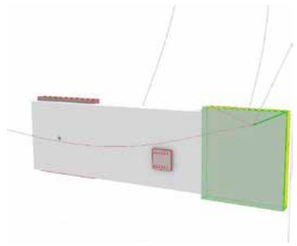
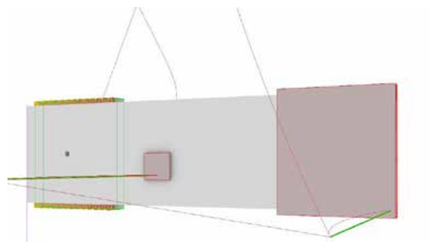
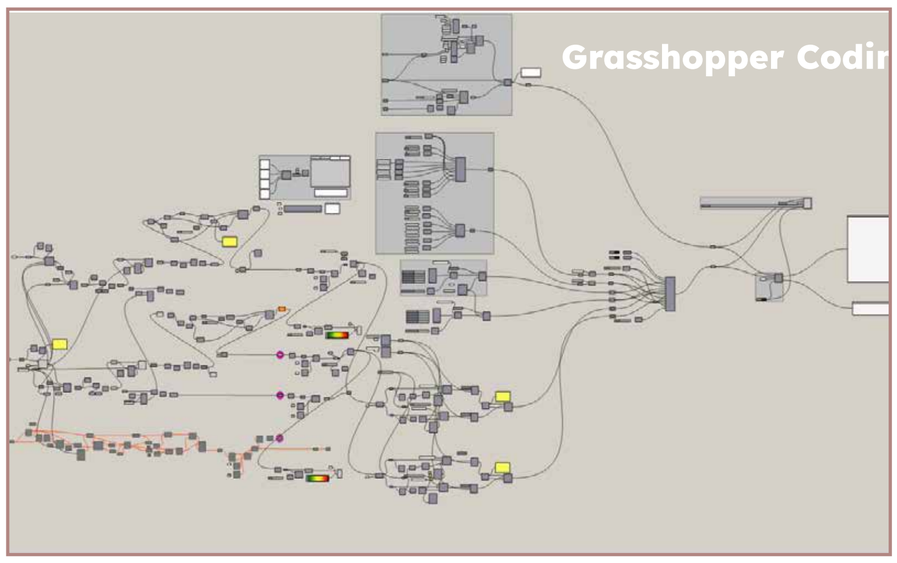
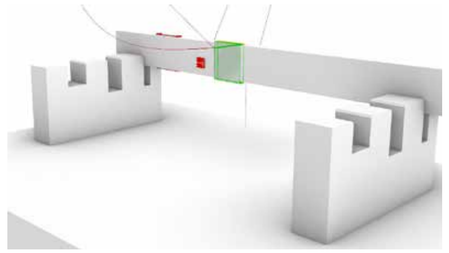
A1 review

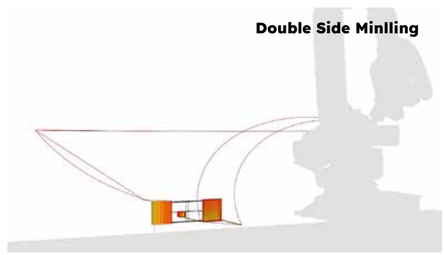
Milling model











In the a1 section, we designed a double-sided joint, which requires the machine to change direction during milling. This setup allows for greater flexibility in the milling process but also adds complexity, as the machine needs to realign itself to approach the workpiece from both sides. This directional change can impact efficiency and requires careful calibration to maintain precision, making it essential to account for potential alignment adjustments in the milling path planning.

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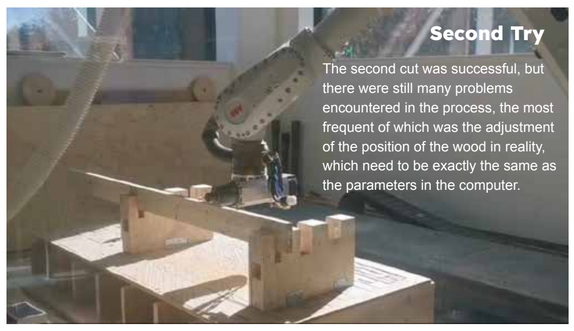
Making Process

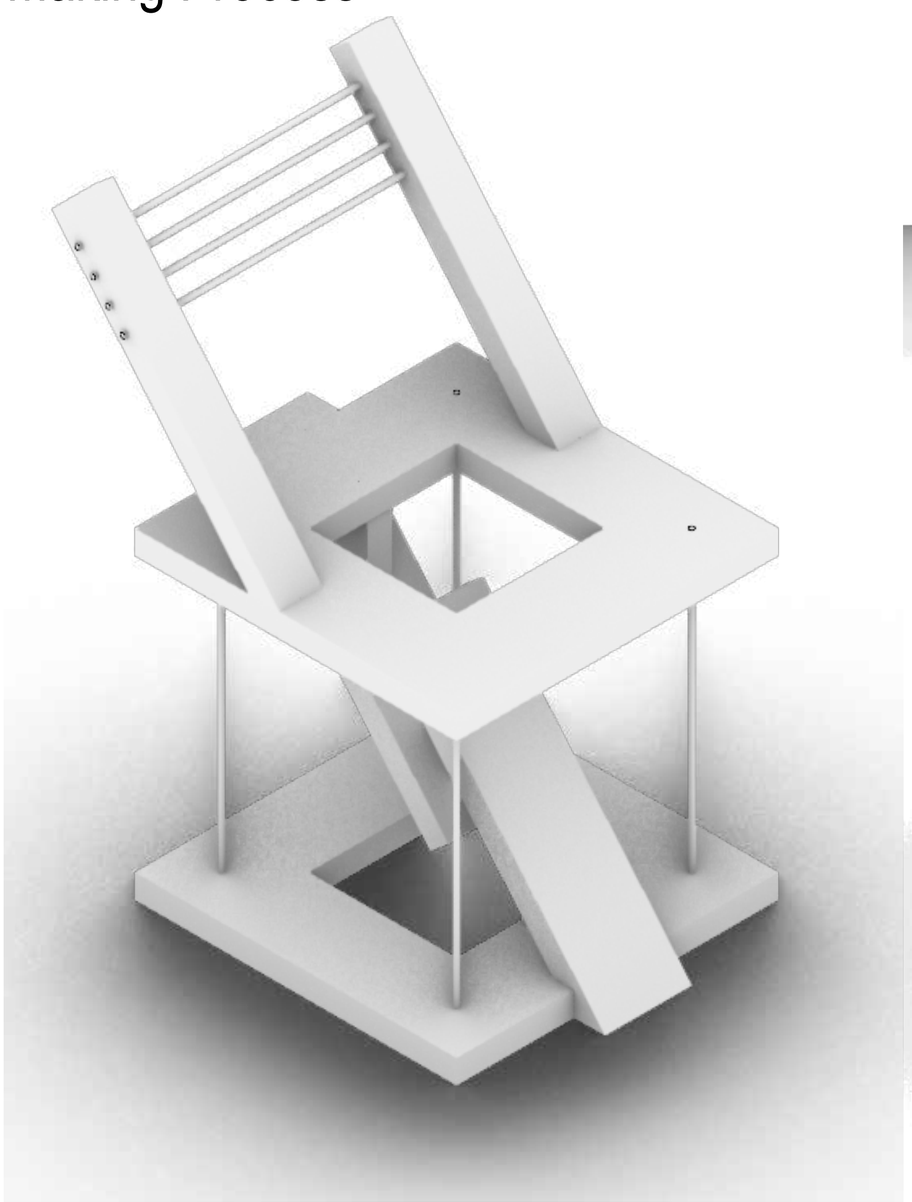
Details Adjusting

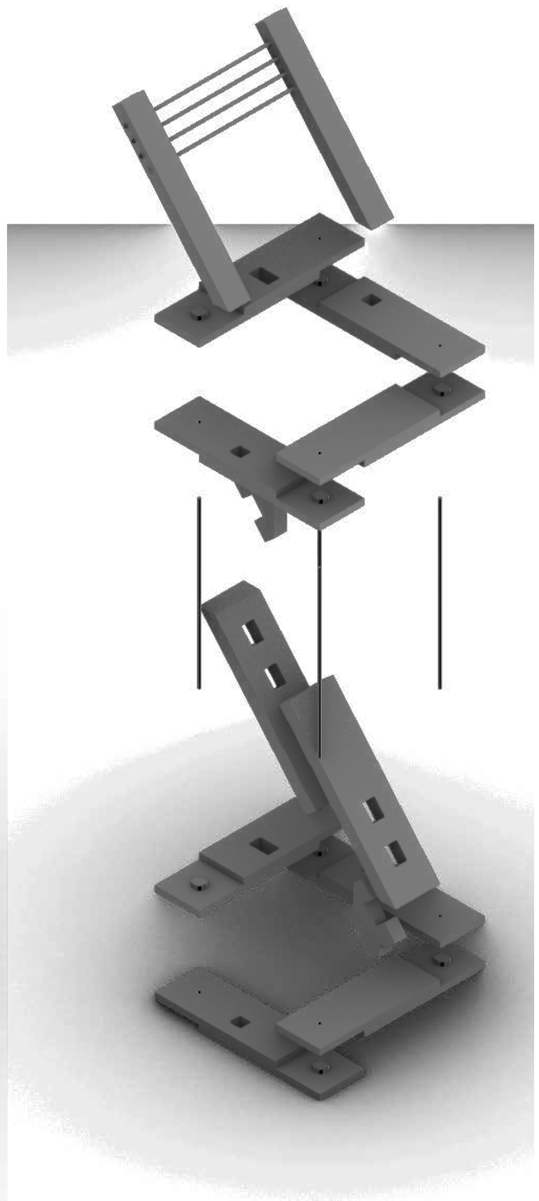
Because the wood processed by the robot will have some problems such as different thicknesses, rough edges, and different interface dimensions, the details need to be adjusted manually.

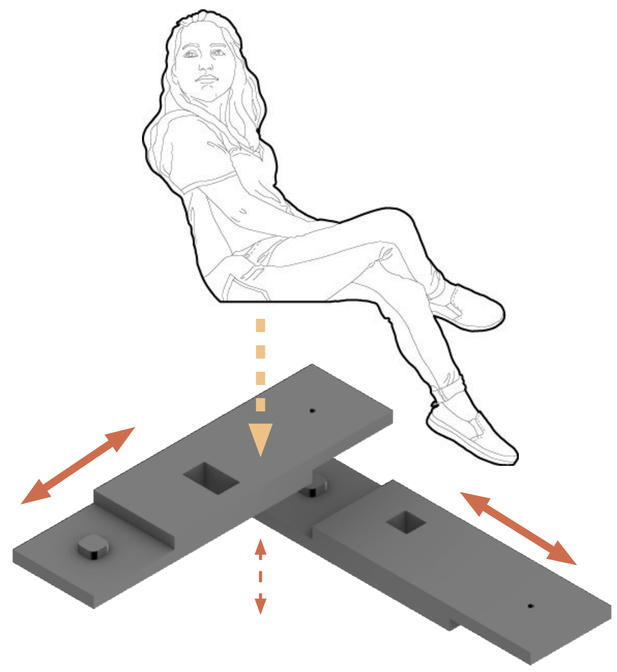


A3

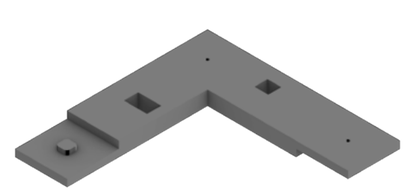
Making Process



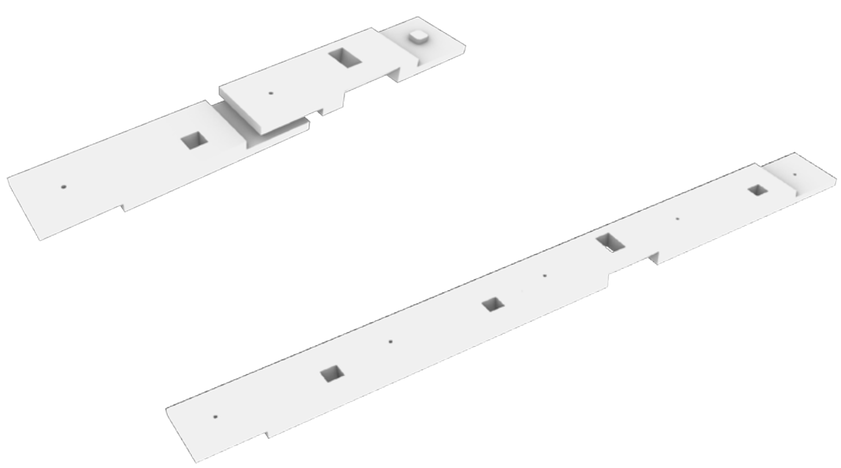




By incorporating nodes into the joint, it effectively prevents movement along both the x and y axes, ensuring the chair remains securely fixed in place. Additionally, forces along the z-axis, which are generated when the user sits down, are absorbed and prevented, further enhancing the chair's stability. This design ensures that the chair remains stable and secure under typical usage conditions, providing both comfort and durability.



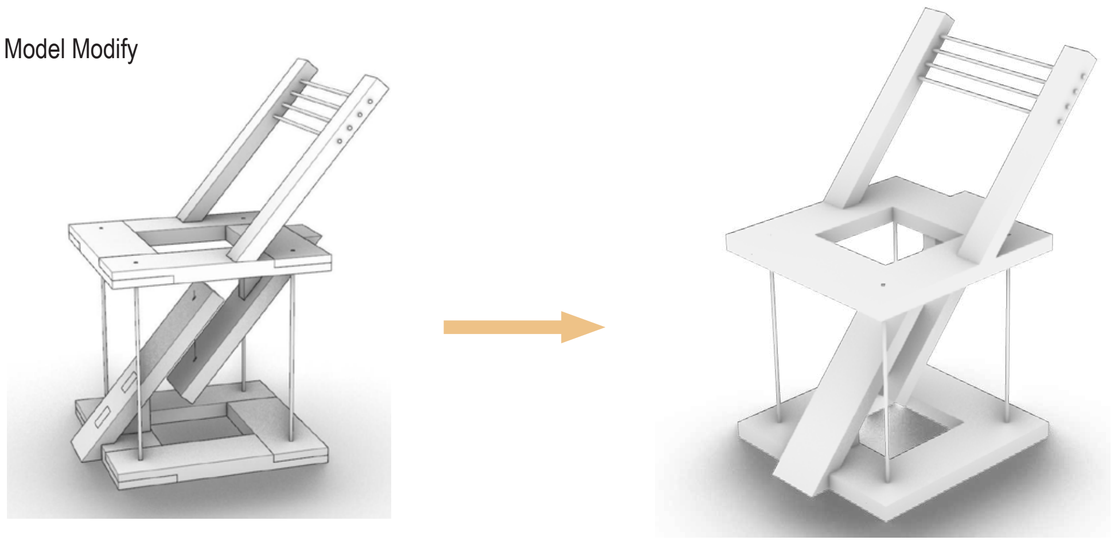
Future Development



In the a3 section, we provide an outlook on the potential of this joint design. Owing to the inherent properties of the joint, it is capable of extending indefinitely along a single axis, which introduces significant flexibility in its application. This characteristic allows the joint to be utilized across a variety of contexts, offering versatility for numerous potential uses. The ability to extend the joint along one axis makes it highly adaptable, providing solutions for both simple structural frameworks and more complex, dynamic systems. Such scalability holds considerable promise for future projects, enabling the design to be applied in a broad range of industries where both stability and adaptability are required. This flexibility could prove instrumental in the development of more efficient and versatile systems in the future.

A2 review

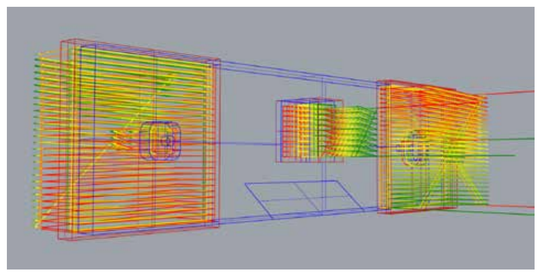
A2 Model Modify

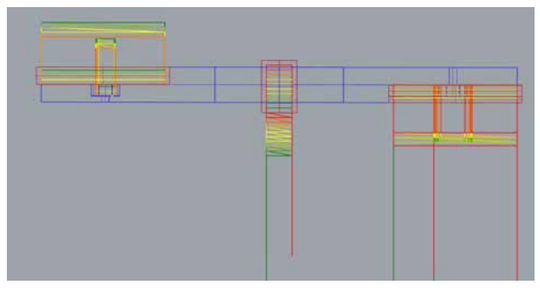


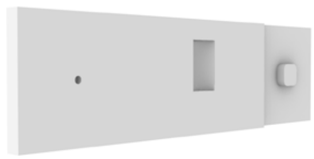
Details

The joint connection method was improved in the transition from a1 to a2, enhancing the stability of the wood during the machining process. Initially, the setup allowed for stability primarily along the x-axis. However, with this modification, the joint now secures the wood along both the x-axis and y-axis. This enhancement minimizes movement in multiple directions, significantly improving accuracy and reducing the risk of positional shifts, which is crucial for achieving precise cuts and high-quality finishes in milling tasks.

Milling Strategy

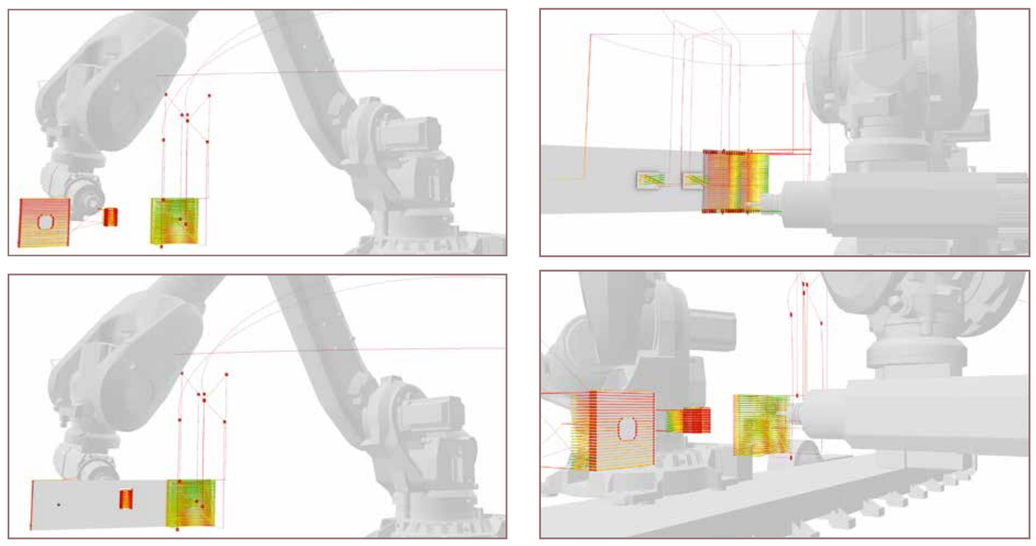


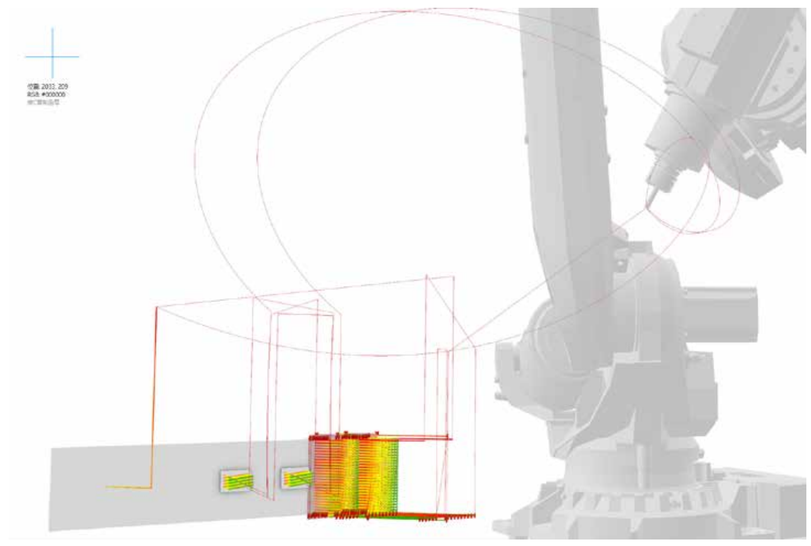




For path planning, it is necessary to extend slightly beyond the wood surface to compensate for any inaccuracies in measurement that may arise during material placement.

Move J (joint motion) moves along the shortest joint path with high speed, making it suitable for tasks that do not have strict path requirements. It is often used when adjustments are needed during point-to-point movements and spindle reorientation. Move L (linear motion) moves the end effector along a straight line with precise path control, making it ideal for operations requiring accurate control or obstacle avoidance. Therefore, most of our milling tasks are performed using Move L.





Milling Process

During milling, securely fastening the workpiece with screws and angle plates is essential to maintain stability. Without proper fixation, the milling head's movement may cause the workpiece to shift, compromising positional accuracy and reducing the overall precision of the machining process. This secure setup helps ensure that the workpiece remains in its intended position, supporting a consistent, high-quality finish.

Joint Details

The joints milled by the robotic arm have some minor imperfections and inaccuracies. To ensure that the joints fit together smoothly, we perform manual adjustments afterward. This additional step allows us to refine the fit and alignments, achieving the precision needed for seamless assembly.