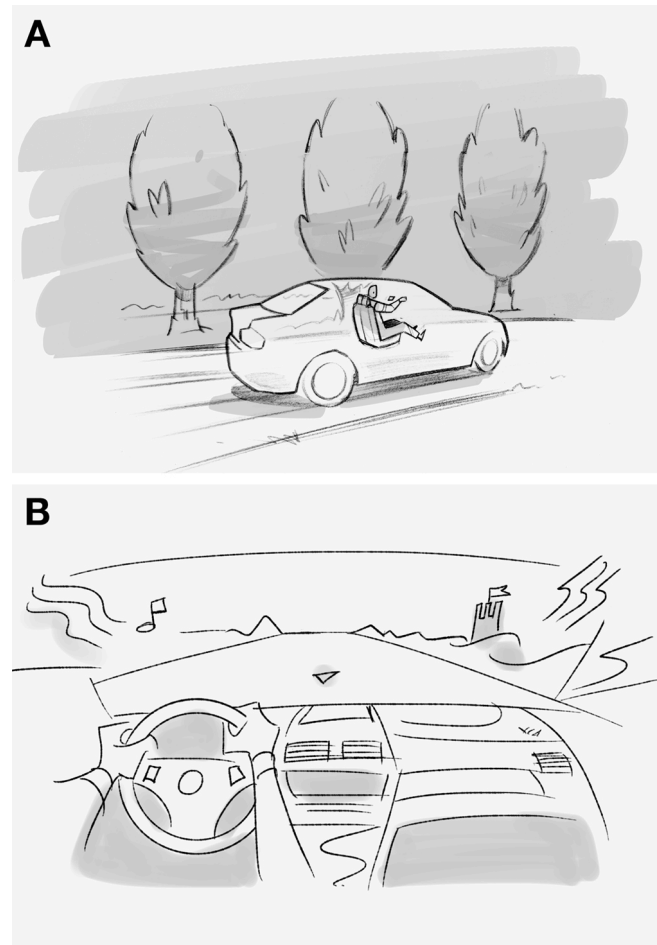

Figure 2. (A) The *Globetrotter* tells stimulating stories about the landscape; (B) Auditory information about points of interest are presented and a pointer links those to the passing landscape.

Security

A security experience is the feeling of being "safe and in control of your life rather than feeling uncertain and threatened by your circumstances" [34]. Rituals and routines provide security. People use a number of recurrent activities to structure their daily lives. Take the morning ritual of preparing coffee as example. This is often a well-practiced, ritualized activity, which not only produces tasty coffee, but also helps settling into the day. Besides rituals, familiar things provide a sense of security, such as a stuffed animal, which makes it easier for the toddler to stay overnight at the grandparents'. Or imagine travelling. When being overwhelmed by a foreign culture, its sights, sounds and tastes, a local branch of a popular worldwide franchise can turn into an island of familiarity, creating a meaningful security experience.

From the perspective of the need for security, a car offers opportunities through the mere fact that it entirely surrounds people and creates a controllable space. This familiar, sometimes even personalized space, provides support and protection in uncomfortable situations. In addition, the car is often itself an integral part of routines and rituals, such as the daily commute. For commuters, the secluded, protective space coupled with the highly routinized task of driving, creates an ideal moment to contemplate and to "think things through". The car and the activity of driving sets the stage for transforming time "lost" in a commute into a valuable part of our own daily routines.
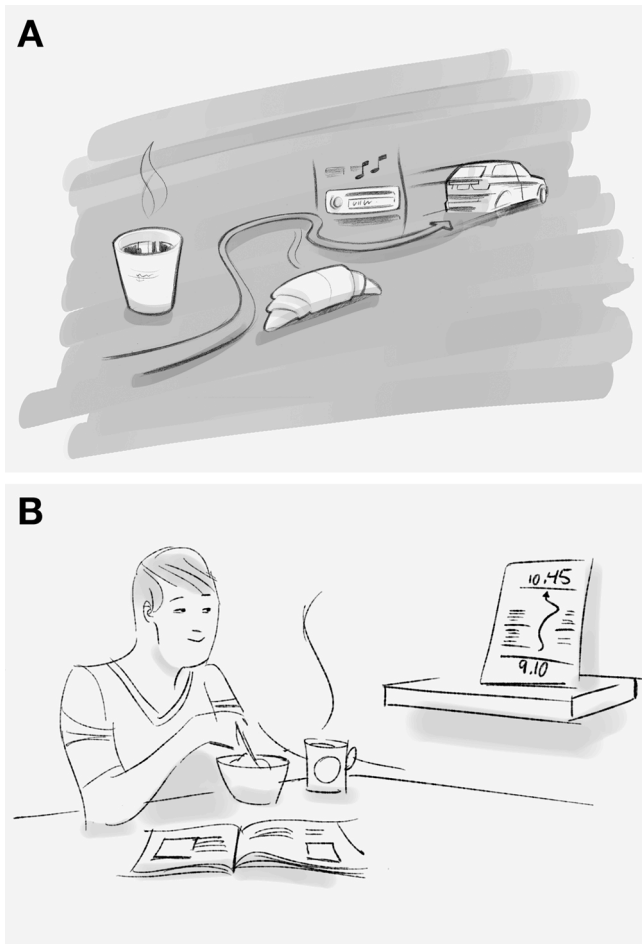
Figure 3. (A) The feeling of having control over the daily commute helps to maintain and improve our daily routines; (B) *Look into the Future* provides a glance of our daily trip to work.

The conceptual design *Look into the Future* aims at supporting morning routines and the daily commute. While we get up and ready, we often cannot entirely enjoy this time, because of the often-unpredictable morning commute. Will there be the usual traffic jams or even more unpredictable problems ahead? Questions only answered the moment the navigation system is turn on in the car. Unfortunately, at this point, our options for reacting, for

example, to a looming traffic jam (or an unexpected free road) are limited. We either arrive too late or too early. *Look into the Future* shifts this "moment of truth" by providing a real-time overview of the commute, when still being at home. It constantly predicts the time necessary for the commute based on the current traffic situation and displays the arrival time, given the user would leave the very moment (see Figure 3). The commute itself is visible at a glance at any time. *Look into the Future* urges us to rush, when being late, and provides a relaxing feeling, when there is still time left. In addition, through its simple and transparent feedback, users can build up a better understanding of patterns in morning traffic to incorporate this into even more relaxing and enjoyable rituals.

Security is about routines and rituals. According systems can either employ a strategy of removing obstacles to good routines (e.g., *Look into the Future*) or might even seek to establish new routines. Note that routines are not necessarily about convenience or efficiency. Furthermore, in contrast to competence, routines and rituals do not require challenge. They must lend themselves to a medium complex, structured and always-same activity, which is in good part physical enough to become highly automatic.

Relatedness

A relatedness experience is the feeling of having "regular intimate contact with people who care about you rather than feeling lonely and uncared for" [34]. There is a wide variety of ways to create the feeling of relatedness [15], ranging from intimate, physical moments, such as hugs, touches and kisses, to being part of a cheering supporter crowd watching a football game of a favorite club.

A car is already social in many ways. It physically connects people, by allowing for flexible and spontaneous travelling. In addition, the confined space of a car provides an ideal space for good and even intimate conversations. It is a quiet spot, removed from the world outside, often shared for a substantial time, with not many possibilities to move away, but enough stimulation (e.g., passing landscape) from the outside to not feel compelled to talk continuously. Besides the possibility of having conversations with other passengers, the car is also an ideal place to communicate with friends. For many commuters, the time in the car in between work and family is a time to call friends [1,21].

Together Alone draws upon being in the cars as the ideal moment to spend time with others. It presents those friends currently in their cars and displays the amount of shared time left for exchange (see Figure 4). Regardless of the region in which each is driving or the destination they are heading to, it is the simultaneous activity of driving, which opens up an opportunity to spend time together and talk – just as if both would be in the same car. *Together Alone* provides the feeling of undertaking at least a part of individual journeys together.
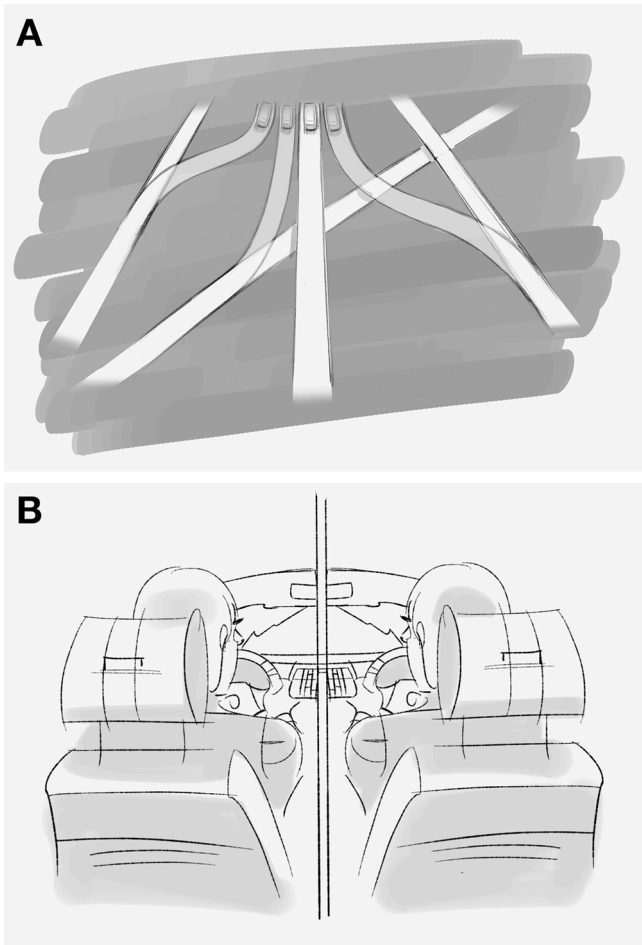
A

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Figure 4. (A) *Together Alone* **creates the feeling of being accompanied by friends while driving; (B) A display shows our friends who are driving elsewhere and visualizes the remaining time share in the car.**

In the age of social media, relatedness experiences in their different forms ranging from a more "ambient sociability" (i.e., being aware that one is no alone) to fully-fledged interpersonal exchanges, are ubiquitous. However, the car is – at least in Germany – mostly used alone and ideas about social activities in cars only rarely go beyond a car phone or a *Facebook* integration (mostly switched off when the car is faster than 5 km/h). To understand the car as a social place, with all the potential practices it allows for, has a great potential [7,20,22].

Autonomy

An autonomy experience is the feeling of being "the cause of your own actions rather than feeling that external forces or pressures are the cause of your actions" [34]. People experience autonomy in situations free from external restrictions. Being free to follow self-set ideals and pursuing goals in a way in line with own principles are typical. There are many practices and situations, which provide people with the feeling of freedom and independence, such as keeping little secrets.

The car is strongly associated with freedom and autonomy. This is especially pronounced in rural areas, where possession of a car is the first step towards independence for young people [30]. When being alone, the car provides a space, where people can be just the way they want to be – singing out loud, nose-picking, and giving in to all kinds of emotions [2]. The car makes them feel unobserved, taking away concerns of making a fool of oneself. In a study about personal experiences of women while commuting [1], the women often describe the time in the car as "personal private time." Especially working mothers enjoyed this because they are very busy during the day. They report feelings of "being free as a bird" during their commute.
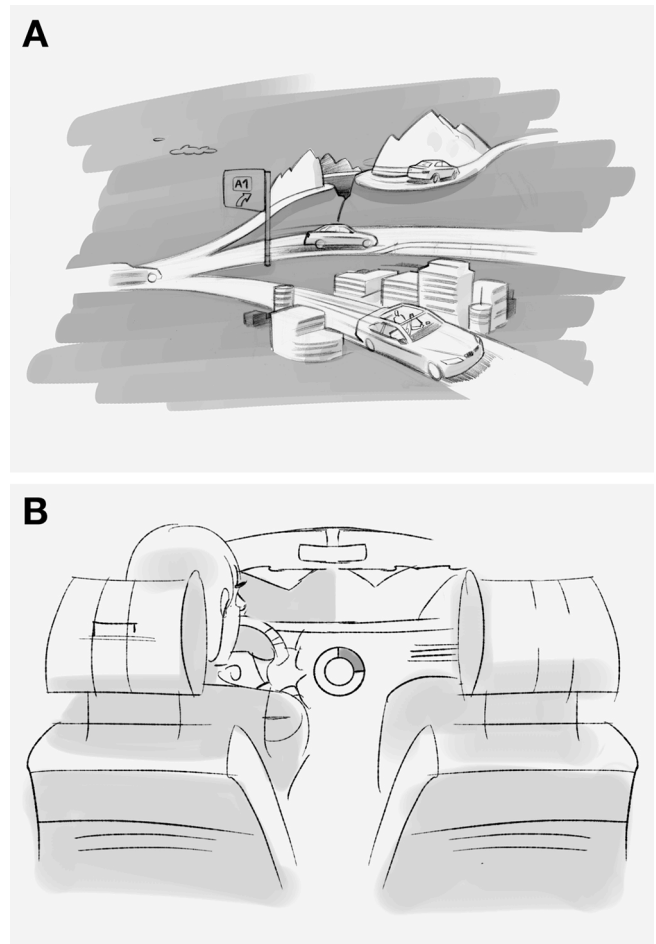
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Figure 5. (A) *All Roads leads to Rome* **creates the feeling of being free; (B) The destination is permanently displayed without presenting a specific route.**

Although, autonomy is ubiquitous, when it is about cars, some in-car systems do no acknowledge this. Navigation systems, for example, restrict freedom rather than promote it. *All Roads lead to Rome* uses an abstract representation similar to a compass to only roughly point out the direction to the destination, instead of suggesting a single, direct way through turn-by-turn (see Figure 5). The size of the sector expresses the remaining "degrees of freedom" in choice. For example, being close to the destination restricts

potential alternative ways. In addition, the driver may specify a particular time at destination, which would lead to a smaller sector (i.e., less alternative routes), depending on the time left. Through this, the individual negotiation between freedom and situational constraints becomes an explicit part of the concept. In addition, while *All Roads'* provides a minimum of security, it leaves it to the driver to select a particular route.

Autonomy is largely a matter of choice and agency. In contrast to competence, it is not about challenges, but simply about the possibility to do things "my way".

Popularity

A popularity experience is the feeling of being "liked, respected, and to have influence over others rather than feeling like a person whose advice or opinions nobody is interested in" [34]. People experience popularity, when they inspire others and serve as a role model. Simple acts of attentiveness, such as offering a seat to an elderly lady in the bus, lead to recognition by others. This in turn creates the feeling of being liked and respected.

A car provides many options to satisfy popularity, because of the many opportunities to interact with others – pedestrians, cyclists, other drivers, or passengers, who sit in the same car. All these encounters can turn into popularity experiences. Typical examples are giving way to other drivers even in situations, when regulations do not expect us to, or to offer a spontaneous ride to a hitchhiker.

Shared Speed (student supervised project by Hengnan Dai), for example, addresses popularity by suggesting a more polite and mindful interaction between driver and passengers (see Figure 6). It offers an abstract common speed indicator, meant to inspire a discourse about "driving style," that is, mismatches between the driver's perception of acceleration and speed and perception and expectations of the passengers, who are at the driver's mercy. The indicator is located at the centre of the dashboard visible to all. The notion of a centered speed indicator is not new (see "BMW MINI" or "Renault Twingo"), but mainly driven by aesthetic or practical reasons. In any case, the speed indicator presents a driver-oriented view of the exact, momentary speed. In contrast, *Shared Speed* is conceptualized as an *additional* speed indicator, providing a second representation of speed, based on the balance between real speed and permitted speed over time. Other than a typical speed indicator, it visualizes average speed and a tendency to speed or to poke along, visible to all passengers and the driver, to support a potential discussion. Foremost, *Shared Speed* suggests a more considerate and attentive driving style to the driver, while at the same time encourages the passengers to express concerns, and even more important, praise. Through this, *Shared Speed* sets the stage for popularity experiences.

Popularity experiences address the feeling of being admired by others. In the context of cars, this is often based on

status, power and envy – a rather self-centered, aggressive variant of popularity. But popularity as a need can also be satisfied through prosocial behavior – cooperation and helping – which seem especially interesting in the context of cars [23].
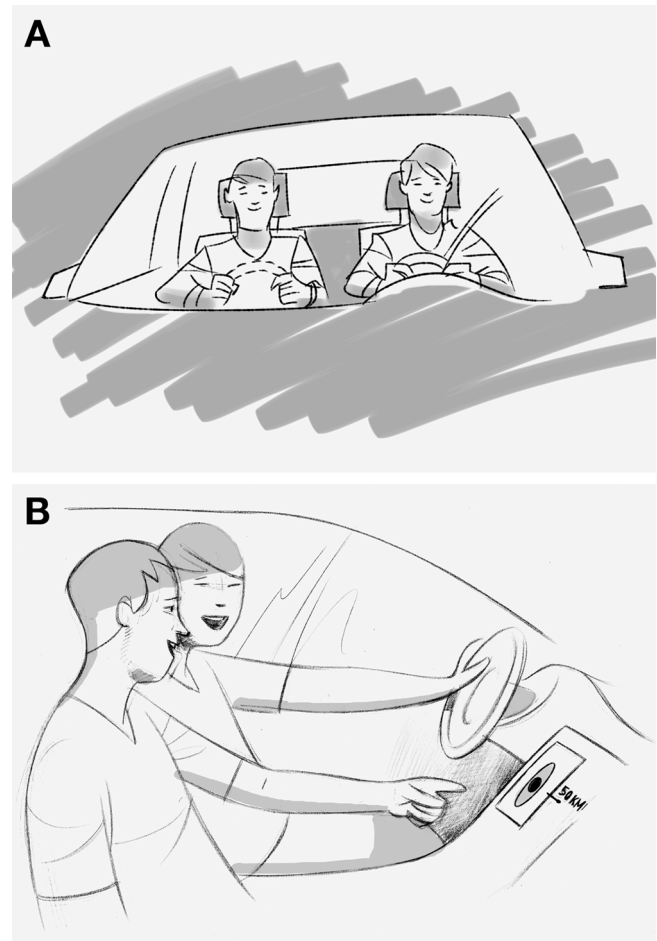
Figure 6. (A) *Shared Speed* promotes a more attentive behavior of the driver; (B) The balance between the real speed and permitted speed is displayed in an abstract manner to the driver as well as to the passenger.

CONCLUSION

Cars play an important role in many individual and social practices, often resulting in positive experiences, such as the freedom of the daily commute, the joys of intensive conversations, or the excitement of a discovered place. However, these experiences are rather the consequence of people's appropriation of the car than explicitly articulated by the car itself. Positive experiences are left to the creativity of users or plain luck. They are neither understood as an objective of design nor as a potential source for innovation.

In this paper, we used the lens of *Experience Design*, – particularly the notion that meaning and positivity relates to the fulfillment of universal psychological needs – to explore the potential of an experience-oriented approach to design

for interactivity in and through cars. Examples of designing for competence, autonomy, relatedness, security, stimulation, and popularity hint at a wide design space for novel articulations of cars. We showed how each need is already apparent in car-related practices and explored how focusing on a particular need will impact specific conceptual sketches of experiences potentially provided through interactive in-car systems. This broadens the scope of design, the design space, way beyond the driving task. Needs, practices and experiences provide a frame for positioning and assessing conceptual ideas.

Figure 7. End-to-end seat bench of concept car "mindset" (Source: www.mindset.ch)

Future opportunities for technology-driven innovations in cars appear limited. Driving itself is long optimized and the more current technological advances aimed at creating self-driving cars do not answer the most obvious question: What do I do, when being in a car that drives autonomously? One answer is just "similar things as in trains or in planes." Whether this, however, is sufficient for customers of premium cars remains an open question. Is a car still a car, if it is not driven? Will people pay for a car that takes away the sole source of pleasure: driving? We believe that the real challenge is to create innovative experiences, to provide meaning beyond or even without driving, but meaning *specific* to cars. Such rather experience-driven innovations, however, require not only good concepts, but also a particular approach to design. Take the concept car "mindset" as an example. It is equipped with a continuous, end-to-end seat bench (see Figure 7). This allows driver and passenger to cuddle up during the journey. The "mindset" website describes the interior as follows: "On this comfy sofa you can enjoy a homey atmosphere – and decide for yourselves, how close together you'd like to be" [28]. In an interview [32], the responsible designer of the concept, Murat Günak, however, did not praise the relatedness experience made possible through the interior, but mainly justified his design choice with the aim to save weight. Thus, until experience remains a post-hoc marketing-driven narrative employed to emotionalize given facts, many potential innovations will not be considered. Even if the

result is the same end-to-end seat bench, it is a great difference whether this was the result of the objective to optimize a vehicle's weight or of the objective to facilitate a practice as meaningful and enjoyable as cuddling-up.

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