Research report (7031 AAD)

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Project title: MOVABLE SPACE FOR EMOTIONAL COMMUNICATION

1. Short abstract

Car can be another private place apart from home. The starting point of my project is to provide a place for tired workers to vent their emotions. In the future, cars will become people's "partners" in another sense, which can feel and respond to complex human emotions.

My purpose is to create an emotional communication space."Emotional communication" has multiple meanings, it can be the interaction and communication between the car and people, it can also refer to the car can be a movable private space, let the distance between people become closer through some atmosphere, forget the troubles, eliminate the fatigue brought by life.

2. Introduction

For car users, the future of the cars will be more machine-oriented, technology-oriented, and the relationship between people and cars is no longer cold. The interior and exterior design of the car will be integrated into more emotional design, reflecting the human care and emotional interaction in the process, increasing the user's sense of trust, while giving users more driving pleasure and emotional experience.

With the gradual maturity of the automotive industry, users’ demand for interiors has further increased. Unlike the way that exterior design is the focus of appearance design, interior design pays more attention to the emotional interaction between cars and users. In addition to the sensory experience of the cockpit itself, the intelligent automotive interior system incorporating emotion + aesthetics + technology will be the top priority of future intelligent automotive.

Smart car interior emotional design on the one hand includes the interior design, layout design, color and material texture design, on the other hand is the use of the interior and human-computer interaction design. The former emphasizes the instinct of the intuitive feel to the person, hoping to arouse the user's emotional experience, while the latter emphasizes the interior and the communication between people. Harmonious, complete and humanized experience is the goal of constant pursuit.

The purpose of my project is to design an emotional artificial intelligence vehicle, which breaks the traditional interior layout design, not only meets the needs of the vehicle itself, but also continuously learns the habits and interests of users——Bring sensory enjoyment to users and provide a shelter for physically and mentally exhausted people.

3. Secondary Research

3.1 HMI technology trend – voice frst, plus multiple ways of interaction co-exist

Voice is the most natural human interaction. It's fast,efficient, instinct and safe.

"Conversational AI" is the new battleground of next-gen AI voice technology that need to:

-Understand emotions

-Perceive, predict, and act based on surroundings

-Learn and adapt

-Able to handle ambiguity and unknowns

-Just like talk to a human, no need for "push to talk'' or"wake up word"

Human beings are sensory animal that receive information from the world through multiple sensory experiences(hear, touch, look, feel ..)

The evolvement of HMI development is far more than just solving functional needs (i.e. voice can do everything), but also providing people with a more immersive experience(i.e. look & feel)

Multiple ways of HMI interaction (i.e. gesture, air touch,eyetracking,mindcontrol,etc.) will emerge with technology development in the next decade(i.e. holographic, electroencephalography, etc.)

3.2 Biophilic Design

Biology is an instinctive attribute formed by long-term human adaptation to the natural environment, and it is one of human's basic psychological needs.

Biophilic design refers to a design method that combines natural lighting and ventilation, natural landscape features and other elements. It can create a more

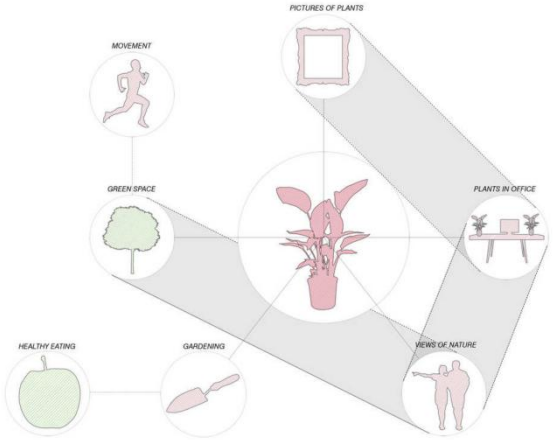
efficient and healthier place for users to work, study, and relax. Compared with designing cities and suburbs in a way that alienates nature, modern users need to treat nature in a deep and basic way. Studies have shown that biophilic design (design features that reconnect humans and nature) can help users reduce the pressure in the workplace and relax faster.

Regarding biophilic design, it can be achieved in the following ways:

Maximize the use of natural light and ventilation;

With open space, you can enjoy the view of the sky and trees, and you can also hear the external natural soundscape;

Use natural materials and textures in interior and exterior decoration to increase sensory experience;



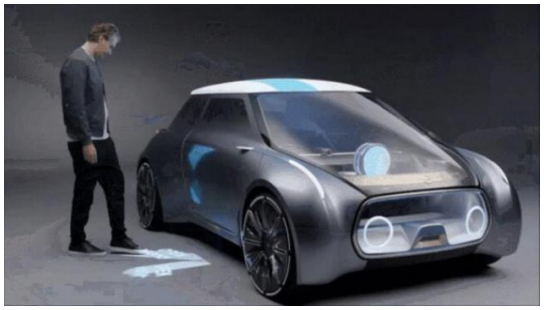
3.3 Automobile active interaction technology under the general trend of intelligenc

Cars are moving from traditional vehicles to smart cabins, and the emotional intelligent mobile space for 5G is bringing active and responsive interaction into the car. Proactive interactions help reduce distractions, improve driving safety, and enhance the user experience.

3.3.1 Function

In terms of functionality, when the user walks up to the car, the car uses sensors or face recognition technologies to greet the user in the form of voice, lights, holograms, exterior screens, etc. At the same time, the user will be fully identified to determine whether they are carrying luggage and children, so as to provide the user with a

baggage handling robot. When the user enters the car, the car also provides the appropriate route plan and scenario configuration according to the travel plan.



3.3.2 Entertainment

In recent years, the automotive industry has paid more and more attention to entertainment design. For example, immersive games, home theater, atmosphere lights, emotional interaction design, etc. On the way from get off work or during travel, the car will take the initiative to show deeper interpretations.

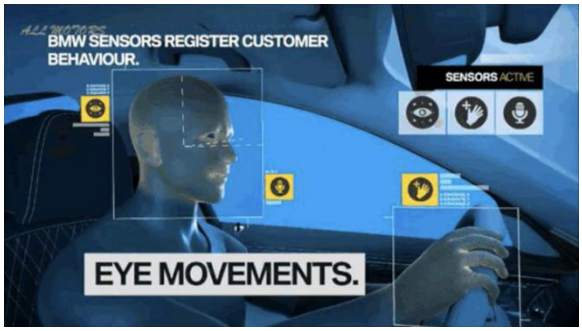
When the user enters the car, the car analyzes the mood of the user through facial recognition and emotional interaction. When the mood of the user is obviously low, the on-board robot or holographic butler will actively communicate with the user in a human-like manner. (Nomi, Walker, Panasonic - POD)

When the user is in a good mood, the car will actively recommend games or comfortable music to the user. At the same time, by adjusting the light, temperature, smell and other ways in the cockpit, the car will provide a better riding environment for the user, which brings a more three-dimensional emotional intelligent experience for the user.

BMW interaction system

3.3.3 Safety

Safety is a very important part of the active interaction of the smart cockpit. The design of functions such as face monitoring and eye tracking play a very important role in driving safety for users. For example, when the user is drowsy, the system wakes up the driver by releasing fragrance and music; when the body is abnormal, it automatically sends a distress signal to the hospital.



3.3.4 Personalization and humanization

Personalized and humanized design is reflected in many aspects in the active interactive design of the smart cockpit. For example, the user can use voice, gestures, eyes, etc. to achieve a dialogue with the car; the lights in the car can be automatically dimmed or brightened according to different scenes. The car will, through continuous optimization, comprehensively process complex information, provide users with the most accurate solutions, and become your more and more interested friend.

3.4 Autonomous vehicles

At present, with the application of more and more new technologies, the technical content of automobile products is constantly improving, and the attributes, definition and boundary of automobile are changing quietly. It is gradually changing from simple mechanical products to mobile intelligent terminals. With the advancement of technology, consumers have greater expectations for high-level autonomous driving with wider application capabilities and more diversified scenarios.

In accordance with the development plans of major car companies, in the future, L4 autonomous driving vehicles that continue to perform all dynamic driving tasks and perform dynamic driving tasks will be launched. This means that autonomous driving will officially enter the era of highly autonomous driving. By 2026-2030, the

sales of L2-L3 level intelligent connected vehicles will account for more than 70%, and L4 level vehicles will be widely used on highways and large-scale applications on roads in some cities; by 2031-2040, various types of connected vehicles , High-speed automatic driving vehicles are widely operating.

3.5 CMF Design

CMF is an organic combination of Color, Material, and Finish. It is a method that uses color, material and craftsmanship as design elements in industrial design. It needs to consider the user's psychology, main needs, the emotional nature of product colors and materials, and their psychological connection with people.

Color is the key design factor that most influences the visual experience of product design besides styling.

For consumers, color is the most intuitive element of beauty. It is also the strongest factor for the first sensory stimulation in product consumption.

With the improvement of living standards and the younger generation of consumer groups, young consumers have put forward higher requirements for product appearance.

The material has a huge influence on the effect of product design through the (physical and chemical) characteristics of the material itself. From the perspective of product design history, the emergence of new materials in particular determines the progress and renewal of design to a certain extent, which can create conditions for the feasibility of design implementation and bring new styles and structural forms to the design.

Surface treatment (Finish)

In the CMF design concept, the surface treatment includes physical treatment and chemical process treatment, giving the product a higher level of texture and function on the basis of color and material. Surface treatment can improve the connotation, beauty and overall value of the product to a certain extent.

3.6 Emotional design

The main purpose of emotional design is to enable people to obtain emotional experience outside the function, including sensory experience, behavioral experience and reflective experience, when using the product on the basis of realizing the basic functions of the product.

Emotional design first includes the design of product shape and interior layout, color and material texture and other sensory aspects of the design. These designs can directly mobilize people's emotional experience, which is the feeling caused by people's intuition.

Emotional design second including the use way and the interaction of product design, and in the process of people to use electric cars.People can communicate with electric cars, if electric cars to the high efficiency, fully functional driving experience, is easy to obtain positive emotional experience, the opposite is a negative emotional experience.

Application of Emotional Design in Automobile

Multi-function cockpit

Multi-purpose cockpit is the inevitable development trend of the emotional design of the car in the future, as the "third living space" of the car interior, through emotional AI insight, can be the inconvenience of office commuting into a pleasant working environment, can also be a cinema, coffee shop (Rolls-Royce has been applied) and shopping places.

Emotional AI

Emotional AI enables cars to sense people's emotions, record behavior, fatigue detection, and more. In future emotional design studies, we can explore how continuous measurements of specific emotions can be used to influence ongoing interactions with common technologies. Provide truly personalized service, form companionship, emotional interaction, and build closer human-car relationships

Lighting design

Better communication with people and cars is achieved through LED matrices and holographic technology for the grouping, pattern and digital projection of lights. The interior lights change according to the user's mood.

Holographic projection

Voice interaction

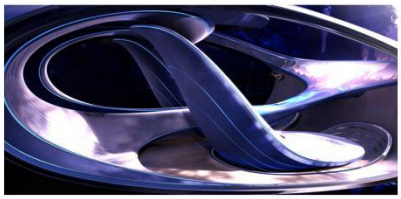
Window interaction

Smart seat

Good examples of emotional design in car design

Renault SYMBIOZ Concept

Renault EZ-UITIMO Concept



Mercedes-Benz Vision AVTR

Icona Nucleus (Geneva 2018)

Bad examples of emotional design in car design

2017 Mercedes GLS

2016 Volkswagen Touareg

2019 Hyundai Veloster

2017 Nissan Armada

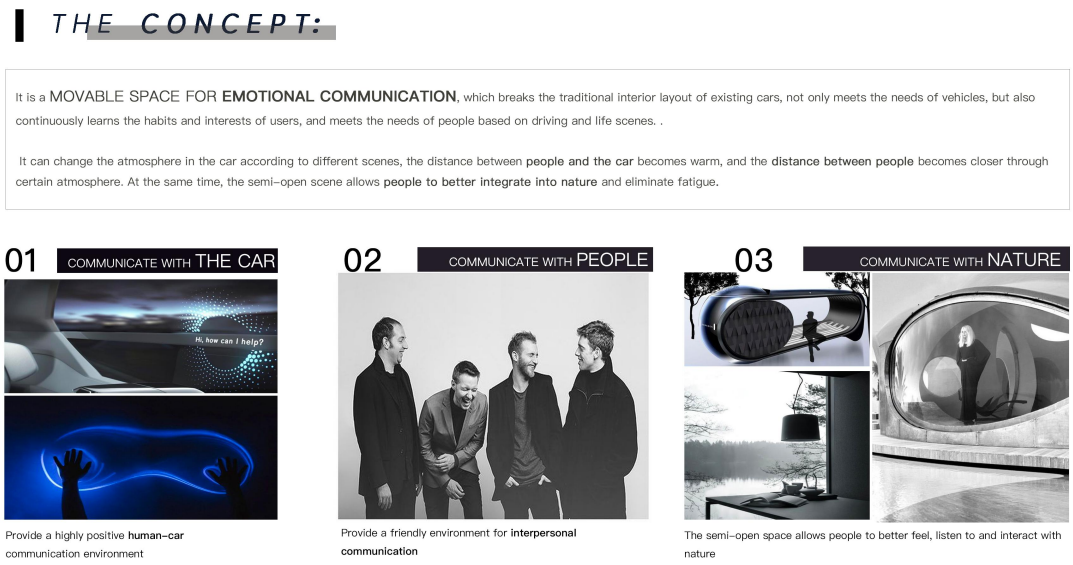
Ford Bronco builder

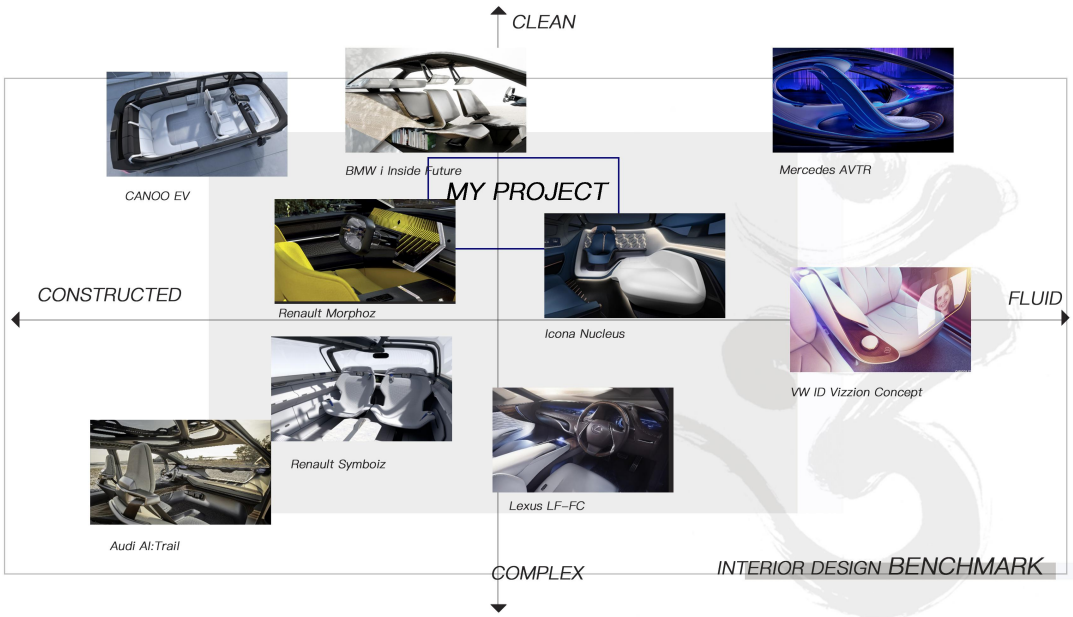
4. Final Specialist Project Brief

4.1 WHAT

It is a MOVABLE SPACE FOR EMOTIONAL COMMUNICATION, which breaks the traditional interior layout of existing cars, not only meets the needs of vehicles, but also continuously learns the habits and interests of users, and meets the needs of people based on driving and life scenes.

It can change the atmosphere in the car according to different scenes, the distance between people and the car becomes warm, and the distance between people becomes closer through certain atmosphere. At the same time, the semi-open scene allows people to better integrate into nature and eliminate fatigue.

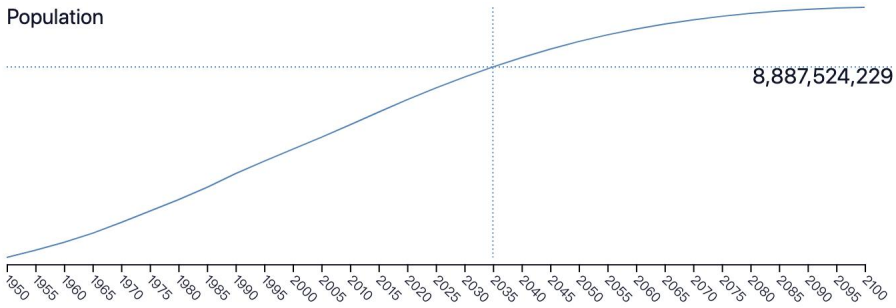




4.2 WHY

- Society

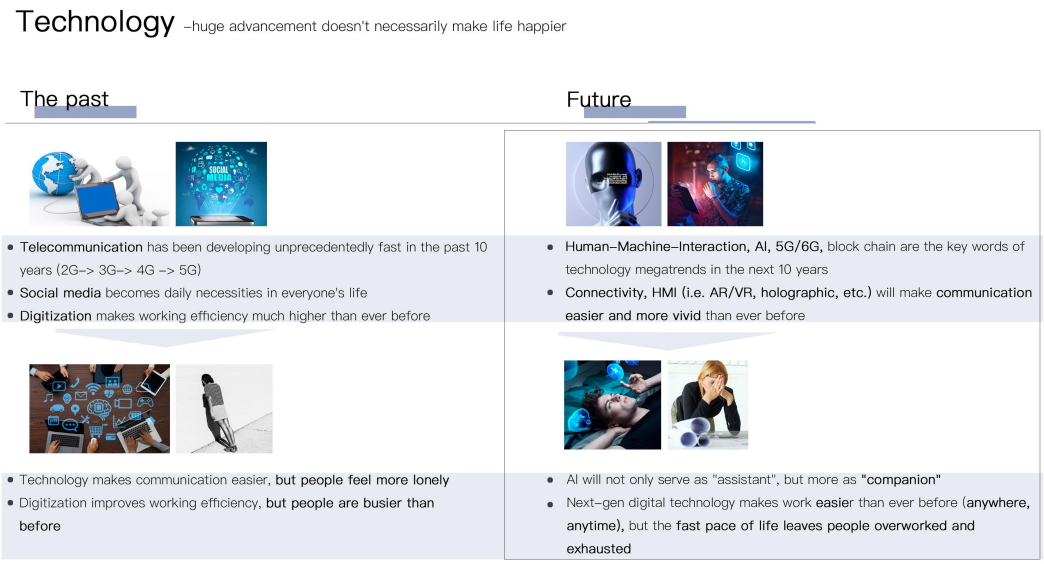
The world's population is expected to peak at about 8.8 billion in 2035. However, the working population will shrink dramatically.Work, family, and taking care of the elderly all fall on shoulders of Middle generation.They feel overwhelmed, but nowhere to escape - physically or mentally.



- Technology

AI will not only serve as "assistant", but more as "companion"

Next-gen digital technology makes work easier than ever before (anywhere, anytime), but the fast pace of life leaves people overworked and exhausted.



- Environment&Health

Heavy environment burden will continue to be a key social issue due to urbanization and economic growth (even if slow down).Cities will become more crowded as more and more people will come to live in cities.Green mindset start to sprout among people ——People are more eager to be close to nature and environment protection becomes spontaneous.

At the same time,Healthcare demand from all age groups will create huge market opportunity.

4.3 WHO

Middle-income employees (Have a certain degree of financial independence, have stable and relatively high-paying jobs)

Under the high-speed operation mode of modern society, with the increase in the base of middle-income groups, more and more overwork is reflected in this group of people. Their mental pressure is increasing, their private life is constantly being squeezed by work, and they urgently need emotional release. The popularity of autonomous driving makes cars increasingly become their "third space"——a social shelter between the company and the family, where they can relax or do some work.

4.4 WHEN&WHERE

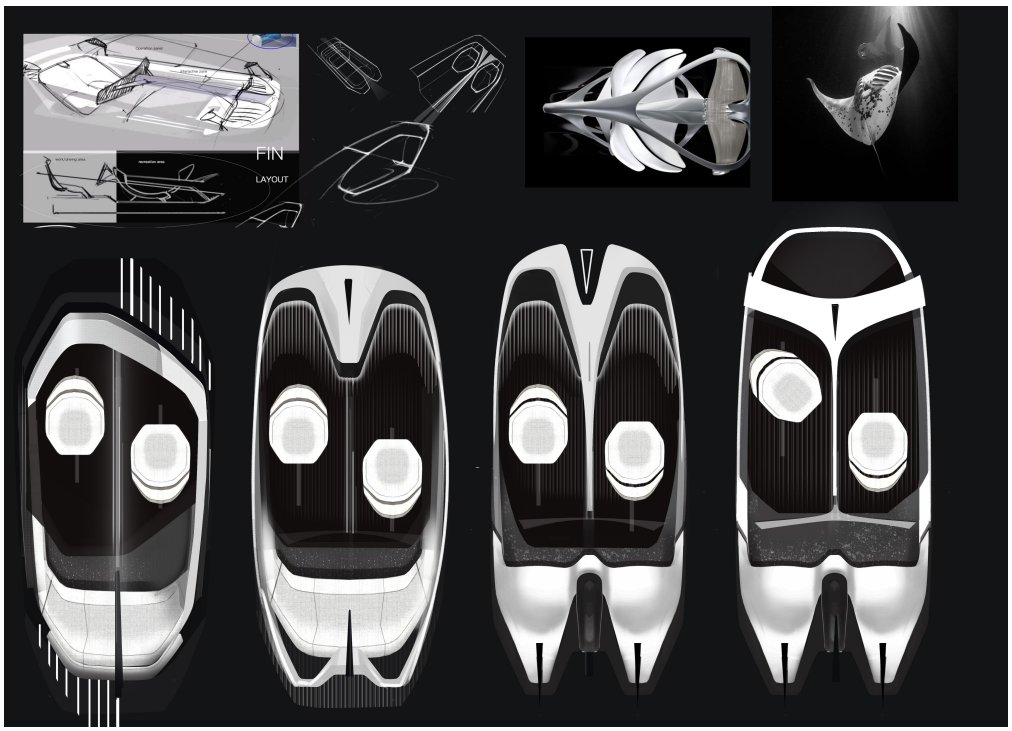
It is set in 2040, and the target market for the car will be globally. The key cities are China, the United States, Japan, Germany, the United Kingdom, and Singapore, which have allowed autonomous vehicles to be tested on public roads and supported the construction of autonomous vehicle test demonstration zones.

According to the development plans of major car companies, after 2030, L4 level autonomous driving vehicles that continue to perform all dynamic driving tasks and perform dynamic driving tasks will be launched successively. This means that autonomous driving will officially enter the era of highly autonomous driving. The industry expects that the proportion of autonomous driving technology entering the new car market will reach 70%, which means that autonomous driving will officially enter the era of highly autonomous driving

4.5 HOW

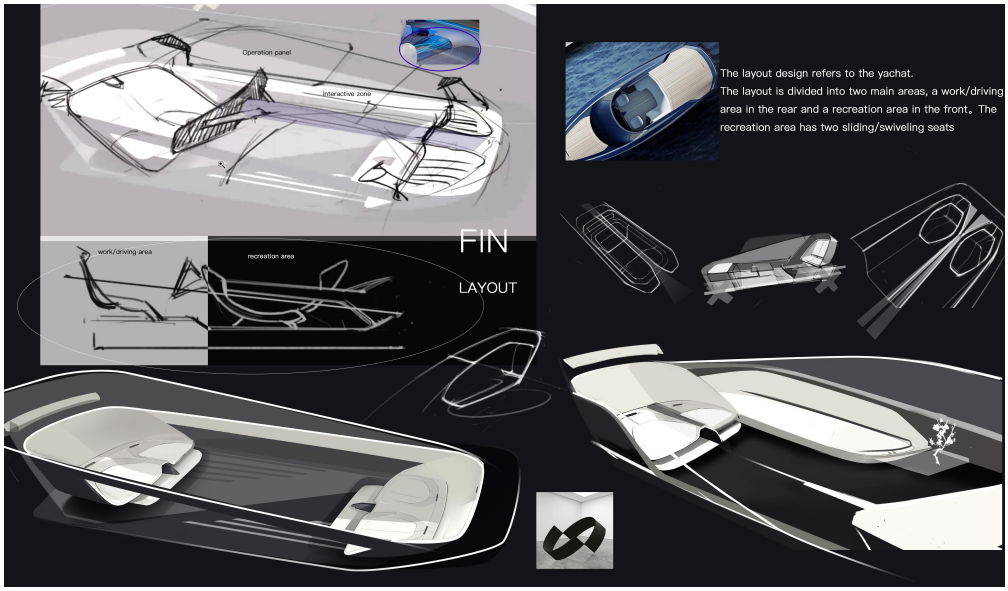
First of all, my design needs to break the traditional car front and rear layout design. Compared with a vehicle, it is more of an intelligent companion, which can continuously learn the habits and interests of users. In the design process, not only functionality, aesthetics, and safety must be considered, but I will also focus on rationalizing the color and material of the car interior to achieve effective emotional communication. By organically connecting the emotion of the design and the emotion of use, the effect of optimizing the emotional experience of consumers can be achieved.

5. Initial sketches / project directions

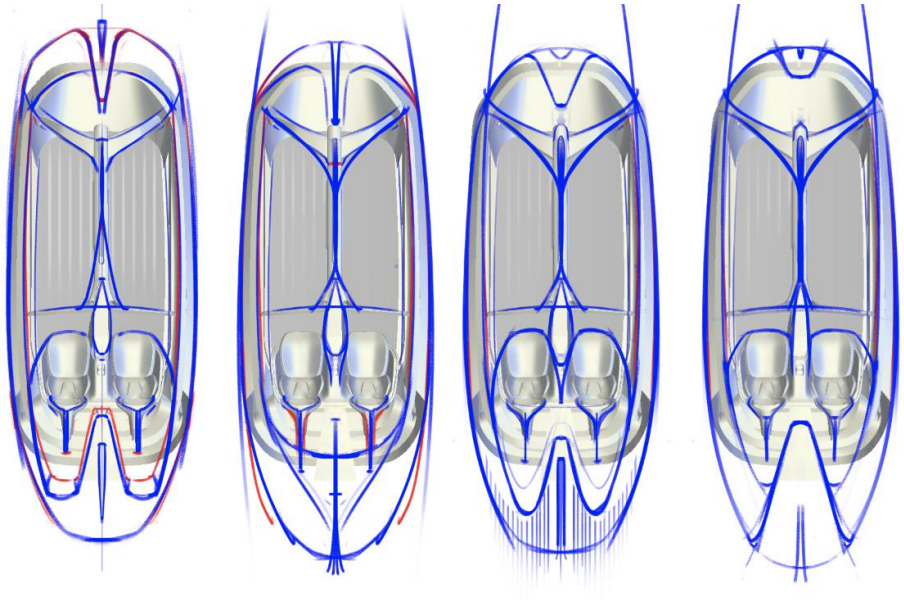


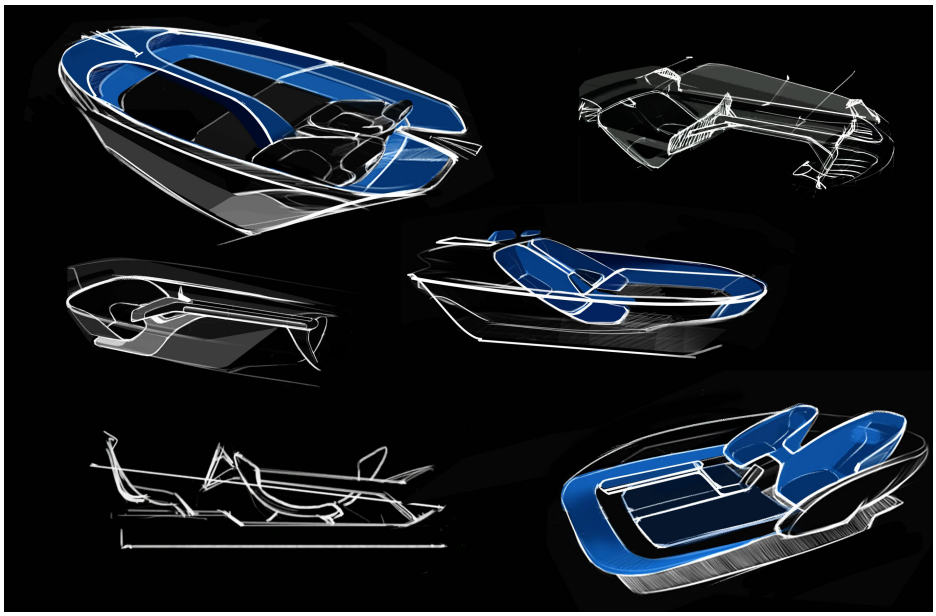
In the process of sketch design, I hope that my design can be both comfortable and futuristic. My inspiration comes from manta rays. Manta rays are elegant, fluid and a perfect combination of sensibility and rationality. By transforming its form, the perceptual organic surface and rational design layout can be obtained.

After a lot of rough sketches, I got a preliminary design plan. I converted the manta rays' fins into an interactive area in the front of the car, and then extended the rear part into an operational display, naturally dividing the spatial layout of the car.



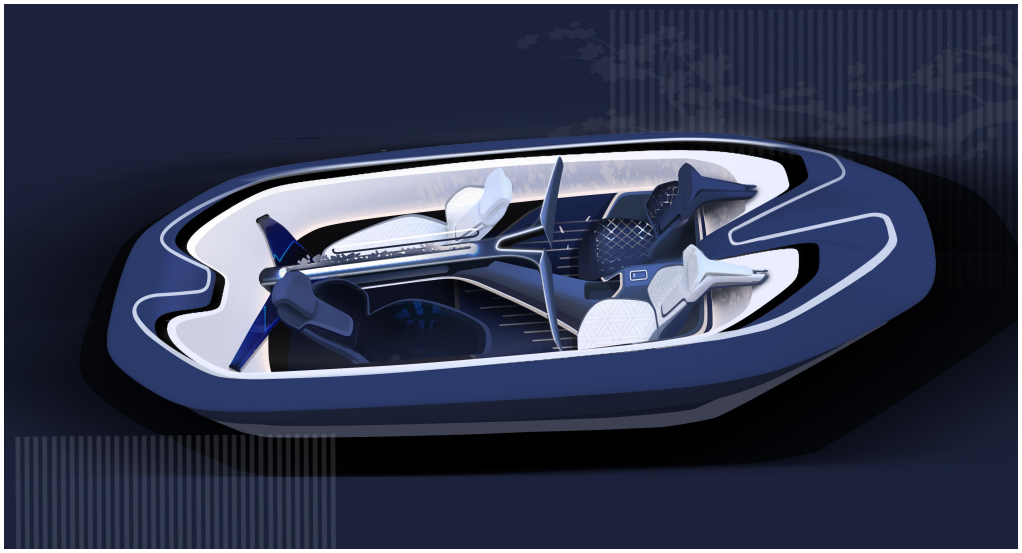
In the overall layout division, I also refer to the yacht layout design. Compared with traditional vehicles, yachts really achieve the unity of driving function and entertainment, I think this is the future development direction of intelligent cars ——more consideration of users' entertainment needs. As the autonomous driving technology matures, the L4 autonomous driving technology will be largely operational by 2040. The traditional steering wheel can be replaced by other high-tech technologies. This gives me a lot of freedom in interior design.

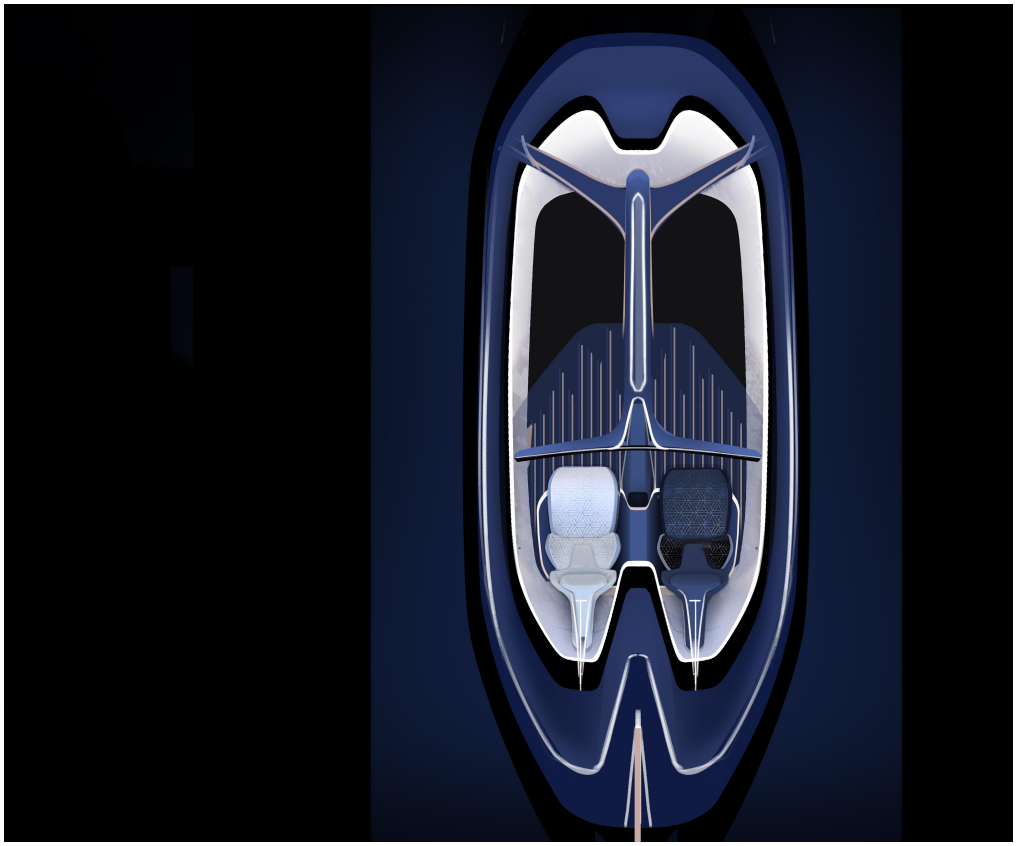




I divided the whole area into two parts. The front part is the leisure and entertainment area, with two movable and rotatable seats .The positions of these two seats can be adjusted freely, so people can easily realize face-to-face communication and interact with the interactive platform. Such a design can realize the emotional communication

between people and cars. The rear part is the driving/working/second entertainment area, with two seats, a touch screen and some sensor buttons. People can complete the driving of the vehicle by touching the electronic screen and touching the induction button. At the same time, considering that the target users of vehicles are business people, the appearance of high-tech electronic screens can also give them a better experience in office, and video conference.





In the creation of the interior atmosphere, I hope to start from different senses and improve the user experience. I added a few a lighting, which can be changed according to the sound and the intensity of the light. On the interactive stage, I hope that users can be personalized, so I added plants and so on. At the same time, I also carefully considered the material of the seat and added the massage function. Between the seats, there is also a storage space, and users can place sundries according to their needs. Below the display, there are several fragrance ports that can emit fragrance.

6. Future Action:

Goals:

-Understanding how emotional design apply to automotive design.

-Discussing apply colors & materials emotionally in automotive design.

-Understanding the change of future intelligent vehicle.

-Understanding the change of future interaction design.

-Integrating emotion, aesthetics and technology into the design

-Realizing the transformation of a car from a travel tool to a travel partner.

Tasks:

1) Studying the possible development direction of emotional design in automotive design.

2) Exploring the changes of future intelligent vehicle: the development of interactive design, the use of new materials/new technologies, the combination of interactive design and automotive space, etc.

3) Thinking about the automotive space design (multi-functional cockpit/new functions, etc.).

4) Thinking about several different design directions and draw a certain amount of sketches.

5) Interview group: I will interview my professional designer friends in the industry to discuss the feasibility of the plan.

6) Develop and determine the final direction through drawing.

7) Sketching and finale design proposal.

8) Define packaging if required, and then orthographic views.

9) 3D modelling and CGI rendering

10) Optional: scale model if it’s relevant and if I have time.

Gantt Chart：

Conclusion：

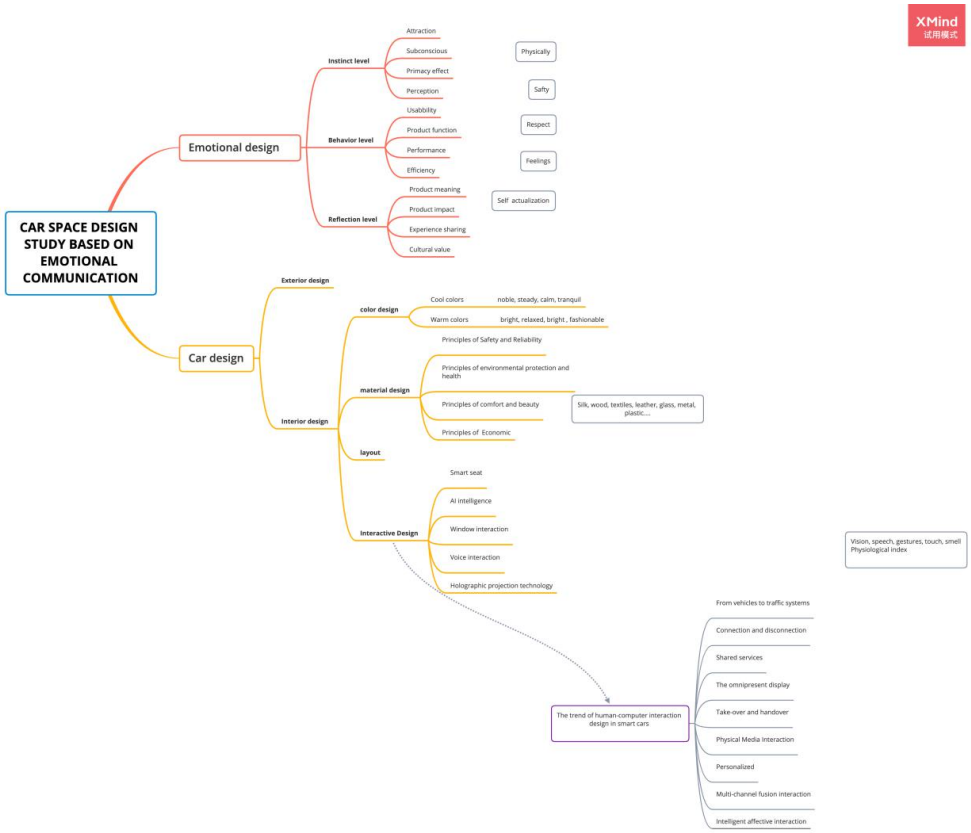
My main research will focus on two directions:
On the one hand, it mainly focuses on the design of automobile styling and the study on interior layout, color and material texture.
I will explore how to rationally match colors and materials in the context of car design, which can effectively convey emotions to users. How to organically connect the emotion of the design and the emotion of use can achieve the effect of optimizing the user's emotional experience. When optimizing the design of interior colors and materials, I may expand the scope of research to other areas. For example, the concept of furniture design is integrated into it to create a personalized and comfortable movable space for users. At the same time, the concept of furniture design also ensures the privacy and closedness of the space.

On the other hand, we need to consider the new technology applied to the smart car of the future and the emotional interaction research of the smart car. There is no doubt that the future trend of intelligent car human-computer interaction design is from high-intelligence machines to high-intelligence emotional machines.

Therefore, with the development of intelligent technology, I believe that the smart car of the future will be able to communicate with users by studying their behavior, thus becoming an emotional companion to the user, rather than a simple means of travel - this is my ultimate goal. In addition, I also need to explore the future of vehicle networking technology, intelligent transportation systems and other technologies how to interact with the environment, vehicles in real time, in order to achieve intelligent emotional interaction. In my projects, these will be difficult and innovative points.Therefore, I may need to consult the professional opinions of relevant people in the automotive design industry and the interaction design industry.

I will continue to optimize my concept and design. Based on the two main ideas of people and vehicles and vehicles and environment, I will start design thinking based on people, and carry out integrated design of people, vehicles and environment. When the design and concept are optimized, I will re-build my final digital model in Autodesk Alias to complete the final rendering and video production.

7. Project Themes Map



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