Towards New Urban Mobility  
*a branching structure that supports the network and knowledge*

**Design assignment**  
The assignment is the development a self-sustaining pavilion for the World Expo 2025 to be held in Rotterdam. The World Expo is an event that tackles global problems through innovation and cultural exchange. Given their size, they are part of the urban development strategies of their host-cities and are extremely efficient tools to modernize transportation infrastructures, introduce innovative urban services and develop new economic and cultural activities. Therefore this project is seeking for a challenge that is interesting as global problem and at the same time could be part of the urban development strategy of Rotterdam. Universal Expo pavilions are commonly abandoned or under use after the exhibition comes to an end. A proposal for a pavilion that has a prosperous life after the Expo is relevant to the design approach.

**Research**  
World’s population is increasingly urban with more than half living in urban areas. Cities will keep growing, they will become increasingly polluted and gridlocked, damaging inhabitants’ health and making it hard for them to get around. Mobility is one of the key-drivers for creating a livable future city because the urban lay-out is determined by the infrastructural network. This project focuses on mobility attitudes and behaviour in the context of new and emerging urban transport opportunities, such as those related to smartphone travel applications, bike and car sharing, electric vehicles, and increasing support for public transport, walking and cycling.

In addition, we technically arrived at a place where the urban mobility might soon undergo fundamental changes. Around the globe researchers are working on technical innovations like new drive technologies and collision recognition systems, while others explore autonomous driving systems. From a purely technical standpoint, the first driverless vehicles—basically robots that participate in traffic—could take to the roads today, but technology is much faster than ethics, law, and policy. These technologies are not publicly accessible yet, which results in a lack of understanding and acceptance of the main public.

The conclusion of the research led to two main design goals:
1. To create a *valuable connection and program* to support flexibility between transportation systems and promote walking and cycling. (urban network scale)
2. To create an *informative experience* about the new technologies to contribute to the visitors’ knowledge and acting. (pavilion scale)

**Design**  
The Hyperbody Studio focusses on the employing and advancing techniques and methods for designing, building, and operating Non-Standard and Interactive Architecture. The research and design of the project are developed from a computational and self-organizing system approach, giving the possibility of using complexity as a tool. In the design of this structure, *agent-based swarm systems* are implemented, researching and defining firstly the program allocation, secondly the pathways, both between a variety of points derived from the urban context. The points are based on contextual inputs as proximity to existing architecture and infrastructure, water, verticality and sun radiation. These swarm outcomes are translated to one continuous skin as start point for
the top-down architectural input. To maximize the accentuation of movement and openness in relation to the location the architectural goal is an accessible fluent open structure. A branching system allows me to meet this goal. It consists of connected lines that has a start and end point. In between it fluently branches with as input parameters: the spans, curvature of the shape, openings for required functions for light and view, and visual connections from the exterior to the program. The branched lines serves as basis for the construction. This strategy of designing provided me with the necessary visual feedback to understand my research, design and choices.

**Conclusion**

In conclusion, it was hard to get grip on the scale of the overall design after the simulations output, starting from the continuous skin. I tried several strategies, the design strategy I used in the end, a top-down branching system, helped me to meet the design goals. Some potentials were missed as a more detailed opening strategy, which could have thoroughly integrated with the constructive system. It would make the design a more generic one. In the end the focus was to make the overall geometry work and to merge the valuable connection, program and experience in one. Eventually the project has achieved this.

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1. function allocation output  
2. pathways output  
3. continuous skin  
4. overall branching structure  
5. close-up branching structure