P4 Reflection

In this last chapter of the thesis it is time to look back and analyse the process and products and reflect on them.

About 30 weeks ago the graduation project started. In the first 10 weeks the research plan and the literature review were conducted and in the last 20 weeks the research is conducted based on the graduation plan. The results of the study are now here and are analysed.

The goal of the research changed during the process because there was no need for being as transparent as possible. Thereby the developing a working script for the panels was more time consuming then expected which lead to the choice of adjusting the goal and research question. This finally resulted in not being able to run optimization on the panel generation. The possibility to run optimizations is still available and will increase the quality of the result. Although, the developed strategy showed that the representation of the structural analysis will lead to a better resistance against bending of about 5% compared to random Voronoi patterns. This is a good result which shows the validity of the strategy and therefore shows possibilities for use of the strategy with other geometries. This means there is no direct result which is optimal, but a strategy is presented to make geometrical patterns more efficient. Thereby a weight reduction of 90% is achieved. This is maybe not the highest possible reduction, but is enough to create facade panels which can be installed by one person. The question is then: Is it needed to create a as light as possible panel?

Early in the process I already encountered the possibility to create a non standard and asymmetrical solution to the standard. Therefore quite some time was invested in the design of the Voronoi pattern. This means also that the objective of the study changed a bit in this stage. It became important to give structural meaning to the 'random' pattern and less important to create that as light and transparent panel as possible.

Since on of the result of the study is the 1:1 scale model applied in the PD test lab, the results are direct applicable in practice. Although it is important to investigate further in the thermal insulating properties of the panels.

A facade element made out of the combined use of thin glass and AM is, besides several student theses, not used before in architecture. Thereby the panel is in the end not a translation of structural behaviour into a symmetrical and optimized panel. The Voronoi pattern implied extra challenges in the structural aspects, but finally delivered an appealing solution for the combined use of the two techniques. The goal thereby was to create the possibility for Architects to design a new type of interesting façades, which in my own opinion succeeded.

On the other hand I expect the concept needs some more time to develop to be really applied in practice. When curved panels are possible to create relative easy and the panels show to have at least as good insulating properties as existing façades, then the panels become really interesting for Architects.

On sustainability the projects delivers the biggest advantage in the use of thin glass. The used glass is about five times as thin as the normal glass in windows. This also means five times as less material. This reduction of raw material is a big advantage for sustainability. Thereby the panel are so light, they can be handled without any heavy machinery which decreases the impact on the environment during construction.

So after all the research which has been done the results satisfy my (adjusted) expectations since I found a way to optimize the Voronoi pattern based on structural analyses of plates. This goal came after the first research framework, but was very interesting when it was discovered. Also delivering a working strategy is more useful in further research then just one optimized strategy.