

REFLECTION

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'How to design a compact Almere in a future of automated vehicles and contribute to urban sustainability?'

The role of automated vehicles

Automated vehicle (AV) technology is a rapidly developing technology that promised to revolutionize the form and function of our urban spaces. Exactly how and when AVs will impact the built environment is difficult to predict due to the uncertainty surrounding major factors, such as the size and design of AVs, the changes of the ownership models, the costs of AVs. However, we can see a vision of the future that illustrates some of the built environment challenges and opportunities that may arise with the transition to an AV world. The possible changes have impacts on different urban system, in different scenarios, it may lead to the opposite outcomes. The project is built on compact scenario where the government and sharing mobility take the lead in future AV world.

Parking revolution

Conventional parking consumes a significant amount of land, especially in suburban area where auto use is highest for commuting. Almere city is considered as a dormitory town for Amsterdam. The daily commuting between Almere and Amsterdam is busiest route in the Netherlands. The current number of car ownership is 0.37 per people. Taking 30 square meters as the average standard current parking space, there are almost 220-hectare space is consumed by parking function. In addition to parking, cars also require a significant number of supporting used such as gas station, repair shops and car washes. In compact scenario, mobility would be consumed as a service which lead to the shift from private ownership to public ownership. When autonomy is fully applied, the ownership would decrease up to 80%. Besides the ownership, the AV parking stall can also be shrink to free up parking space for new development. There are several reasons, the AV is considered to be designed smaller than conventional vehicles, the autonomous parking system would save the space for opening a vehicle's door, and parking stall stacks can be achieved to save space.

Mathematical analysis is done through research and design to come up with the most possible AV paring dimensions and number of AV ownership. The project proved that the average AV parking space is 14 square meters and the number of AV ownership will decrease to 35%. For Almere city, the number is 0.16 AV per people (the current number of car ownership is 0.37). The project designs an AV parking system in Almere centre area, to place 332,640 square meter AV parking space in total. To design flexible parking system, achieve the high service efficiency and make the transit clear conventional parking space, the project came up with three categories. The AV parking is divided into AV parking garage located in periphery area (50%), AV floor parking in border of community (40%). The last 10% of AV parking space is considered to be private for people who still want to own their personal vehicle. The position is highly related with their own preference, so the project did not give the fixed position for this category.

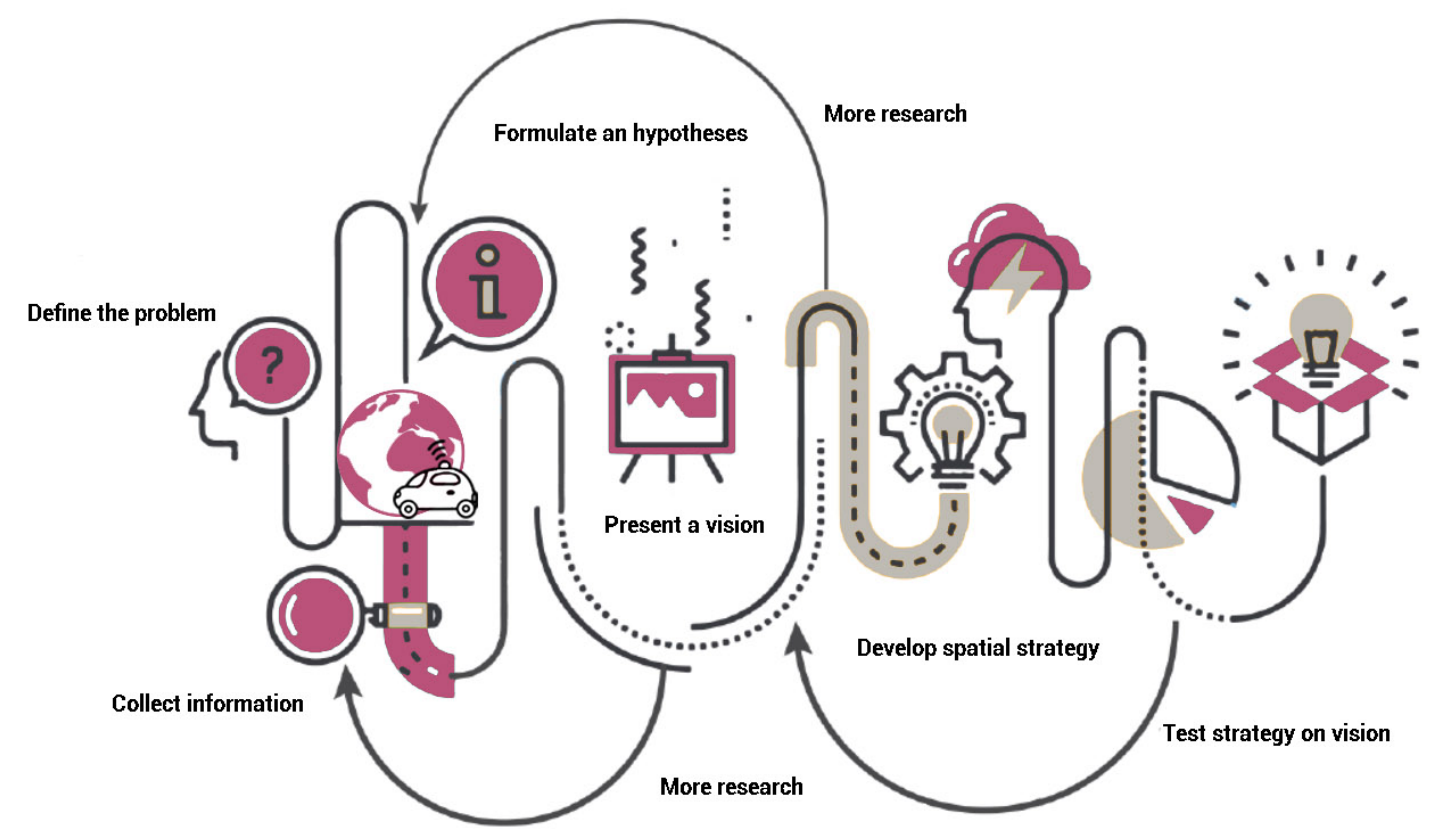
In the project, AV periphery parking is positioned in industry area, due to the good connection with highway which can achieve higher traffic efficiency in regional scale. The AVs are parked in AV parking garage in several floors from first floor. The ground floor is designed to be mixed-use development, adding AV supporting function as priority. The current automotive industry would be transformed by AVs, such as less vehicle production, less gas station, more repair and maintenance, more service provider. Large amount of space can be freed up due to the industry transition and transform the current parking space to place AV parking garage and achieve compact development such as new housing.

The AV floor paring are placed in mix border in community, where the area is currently used in low utilization rate, or has low urban quality destroyed by car industry and ground parking. The parking floor suited in first floor. Compared with the conventional parking, the ground floor can be opened up to have multiple

function, such as shops, offices, healthcare and housing. Simultaneously, the outdoor space have different activity strategy, to transform the low-quality block in to a walkable, accessible, and sustainable community border.

The relationship between research and design

There are different relations between research and design according to Nijhuis (2012): research for design, research through design and research on design. All these three process are used in this project. Such as the theoretical research and literature review is used to understand the board context for sprawl and compact development. Scenario building can be seen as the main method for research through design to find out the background condition to make the project more reasonable. The impact of automated vehicles on built environment is firstly build upon the researches done by related association and department, during the design, adjusted by the original thinking. The idea of research on design has been done exploring AV ownership, size of parking stall and designing AV parking system in periphery area and community border. Through this system-approach, the design proposal is build on the solid knowledge base.



Relevance to graduation studio

Urban Fabric studio focusses on the topic of Automated Mobility, exploring the possible impact on built environment within different scenarios and aiming to foster a sustainable and liveable urban environment. The studio considers the Amsterdam Metropolitan Area (AMA) as the research field, the project gets the initial input from understanding the growth of AMA and identify the city of Almere as the dormitory town, the typical outcome of urban sprawl, with low-density and single-use development. The sprawl presents as an unfolded urban form. One of the most important factor shaping the sprawl form is the rising affordability of the private automobile. The research between urban form and urban mobility perfectly fits the study goal, which is the relations between tangible and intangible structures in different contexts. The rise of autonomous mobility would bring a significant change in how people moving around and urban structure related with traffic. The project research the tangible and intangible convert and test the design intervention in Almere centre area. The scenario building is also practiced in this project to establish a solid storyline. The use of scenarios widen the research and explore what to stimulate and what to avoid in the aim for the compact future.

Reflection of the selected methods

During the elaboration of the project different methods were used. The methodology consists of a theoretical and contextual framework followed by a strategic and design framework based on the knowledge gained from the relationship between urban form and mobility. In order to build a solid knowledge base, certain tools were specifically developed. These tools are literature review, data analysis, mapping, site visit. The reflection on their adequacy is based on their contribution to the final results. In particular, it is interesting to focus on the two main stages of the work. Because each of them required identifying, recording, understanding, meaning-making, and transmitting information pertinent to the stable base

for the project.

The literature review is used to build the knowledge base for understanding the relationship between urban form and mobility, and possible impacts on built environment with AV intervention. Both of them work on the intervention between tangible and intangible structure. The former presents the long term study based on empirical evidence. The latter is a futuristic research and exploration. Learning from the past provided the critical thinking for knowledge-rich AV future. The project practiced a systematic study of parking revolution with AV intervention. Without this particular step, the transition from the abstract to the concrete dimensions would have been unrealistic.

Data analysis is used to provide a mathematical thinking in transforming numbers into space. This is crucial to design a fulfilled vision. The basic numbers are gathered from different aspects, such as conventional parking dimension (vehivle size, parking stall, parking garage ramp, parking floor height), population (in current and future). Combining with knowledge base for AV, the AV parking dimension and AV ownership is proved to be the scientifically convincing. This helped the project to promote a realistic future vision and solid design.

Social and ethical relevance

As described during the thesis, with AV applied, large amount of space can be freed up by parking revolution. Multipole strategy and design can be practiced creatively. The project provide the compact development and valuable surface design aims to embrace the sustainable future.

Nowadays, car-parking takes over the valuable land in city and eliminate the quality of space. Such as the board ground parking is chartered as one of the main factors that making community border less attractive. With AV parking revolution, those urban blocks can be redeveloped to provide efficient transit, start new local

business, accommodate new residents, obtain outdoor activities, and celebrate community meetings. These interventions would create a sense of belonging which the most Almere residents think is lack of.

In the larger context, the coverage of AVs and sharing mobility could serve to improve accessibility for disabled people and the elderly. For the whole society, access to transportation is closely linked to opportunities for employment, education, health care, and recreation. For ecology issues, with the decrease in AV ownership, the carbon emission will drop as well, which is a way to prevent global warming. The free up car-parking space can be redeveloped and contribute to environmental-friendly function. For economy, automotive industry will be affected. The trucking and freight industry will be among the earliest adopters of automotive driving as companies seek to improve transport efficiency. Autonomous driving systems will free drivers from the task of driving, and eventually many driver jobs will be eliminated when such systems become a reality. This will enable for city to have new start-ups in AV park and local business in community border, resulting in an increase in economic benefits.

Project transferability

The project deals with compact development in Almere city intervened with parking revolution. The main futuristic numbers are scientific convincing. To make the project transferable, the project did not look at the extreme condition, research and original exploration has been done to firstly have the possible range then choice was made based on the current situation. The design structure, for example, the AV parking stall and future ownership, the space for AV parking in Almere centre area can be directly used in other AV related projects. For AV parking system, there is also an extreme that all AV can be parked in skyscraper in periphery. The project provided different parking solutions to achieve better service efficiency and transferability. In a larger picture, for design size, the project focus on Almere

center area. In general, the statistic (AV parking stall and future ownership) can be applied to other Dutch cities. The parking system can be applied to mid-size or larger cities where are capable to hold both AV parking garage in periphery, AV floor parking in community and AV private parking. For those small-size, cities may only have AV floor parking are more flexible or several cities may share one AV parking garage.

Limitation

Despite reviewing municipal documents and visions for the Almere city, a major limitation was the government-oriented AV control. Federal policy needs to be made to avoid AV spread everywhere. In thesis, government should make the price hierarchy to limit the ability for AV travel. Without control, such as people travel further to have new housing in green area is likely to happen. In the coming research period, I would try to contact stakeholders and cooperate with municipality. This would be helpful in policy design. In report, the economic activity proposal is made, such as the ground floor for AV parking garage and new housing in community border (with AV floor parking) is designed to place new business at priority. The current Almere economic condition and future competitive strength need to be explored. The strategy proposal can be further defined.