AMG D-VISION

by

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Acknowledgments

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Abstract

Today China faces the issue of overcrowded urban spaces. Booming automobile ownership is causing massive traffic congestion. Even though public transportation has been promoted and regarded as mainstream within the society, I believe that private vehicles do not necessarily need to be a controversial option in the future.

The design process included background research, user definition, packaging studies, ideation, digital form development and context visualisation. All these were carefully executed to ensure a sensible and creative result.

The proposed concept vehicle envisions greater technical efficiency combined with environmental responsibility. A sports car that is the ultimate carpooling solution during weekdays and a fun getaway drive for the weekends.
Introduction

When I started searching the topic for my degree project, I set myself the goal that trying to combine my international education experiences and Chinese cultural sensitivity to focus on bringing new sustainable transportation solutions for the next generation’s young Chinese.

Taking a deep look into what’s going on today in China. Besides the massive and rapid economic development, the urbanization tide nowadays seems like the topic that could be inevitably talked about. High population density and booming automotive ownership determined over crowded spaces inside those mega cities. Apart from the public transport system we are encouraging to use today, the young generation may choose to live with their own style thanks to the convenience and connection brought by the internet era. Commuting Sharing and carpooling are more and more accepted by this age group. However, sports car, as a controversial existence, seems like going completely against the urban sustainable development trend. How to fulfill the requirements for those car enthusiasts but also respect the city environment and surroundings became the main argumentation for my thesis project.

Throughout the process, I kept challenging myself to come up with creative package solutions in order to reach the demands being used as two types of cars but without many compromises. The EV(electric vehicle) platforms provide me this fresh angle so that I can test out design beyond limitations. The design language took references from Mercedes today, meanwhile trying to redefine the identity both as a high-end AMG sports car and an efficient electric car.
Urbanization tide in China

During the past 30 years, China’s large-range urbanization could be seen as marvelous in the human history apart from its impressive economic growth. Following the reform and opening policy, almost half a billion population have moved into cities. By the end of 2013, the mainland of the People’s Republic of China had a total urban population of 731 million, 53.7% of the total population, but this number in 1949 was only around 11 percent. There was more population living in cities than in rural areas for the first time in China’s long history.

In the long term, this urbanization tide won’t slow down; according to predictions, about 70% of the population will live in urban areas by 2035. Over the next 20 years, around 30,000 to 50,000 new skyscrapers will be built in China and more than 180 cities will require mass transit systems by 2025.
What is now worrying the government is if an additional 100 million population could be supported within the city we are living in today. Housing affordability, traffic congestion and pollution are already taking a heavy cost, so officials are looking into ways to let cities could offer migrants a better living condition. Meanwhile, China is also aiming to encourage the ecological city construction with more attentions toward circular development, sustainable development, and low-emission strategy to balance industrial development with environmental protection.

The world’s largest eco-city is rising from wastelands in China, Tianjin Eco-city aims to house 350,000 people in a low-carbon, green environment by 2020.
First-tier city phenomenon

In China, the first-tier cities are the ones like Beijing, Shanghai, or Guangzhou that have been playing the role of the district center leading the economic development for many years. They also benefit a lot from the country’s prosperity in the first place. The municipal planning and infrastructures in those cities have been fairly well constructed when compared to the other under-developing regions. More opportunities and huge markets become the key factors that draw the majority of the migrants into these already overcrowded cities.
High-rise blocks cluster & crowded urban space

Tower block, high-rise, residential towers, apartment tower, apartment block, or block of flats, no matter how you call it, this type of high density vertical inhabitant building probably has become the most common architecture pattern in the majority of China’s mega cities due to the keep growing population and will keep being like this in the near future.

As metropolitan growth continues, high-rise buildings fill the dense city center and new towns are constructed along peripheral ring roads. Yet, in a pattern where concentration predominates over dispersal, close to half of Shanghai’s population lives in an area smaller than 5% of its total land surface. Urban densities average slightly over 40,000 residents per square kilometer in the city’s four core districts and reach a peak of 760 persons per hectare in Huangpu’s central neighborhood of Old West Gate, just south of the People’s Square. Some expert even said Shanghai is a city with almost limitless density, in the sense that it can add population vertically rather than laterally and it can serve that population with a high-capacity rapid transit system. However, the more and more limited city space has become an increasingly cruel problem for the modern urban life.
Booming automobile ownership

China exceeded the US and all the other countries in vehicle sales in 2010, this ranking will no doubt remain its number one place for many years. The vehicle ownership figure reached 140 million in mainland China by the end of 2014, placed secondly just after the US. But how large will this vehicle market end up with? The answer is quite important and related to the entire world. Rapid motorization rate in China has pulled the alarm for both the energy resources and environmental issues due to China today is already the world’s second-largest oil importer and the largest CO2 emitter, even its vehicle ownership rate is still just a fraction when compare to the US—58 vehicles per 1,000 people in 2010, while 804 per 1,000 in the US. No-doubtfully, the vehicles’ market in China will keep increasing and most forecasts predict the car ownership number will be around 200-300 vehicles per 1,000 people in 2030, maybe even faster. But what if the vehicle ownership ratios reach Japanese or Western European levels of about 600 vehicles per 1,000 persons, along with the rapid climbing urban population, another up coming issue is how to handle the traffic congestion caused by this huge amount of private vehicles.

Eternally insufficient parking slots

Compare to the congestion on the road, the insufficient parking space seems more like a eternal tricky problem for all the private car owners living in those mega cities. This sounds ironic but as the reality today, in Shanghai an exclusive parking space costs about 150,000 yuan on average, but in some places, the price can be three times as much. And sometimes you just can not find any available spot in your neighborhood no matter how much you are willing to pay, for residents though, finding a place to park after 6 pm is real nightmare. All of a sudden the tool that is supposed to bring people convenience turns into some kind of liability.

In Beijing, parking issues are being talked about all the time. A recent article said the city is going to need at least 2.5 million parking slots in the next several years, according to a comprehensive analysis in Beijing. Driving around for a quite long time before you can find a parking space is almost a daily experience for many inhabitants living in this capital city. Sometimes you may notice the pedestrians being forced to walk along the motor lane because the side lane is taken by parked vehicles, especially in those old residential communities with no underground parking lot.
No matter it is from the official urban planning or the individual solution, people have come up with many practical ways to tackle the increasingly limited city space and try to make their daily life more efficient. Modern public transit system like the BRT (Bus Rapid transit) system in Guangzhou successfully solved the traffic congestion caused by too many buses stuck the road. Creative storage technology can create more parking spots in a very limited space. However personally I tend to look at the question from another angle, is it possible that we can deal with the space problem in some more sustainable and active ways instead of counting too much on the third-party plans?

Solutions we are using today

No matter it is from the official urban planning or the individual solution, people have come up with many practical ways to tackle the increasingly limited city space and try to make their daily life more efficient. Modern public transit system like the BRT (Bus Rapid transit) system in Guangzhou successfully solved the traffic congestion caused by too many buses stuck the road. Creative storage technology can create more parking spots in a very limited space. However personally I tend to look at the question from another angle, is it possible that we can deal with the space problem in some more sustainable and active ways instead of counting too much on the third-party plans?
Sports car, the controversial existence

However, sports car, is more or less being regarded as a controversial existence for our modern urban life due to its unusual category. Too much space consuming, very low energy efficiency, total insufficient interior using rate are the common features we normally use to picture them. Its aggressive stance sometimes may also threaten the public safety due to the drivers are a lack of social awareness. All of sudden sports car became the other side of the coin, going completely against this sustainable main stream within the whole society. Then how to fulfil this hobby for those car enthusiasts but still respect the values for the future urban development became the main argumentation of this thesis project.
Could we design a sports car for those enthusiasts without any compromises but still respect the values for the future city development in China (towards a more eco-friendly and energy-efficient future) as the main argumentation seems quite paradoxical, but it might be resolved by using some creative way. I got inspired by the carpooling idea, just like many young people today are even using the internet application UBER for their weekday commuting when the passengers are sharing the same routes like from A to B or C to D. However, one of the main concern for this way being used as daily solution is the lack of consistency, trying to patch yourself with a suitable ride could be very hard on a rushing morning to work.

Sharing the same route
Carpooling, the optimized solution?

The three pictures on the left are about experiment people did in 2001 Germany, showing the amount of space required to transport the same number of passengers by car, bus or bicycle. But when we look at this question with the critical opinions today, we may wonder is this really what we are looking as the final solution? Or maybe we can come up with some more practical, flexible and sustainable solutions like car sharing or carpool by using the powerful internet.
So the idea for my thesis is to design an urban electric vehicle for this young generation who live in the mega city of China in 2025 and the car should be driven by those enthusiasts among this age group. The proposal should target on the lifestyle of this population, try to bring in the idea of sharing, make better use of the personal vehicles’ interior space, using it as the commuting tool during the working days and for private fun at the weekends, eventually bringing people conveniences and save city space.

Design opportunities

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In order to find some more sustainable and spontaneous solutions to tackle the city space issue, maybe we should switch our mindset to a more creative mode. So I set the vision in 2025, when these mega cities are getting more and more crowded, how will the age group between 25-30 react accordingly? To figure that out, maybe the best way is to understand what people from this generation think about their near future today, how would they fit themselves into such stressful environment? Are they going to behave differently? So I launched a questionnaire, the target group are the youths between 15-20 today (25-30 in 2025), to understand their opinion for the future urban life.

**Target group**
The questionnaire including 8 single choices and 1 open end question. I got totally 117 samples back during 1 week. The questions are basically related to what do you think the future urban life will evolve.

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<th>How often could the concept for sustainable lifestyle be mentioned in your daily study or life?</th>
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<td>90% people said frequently or at least occasionally</td>
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<th>How necessary do you think private cars are for future urban life?</th>
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<td>35% Very necessary, a private car can bring more convenience anyhow</td>
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<tr>
<td>53% Maybe it is necessary on some certain situations</td>
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<tr>
<td>12% It’s not necessary, would rather choose other ways instead</td>
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<th>What feeling are you holding towards driving a car?</th>
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<td>15% I enjoy driving or at least I guess so</td>
</tr>
<tr>
<td>61% No special feeling, just regard it as a skill</td>
</tr>
<tr>
<td>24% Don’t like driving a car at all</td>
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Questionnaire conclusion

For the last open-end question, I asked them using several simple words or a short sentence to describe themselves as new generation. The results are listed here. Young people may choose to live with their own way. Only a little percentage of them want to have their own cars, maybe the majority of them won't be so obsessed with cars, maybe sharing the car or using the public transportation system would fit into their sustainable lifestyle better. This age group is growing up under a magical era (experienced the information technology booming). The reflecting values from them could be very critical but objective: new cultural identification (based on the traditional Chinese culture), more social responsibility and stronger environmental protection consciousness.
And for those car enthusiasts, sharing the car from Monday to Friday could fit into this sustainable lifestyle and give society positive pictures for both EVs and this user group. Driving a car will be defined as generous, not only symbolizing privilege and careless. The impressions may be marked as the new cultural identifications for this generation.

Persona
The brand

The brand that I chose for my thesis project is Mercedes-Benz, the best-known automotive brand in the world, and also the world’s oldest automotive brand still in existence today, having produced the first petrol-powered car. This German automobile manufacturer is a multinational division from the German manufacturer Daimler AG, owns a wide portfolio including luxury automobiles, buses, coaches, and trucks. Its exploration over the automotive industry is filled with innovations, the achievements nowadays like the experiments in the autonomous car or electric vehicles fields are also impressive. I believe by studying this brand along my thesis project could provide me a lot of inspirations, guiding me towards a correct result.
The identity by heritage

Studying and understanding the brand identity and design language of Mercedes offered me valid support upon my later design process. The first image that normally got into our minds when talking about this brand today probably should be the huge three-pointed star logo which connected by another horizontal metallic blade. This typical feature has been used on a lot of old models at the beginning, even from the very first vintage, the Mercedes-Benz 540K (1937) we still can capture the feeling from this silver bar that supported the front lamps. Then for some reason this strong language for a while disappeared on its models during the 90s to the 2000. However, the latest Mercedes design has brought this heritage back. I tried to integrate this feature with my design but even enhance it with surfacing treatment, showing a more direct Mercedes statement.
The form language

The form language of Mercedes today is indicating the elegance and sophistication of surfaces and proportion. But the latest concept cars, the vision G-CODE concept and the F015 luxury in motion concept are directing the design language towards a more futuristic and simplified results, but still contains a lot of highly refined details in contrast, which could be regarded as the new definition for luxury cars. My understanding for the form language was inspired by the Mercedes conceptual sculptures (2011), to really emphasizing this sophisticated surfacing treatments but in a more consistent and energetic way.
Mercedes AMG, stronger personality

Mercedes AMG, this independent engineering company specializing in performance improvements for Mercedes vehicles which was taken a controlling interest by Daimler-Benz AG in 1990, then owned by Daimler in 2005. AMG models normally have more aggressive looks, better handling, higher level of performance, better stability and more extensive use of carbon fiber than their regular Mercedes counterparts. I took the name AMG D-vision for my project because the overall design was inspired by Mercedes AMG GT due to its fresh and unique identity based on this branch brand. What’s more is I believe the essence of my concept is not only a simple combination of commuter and sports car but meanwhile can still provide uncompromised user experiences, which shares the same value as this special title after Mercedes.
As the trend we can see today, EVs (electric vehicles) could be the best replacement for traditional combustion engine vehicles due to the many benefits they can contribute to the society and environment. On the practical surface, with the new technical breakthroughs being introduced to this field, the power supplement may not depend on cable charging but battery units’ replacement, the meaning behind this could be significant (no more charging time wasted). It will help to change the whole society’s attitude towards EVs in a large scale. What’s more, its new architecture will provide opportunities to catch fresh design language, defining new oriented aesthetics, creating new package possibilities.
Subsidy & Beneficial policy

The government has invested a lot into promoting Electric Vehicles in the national range. The most significant policy came out in September 2013, providing the national subsidy (around $5,600-$9,600) for those who purchase EVs.

Another way from official side to encourage purchasing EVs is by exempting those consumers from some taxes. In September 2014, China’s State Council took away the 10 percent purchase tax for domestic-made EVs, which will continue through 2017. Several local governments, including Shanghai, have experimented with programs offering free license plates for new Tesla vehicles—a significant incentive, considering a license plate itself may cost $12,000 on average.

The “privilege” for EV sales is following the policy shifts at the national level favored by the sustainable development after the rapid economic growth. Since 2012, the new government has been paying more attention over several environmental issues such as air, water, and soil pollution.

A market that lacks of standards

Even though the government has done an admirable job in pushing the development of EVs, the lack of national standards over charging infrastructures still going to limit its development in a large scale, this could mean a vehicle built in Shenzhen may have operability problems in Shanghai, due to different regulations between the model and the local grid. This coordinating problem is further popped out within those demo areas, located in 88 cities that regularly issue new EV standards. Without a uniform standard calibrating the infrastructure in those different areas, implementing EVs to the market will remain many limitations over a national scale.

A lack of standards will have an impact on EVs imported from other markets as well. Since no existing global standard for EVs today, and all the countries have their own policies governing charging infrastructure and electric currents, imported EVs will have to be redesigned to fit into the local charging stations. Finally, consumer taste remains a significant obstacle for EVs’ growth, despite all the efforts of the government have put into to spur demand.
Compact platform for electric vehicles

In Los Angeles on October 9th 2014 Tesla launched its latest Dual Motor platform named P85D, with high performance rear motor and a high efficiency front motor to achieve supercar acceleration, from zero to 100 kilometers per hour in 3.1 seconds. Besides the improvement upon performance, the accomplishment of its structural optimization is the same remarkable. The new power train components are lighter, smaller and more compact especially when put in comparison to the other EVs(electric vehicles) today. The result is indicating us new possibilities over package solutions and interior layout.
**Mood board**

The mood board includes a various of inspirations I got throughout my design process. I tried to seize the aesthetic values from both form aspect and proportion wise, combing plump surfaces with rich detailing treatment, delivering the premium sense of the brand. Functional side I got inspired by the SAAB Aero X concept by its strong futuristic design language, using creative hinge opening ways to indicate the technical feeling.
Ideation

I started initial ideation sketching by trying to interpret the Mercedes form language in a futuristic way. The exaggerated proportion and the reaching forwarded green house are inspired by the spaceship.
Ideation

The overall length of the vehicle is close to a compact 4-seater hatchback, for example the Mercedes A-Class. But proportion side it should be close to a sports car like Merceds AMG GT with much lower profile. The only difference is this car should be able to fit in 4 passengers when it is used as a commuter. That proposed a demand for a creative package solution.
Ideation

The direction tuned a little bit due to the expectation of this project should be able to fulfill the requirements being used as both a commuter and a sports car. So the practical aspect of the vehicle should be emphasized, especially on how to utilize the interior space in a more optimized way. So I got the key sketch with a more compact package on top of a sporty proportion.
Ideation

Variations and different proposals for front face and rear view.
Ideation

The idea comes from a key sketch by showing a part of the cabin could be replaced so that the profile and the proportion of the car could fit in both identities.
After the initial design was fixed, I stepped into the polygon modeling phase by using digital software MODO to test out and evaluate the form and volume in a virtual 3D way, meanwhile using the polygon model as references to keep developing the design on top.
The design kept developing on the results from previous ideation and polygon evaluating model. Here is the sketch rendering of the front quarter view and back quarter view.

Development and renderings

The design kept developing on the results from previous ideation and polygon evaluating model. Here is the sketch rendering of the front quarter view and back quarter view.
Design development

The front face design

The front face design is trying to present a very futuristic feeling with dynamic lines and holistic green house. The exaggerated wheel arches are continued with a sculptural front face, showing a very sophisticated Mercedes language.
The rear view design

The rear view design was inspired by the airplane wing, by having the wing shape surfaces as the lower part of the air outlets. Trying to integrate the volume with the sharp feature in a contrast but harmonious way, showing a exaggerate sporty proportion from this angle.
Replaceable module for the rear part of the cabin, switching between the two different modes, the blade overlaid spoiler on the back of sports mode is inspired by the night fury from the animation How to Train Your Dragon.
The wheel design

The idea of the wheel design is trying to blend the outside surface of the wheel hub into the surrounding wheel arch (shown in the section view), meanwhile using blade shape spokes to enhance the contrast.
Digital modeling

I started digital modeling at the beginning of April, when the design was almost in the fixed phase. The total modeling duration lasted for about one month. It involved a lot of adjustment and refinement on the curves and surfaces so the result could really implement the original design intention. I used quite a lot hardware rendering to give me direct feedback and control over the design. The focus of this project is about exterior but I still worked a bit with the interior because the functional part of this car has a lot of connection with its inside space.
Package

The overall dimension of this car is quite compact but with practical interior space because of the using of the electric powertrain. Side views displayed both results when 4 people could fit into the commuter mode but only 2 people with the sports mode.
Function display

Gullwing opening make passengers feel more embraced and let people easy to get inside. Putting down the back seats will end up with an enormous trunk space, enough to fit into two big size golf bags.
Dimension in comparison

The overall impression with the dimension when you put it together with a traditional compromised sports car and a 1.8 meters mannequin.
Final rendering

Replacable modular for the rear part of the cabin
Final rendering
Scenario
Scenario
Scenario
Degree exhibition
2015.6.3 — 2015.6.4
Model studio photos
Conclusion
I believe the result of this project have successfully implemented the proposed concept in a very sensible but creative way, a sports car that is the ultimate carpooling solution during weekdays and a fun getaway drive for the weekends. The whole process contains a lot experimenting and creative thinking over the package so the functional aspect could fit into both identities, especially on challenging of being functionally practical within such a sporty proportion. Aesthetic wise I tried to capture the Mercedes feeling by exploring the new design language based on my understanding. A lot of inspirations have been applied to keep the consistency on the final design, for example the jet-wing shape identity put on lower front and rear, the blade feature on the back of the sports’ mode and even on the inside of the wheel hub. Meanwhile with all the critical thinking and creative ideation among every part of the process, the design could be guided towards the right direction and eventually ended up with a fairly well result.

During this 6-months-intensive project, I went through almost a holistic design process, from the very initial topic brainstorming till the final physical model making. To be honest, the entire half a year was extremely stressful, and full of challenge, but of course got me improved quite a lot. The most significant parts that I learned is about time management and how to make quick but correct decisions within very limited time. For example, when I realised my design direction has to be adjusted after mid review, I felt very confused and anxious because I knew I was behind the schedule. Nevertheless, I adjusted my later time plan, tried to work in a more efficient way by combining design development with digital modeling, giving more direct reflection and refinement over the design. Meanwhile since I didn’t have any collaborative partner, I have to manage my digital modeling by myself, even though I believe I had enough knowledge about Alias which could let me have better control over the form and proportion, but the drawback of this is that I couldn’t spare more time to build the physical model at school. So in order to achieve the best result, I decided to send my model to China and build it there. However, A lot of communication work is contained to make sure the model was being made the way that I want, meanwhile I also have to tackle the final presentation and get all the materials prepared at the same time. Fortunately, the physical model was proofed to be quite successful in the end, but even before it finally delivered to school it is still filled with uncertainties. However, now when I have finally come over all of these and looking back, I realize how precious these experiences are.

The Thesis project is like the summary for these 3 years’ study. I have been keen trying different design methodologies in order to find the suitable one for myself. Finally within this last project I can feel some parts of my design philosophy is forming. Thinking in depth, drawing with creation, finalizing into perfection! This is probably what I want to see from myself today as a car designer and the attitude that I should be prepared for my up coming design career. I also deeply understand this industry is filled with revolutions and innovations, so maybe keep hungery for fresh knowledge could be the only way to take me further!

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Appendices
**Time Schedule**

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<th>JAN</th>
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- **Project kick-off**
- **Research review & concept freeze**
- **Polygon modeling started**
- **Mid review & design freeze**
- **Process gateway**
- **3D data delivered to Chinese supplier**
- **Submit degree report**
- **Examination**
- **Partial model arrived**
- **Degree exhibition**