

P5 Reflection

Studio
Robotic Building

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Free-form timber in architecture

The main aim of my thesis was to research the possibilities of freeform timber in both, construction and design. I started looking into traditional and recent wood architecture. The construction principle of CLT (cross laminated timber) caught my attention. Through several experiments and built models along with computational models and simulations, I was able to develop two constructive principles based on the idea of cross lamination.

The first built result was a double curved and glue laminated panel. By making use of a Kuka robot arm, I first created a mold out of EPS. This mold was then used to press three different layers of wood strips together. All the strips had a different geometry due to their position and curvature in the panel. To cut these pieces I used a conventional laser cutter. Although the resulting panel was only a scale model, I was already very happy about its structural potential and strength. This result convinced me to continue the direction of my research. For future application I assume that a digital flexible press can replace an EPS mold and a robot will become necessary the moment the strips increase in thickness. Nevertheless, there were some aspects that require a critical reflection. First, even though the result was convincing in strength, it was not very precise as a 3D scan had shown. The reason for this might have been the use of slightly flexible EPS. Second, the press process required a lot of time to prepare all the strips and prefix them in position. These two aspects would need to be discovered further before this principle could be put into reality.

In the second prototype, I tried to learn from the results of the previous model. In this experiment my goal was to avoid a mold, but to create the same complex geometry. That meant that I had to rethink the connection between the strips. My solution was not to use glue, but to rivet all the pieces together. This approach enabled me to assemble strip by strip without being limited to the size of a panel. The result was a very precise and aesthetic prototype. Even though I was strong enough to bend a strip in the scale model, I speculate that a robot would have to do this job the moment the material increases in thickness. Besides the positive aspect of precision, the amount of rivets needed was quite high. Since the structural capabilities of this approach are not as high as with the glued panel, I think that this method could be used to shape interior spaces.

Reflecting my process, I can say that I feel very confident about the results of my research in terms of fabrication. I expect that future architecture will increasingly make use of computational design strategies resulting in complex architectural geometries and buildings. Together with a tendency towards resource friendly and natural materials, I think that there is a huge potential for freeform timber architecture.