Discretised Procedural Timber

An Investigation into robotic manufacturing and assembly for residential timber construction

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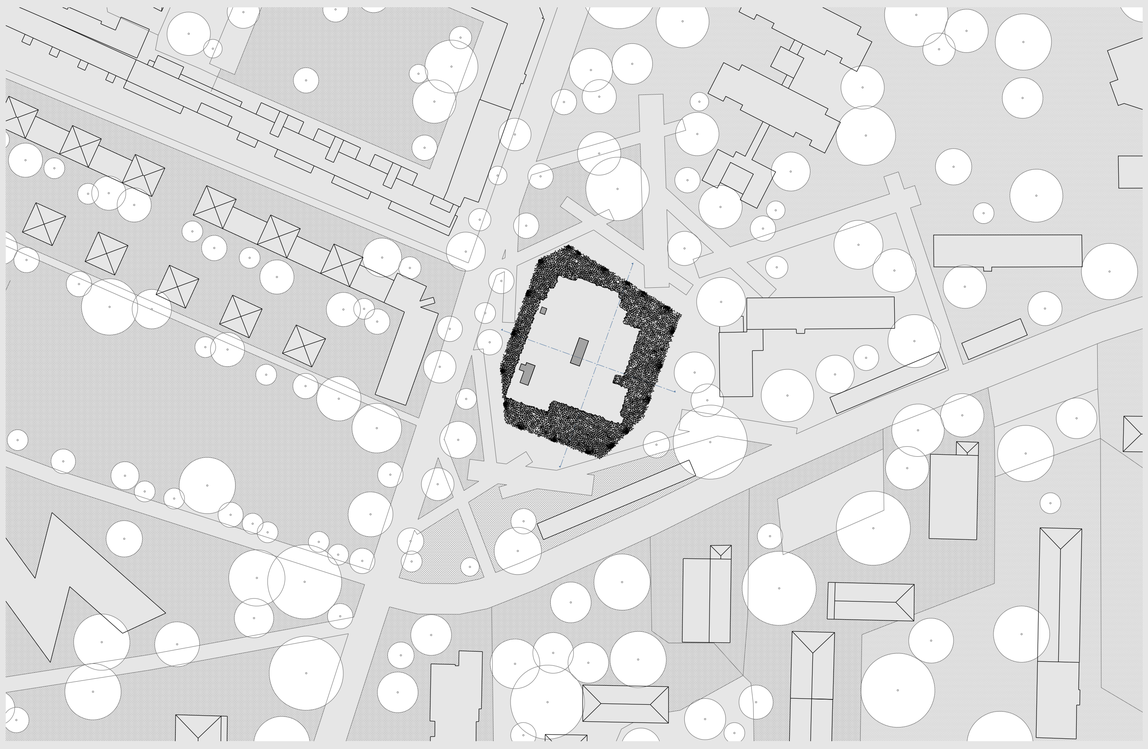
This project seeks to investigate the multiple materialisation approaches of timber as a construction material for a residential/mixed use building sited in Berlin, Germany. Seeing as there is a major housing crisis Europe wide with the added concern of the growing environmental concern, this proposal aims to be the embodiment of applied research in timber construction, combining both techniques of mass customisation as well as standardisation. The ethos is that while some aspects of the project must utilise innovative construction technologies such as robotics, other facets still rely on standardised components. This philosophy is rooted in that a complete overnight transition from one industrial construction methodology (standardisation) to a new era of mass customisation 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 hybridised rather than completely revamped. Furthermore, this research and development endeavour 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: Discretised timber joinery system (mass standardisation)
2: Large timber compression shells (mass customisation)

The goal being to utilise 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, utilise 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 materialisation result, one could see that the heavy technical aspect was given the most attention through out 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 materialised in a 1:1 scale which added another interesting layer to the thesis investigation.



1:1000 Site Plane