ROBOTIC TIMBER CONSTRUCTION

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Robotic Timber Construction

The urge to significantly reduce the environmental impact of the construction sector has led to a renewed interest in wood as a building material. Timber structures store CO_2, turning cities into carbon sinks. However, we also need to rethink existing construction workflows to improve efficiency, quality, creativity, and sustainability. **Robotic Timber Construction** explores how robots can be used to automate the fabrication and assembly of bespoke timber structures. The research aims at introducing a streamlined workflow from design to construction that would allow industries to move from a logic of standardization to a logic of mass customization.

La nécessité de réduire drastiquement l'impact environnemental du secteur de la construction a suscité un regain d'intérêt pour le matériau bois. En effet, les structures en bois permettent de séquestrer le C02 et de transformer nos villes en véritables puits de carbone. Cependant, il est également nécessaire de repenser nos méthodes de construction afin d'en améliorer l'efficacité, la qualité, la créativité, et la durabilité. Le projet **Robotic Timber Construction** explore comment les robots peuvent être utilisés pour automatiser la fabrication et l'assemblage de structures non standard en bois. Cette recherche a pour but d'introduire un flux de travail rationalisé de la conception à la construction et de permettre aux industries du secteur d'évoluer d'une logique de standardisation à une logique d'adaptation locale.

Robotic fabrication of round wood

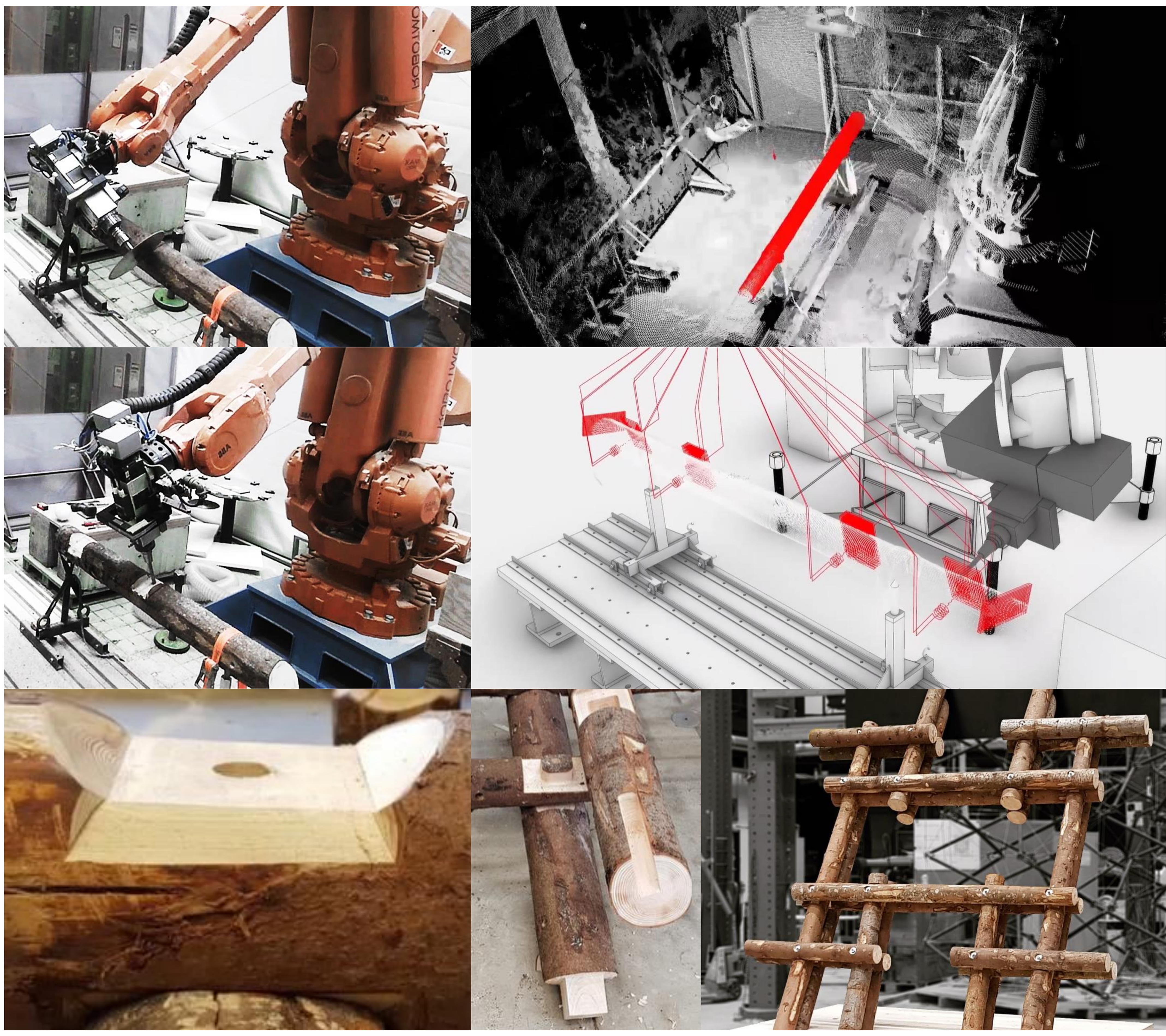

Figure 1 (top): Robotic cutting of timber joints.
Figure 2 (middle): Robotic milling of timber joints.
Figure 3 (bottom): Example of robotically fabricated timber joint.

Figure 4 (top): Scanning a round wood to get its exact shape and position in the robotic cell.
Figure 5 (middle): Generating robot trajectories to automate the manufacturing process.
Figure 6 (bottom): Reciprocal structure with round wood connected by robotically fabricated timber joints.

Robotic assembly of timber panels

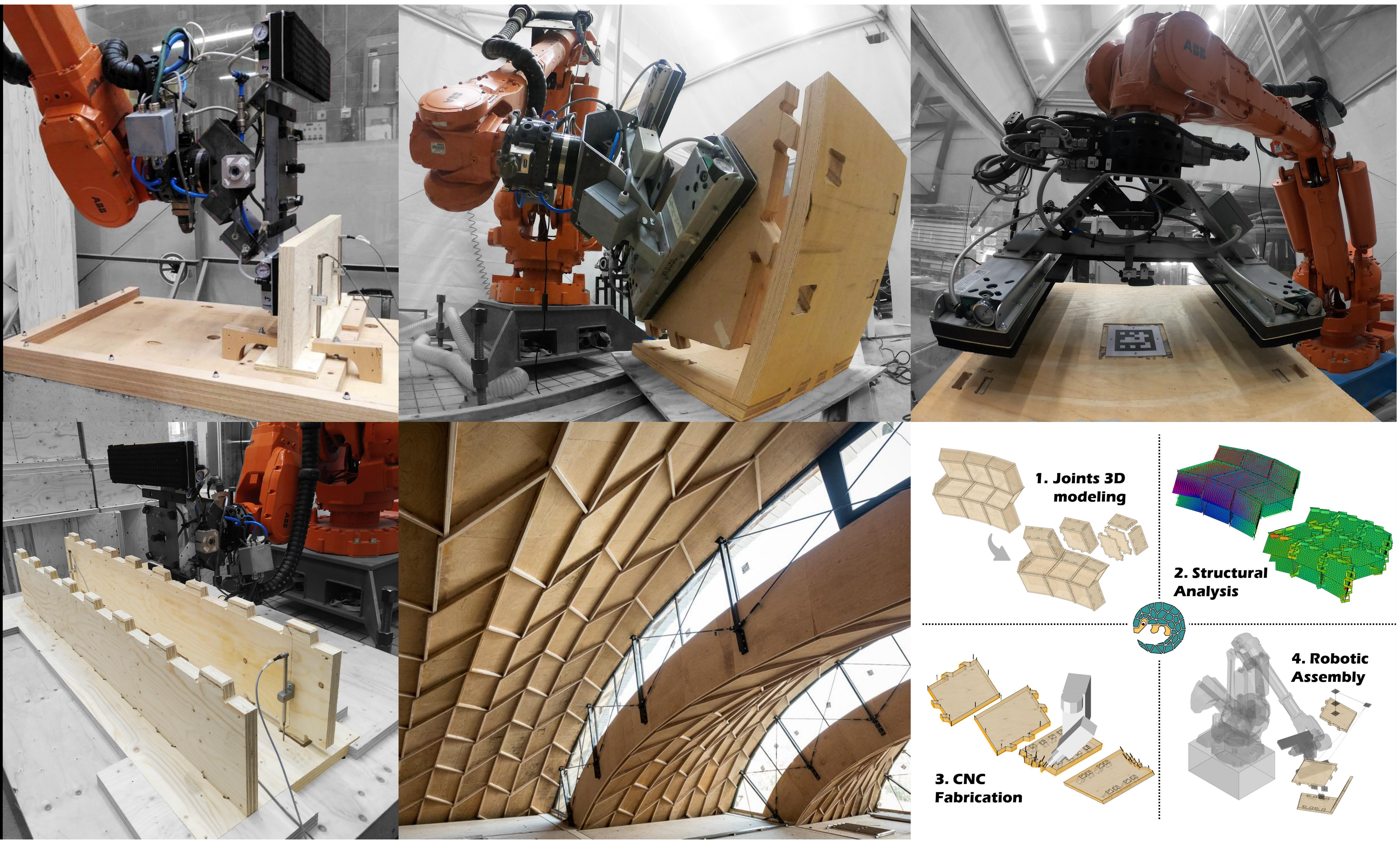

Figure 7 (top): Studying the influence of friction forces on the robotic assembly.
Figure 8 (bottom): Assembling a timber beam connected by through-tenon joints.

Figure 9 (top): Automating the assembly of one module of the structure shown in Figure 10.
Figure 10 (bottom): The doubly-curved vaults of the Annen headquarters in Manternach, Luxembourg.

Figure 11 (top): Using computer vision to locate timber panels and enhance the accuracy of the robot.
Figure 12 (bottom): The open source plugin Manis automates the design and construction process.

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