Pallet Assembly

(FABRICATION SEMINAR)

Course: Robotic Fabrication

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Contribution: Computational Modeling | Designing | Grasshopper Scripting | Robotic Fabrication | Presentation | Rendering

Abstract:
The seminar "Pallet Assembly" explores the potential of re-purposing waste pallet wood through advanced fabrication techniques. With a focus on sustainability and resource efficiency, the seminar delves into the environmental impact of timber waste and the life cycle of pallet wood. We look into traditional and advanced methods of reusing timber, including the use of computational tools, CNC machines, and robots. The seminar highlights successful case studies and design innovations, addressing both the aesthetic and functional aspects of using reclaimed timber. We also discuss the technical, economic, and logistical challenges of processing and fabricating with pallet wood, as well as future trends in fabrication technologies. By the end of the seminar, we had gained a deeper understanding of the ecological and practical benefits of reusing pallet wood, equipped with knowledge to contribute to sustainable architectural and design practices.

For more info:

Click here!

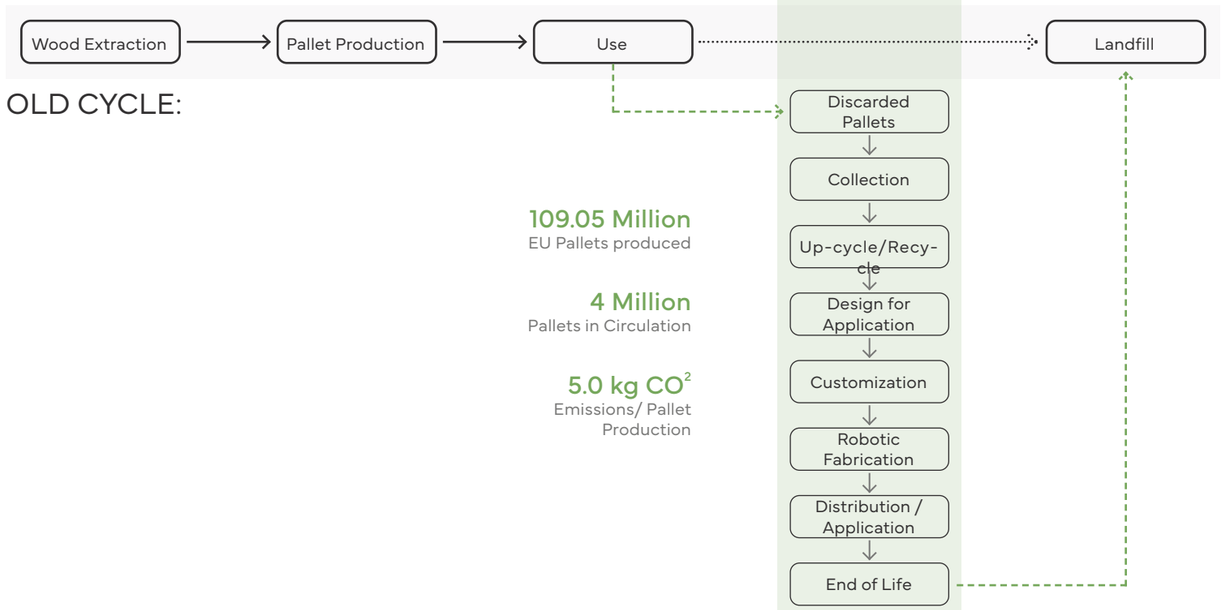
50.8 Million Tonnes
Timber Waste/ Annum

800 Kg
CO2 Equivalent Methane / Tonne

CONTEXT:

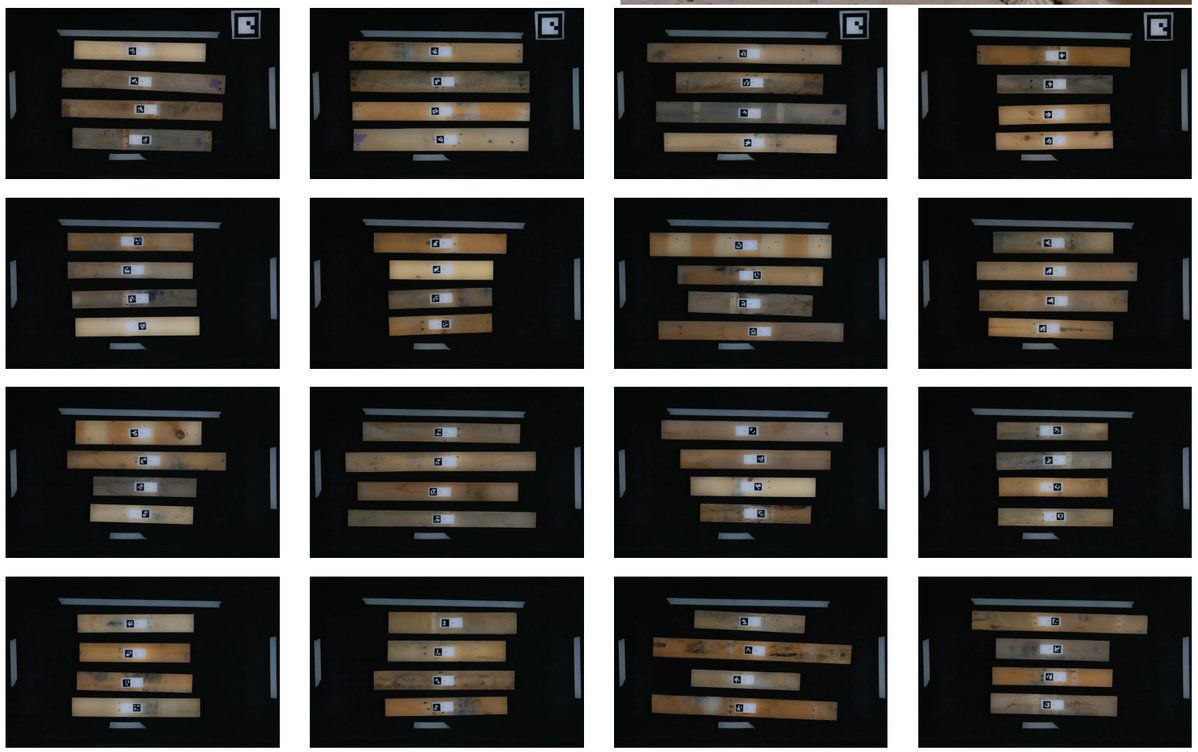
In the EU, 50.8 million tonnes of timber waste are produced annually, including natural wood, off-cuts, sanding dust, coated wood, and wood with protection agents. When wood rots in landfills, it generates methane, with each tonne producing 800 kg of CO2 equivalent. Toxic chemicals such as paint, glue, and creosote leach into the soil, polluting groundwater and waterways, highlighting the urgent need for improved waste management.

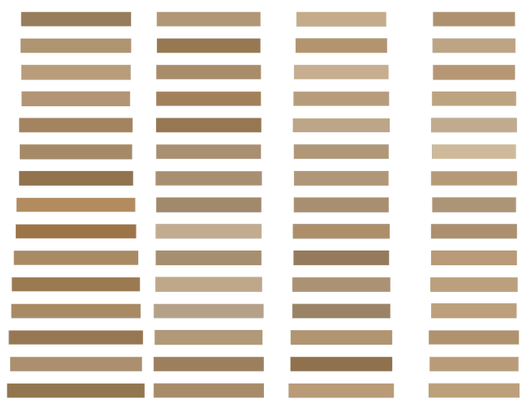
CHANGE THE CYCLE:



SCANNING:

Scanning waste wood pallets is essential for cataloging them by size, color, and defects. This enables accurate sorting and efficient re-purposing, ensuring optimal use of materials and reducing waste.

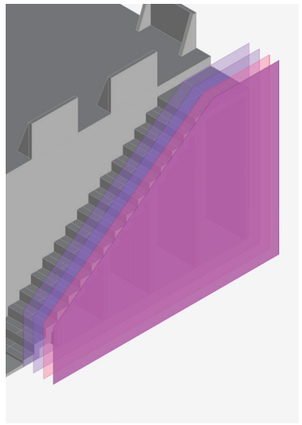




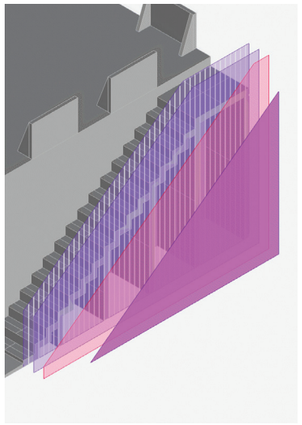
DIGITAL TWIN:

By creating a virtual replica of the waste wood pallets, designers can experiment with different configurations and styles, optimizing both functionality and visual impact. This technology facilitates precision and creativity, leading to superior and sustainable design outcomes.

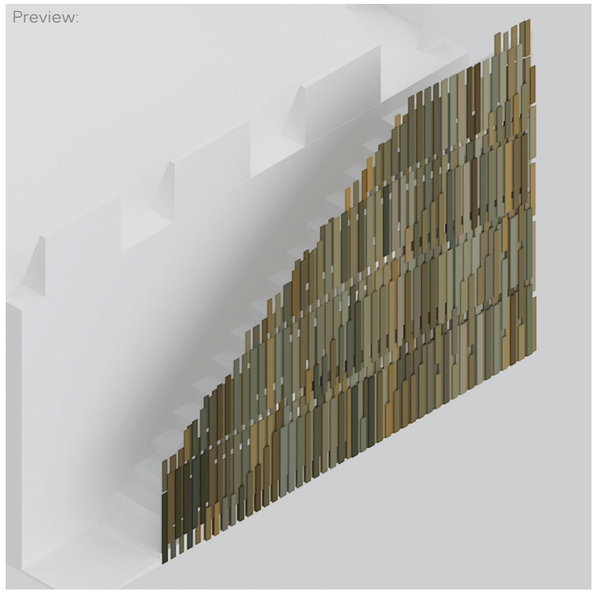
DESIGN:

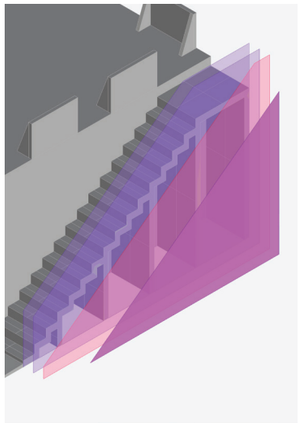


Setting the Layer Divisions
This balances structural stability and aesthetic appeal. The base layer provides a strong foundation with robust pallets for stability, while the top layer ensures rigidity and aesthetics.



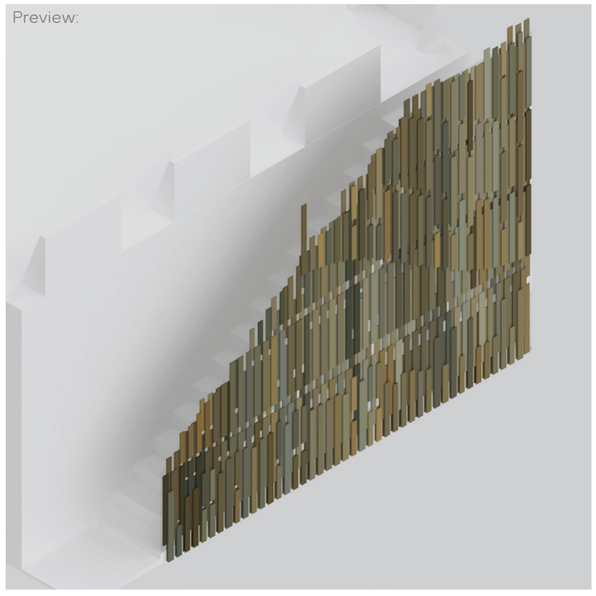
Placement Center Lines
This ensure precise placement by aligning by the widths of the pieces, to ensure proper alignment for seamless fit.

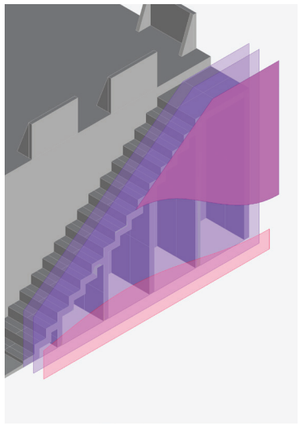




Design Variations
Exploring different design variations of module placement, enhances resource utilization efficiency, ensuring optimal use of resources and creating visually and functionally superior structures.

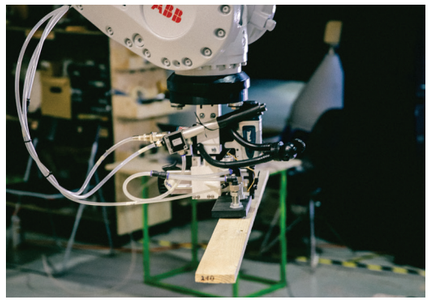
Option A





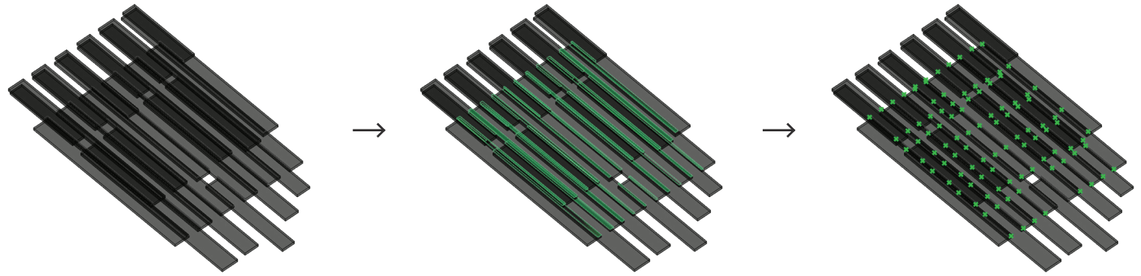
Option B

FABRICATION:

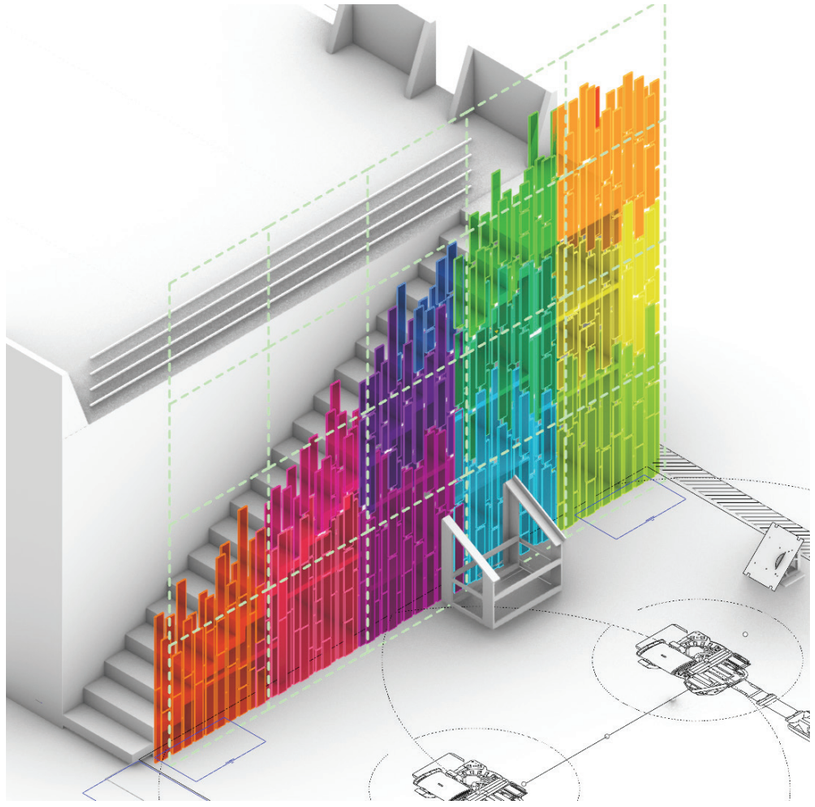


Designing the End Effector
It is made up of a suction cup for picking and placing pieces, and a nail gun for nailing them together simultaneously.

Preparing the Feeding Tray
This ensures that the right piece is picked and placed from the tray, on to the assembled model.



Built Panel Module → Layer Overlap between Surfaces → Nailing points within the Overlapped Surface



Wall Discretization
The design is subdivided into panels matching the fabrication platform size for efficient assembly.

EXECUTION & ASSEMBLY: