Karim Daw P4 Reflection

M.Sc Architecture, Urbanism and Building Sciences

This project seeks to investigate the multiple materialization approaches of timber as a construction material for a residential/mixed use building sited in Berlin, Germany. Seeing as there is a major housing crisis Europe wide with the added concern of the growing environmental concern, this proposal aims to be the embodiment of applied research in timber construction, combining both techniques of mass customization as well as standardization. The ethos is that while some aspects of the project must utilize innovative construction technologies such as robotics, other facets still rely on standardized components. This philosophy is rooted in that a complete overnight transition from one industrial construction methodology (standardization) to a new era of mass customization is too abrupt for the construction industry. Therefore, a hybrid adaptation of both system within project, would be the methodology to tackle this issue and further advocate for how innovation in the construction industry can be hybridized rather than completely revamped. Furthermore, this research and development endeavor tackles the topic of housing which intuitively is a logical testing ground for this proof of concept.

The two main avenues of research in this project are the following:
1: Discretized timber joinery system (mass standardization)
2: Large timber compression shells (mass customization)

The goal being to utilize both methodologies only where appropriate. For example, areas of the building that are under large amounts of compression forces such as the timber shell anchors are fabricated though a method of robotic subtraction given a wooden bounding box. Other areas such as partition walls, flooring, and facade, utilize a more standard approach combining material strategies such as CLT, particle board and simple timber structural beams/girders that aggregate in an additive fashion.

Conclusively this project attempts to showcase the multiple use of timber as a construction material and how different treatments of this diverse and living material can encompass larger portions of the construction of a building then we originally thought. The idea being to reduce the amount of materials being used in a building as much as possible and advocating for timber being the construction material of the future especially when integrated with robotic building operations.

To Reflect further on the thesis statement and whether this project can be deemed successful, the relationship between research and the design process needs to be addressed. In this thesis, the subject matter involved a heavy investigation and prototyping regime in subjects of geometry, mathematics, and computer science. Coupled with the studio requirement of a robotic fabrication procedure as a final materialization result, one could see that the heavy technical aspect was given the most attention throughout the research and design process. Investigations on building techniques with timber were conducted with several prototyping workshops held both in Delft and in DIA (Dessau Institute of Architecture). Therefore, while the aspects of research were meticulous in its

complexity within different subject matters in computational design, all of this abstract thinking needed to be materialized in a 1:1 scale which added another interesting layer to the thesis investigation.

In terms of the scientific relevance of this thesis, while the topic seeks to investigate the technical interest in the vast possibilities of timber construction, it further investigates the possibilities of computational design as a systematized was of thinking in terms of configuration of spaces with attributes and properties one can take into account. I believe while the results of this thesis are subjective, the attempt to craft a computational workflow and process is the key interest in the work. The final product is not as relevant as the procedure that was designed and crafted. This positions my thesis towards the idea of generative ideation. Rather than forcing the design process, the tools of computation become a collaborator where the access to rapid prototyping. high performance algorithms, and interactive intelligent feedback creates a very new design process that feels less micro managed as it is right now.

Moreover, the results of this thesis can contribute to a broader scientific and professional framework to today relevance in AI, computation, IOT and subjects of tech. The architecture industry seems to be one of the least innovative industries in the world and therefore by pushing the agenda of the digital age towards the built environment as my thesis attempts to, I believe this contributes to the discussion as to the importance of these new methodologies.

While there are indeed ethical issues that need to be addressed in relation to the broader subject of automation, robotics, and ai, the same arguments are always exhibited: whether it be the threat to the economy of jobs or even the well-being of society. However speaking within the bubble of the building industry to not broaden the scope to irrelevancy, the fact of the matter is, the architectural design process should be a playful creation atmosphere where the power of automation can aid in the design and build process benefiting several parties in the pipeline, let alone creating more jobs and opportunities at an exponential level. Computational and systematic thinking is the key process for this thesis and is the orientation that my thinking tended towards during the entire project.

I believe my approach with the help of my mentors was informed and thorough. While the thesis requirements have segmented times for design and research, my process entwined both these aspects the entire time. The mentors helped guide me both in aspects of design and materialization which forced me to consistently think in both large and small scale which I believe gave a certain richness and complexity to my design. Finally, looking back at the process and final output, naturally there are questions of feasibility and maintenance and the work began to show how the final building could be constructed, but a deeper investigation into the construction and phasing of this prototype needs to be undertaken and therefore can be seen as the limitation of this project.
Often times, the feedback that was given to my work was the fact that I was mixing to many ideas therefore a consistent remark was to simplify and design and to integrate all design aspects. I have learned to therefore create thorough procedural work that at a moment’s notice can be edited and changed by adjusting a few parameters in my digital model. This was key in being flexible to change and continued feedback of the design as a whole.