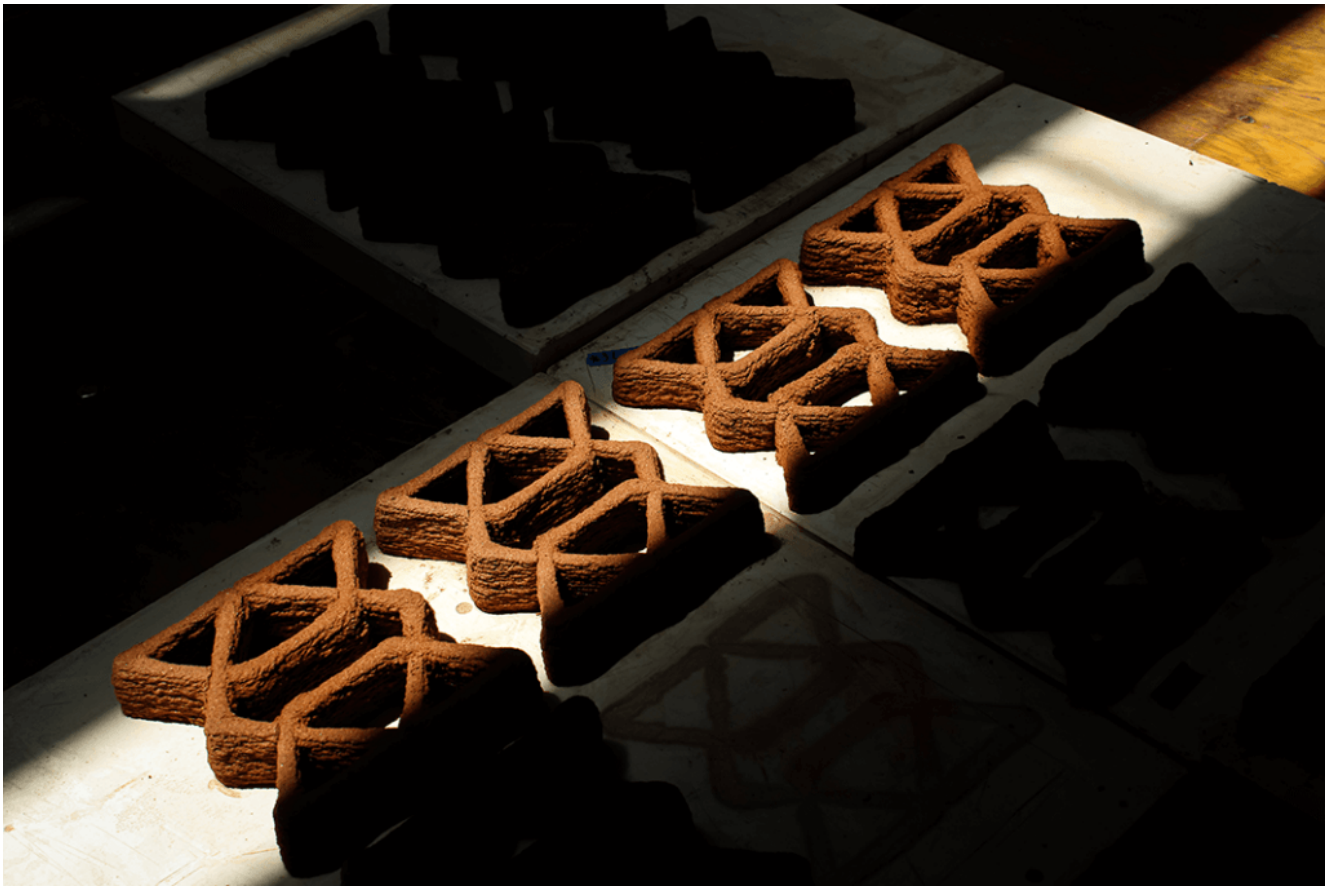
Circular Economy in Action: The Wood Project

In Mexico, the staggering daily generation of approximately 102,895 tons of trash, with only 9.63% being recycled, underscores the critical need for sustainable waste management solutions. Amid this environmental challenge, The Wood Project emerges as a beacon of innovation, addressing the massive waste from the timber industry.

With annual timber production reaching around 9 million cubic meters, a significant portion is reduced to sawdust, shavings, and bark, often relegated to waste. This project, a collaboration with La Metropolitana, a furniture manufacturing workshop, seeks to transform this waste into valuable, sustainable materials using cutting-edge technology.



The 3D printing process with a KUKA KR-150 industrial robotic arm.

HARNESSING COMPUTATIONAL DESIGN WITH RHINO & GRASSHOPPER

Central to The Wood Project are Rhino and Grasshopper, two powerful tools that revolutionize the design and production process. Rhinoceros, commonly known as Rhino, coupled with its plugin Grasshopper, enables the creation of parametric designs through algorithmic thinking.

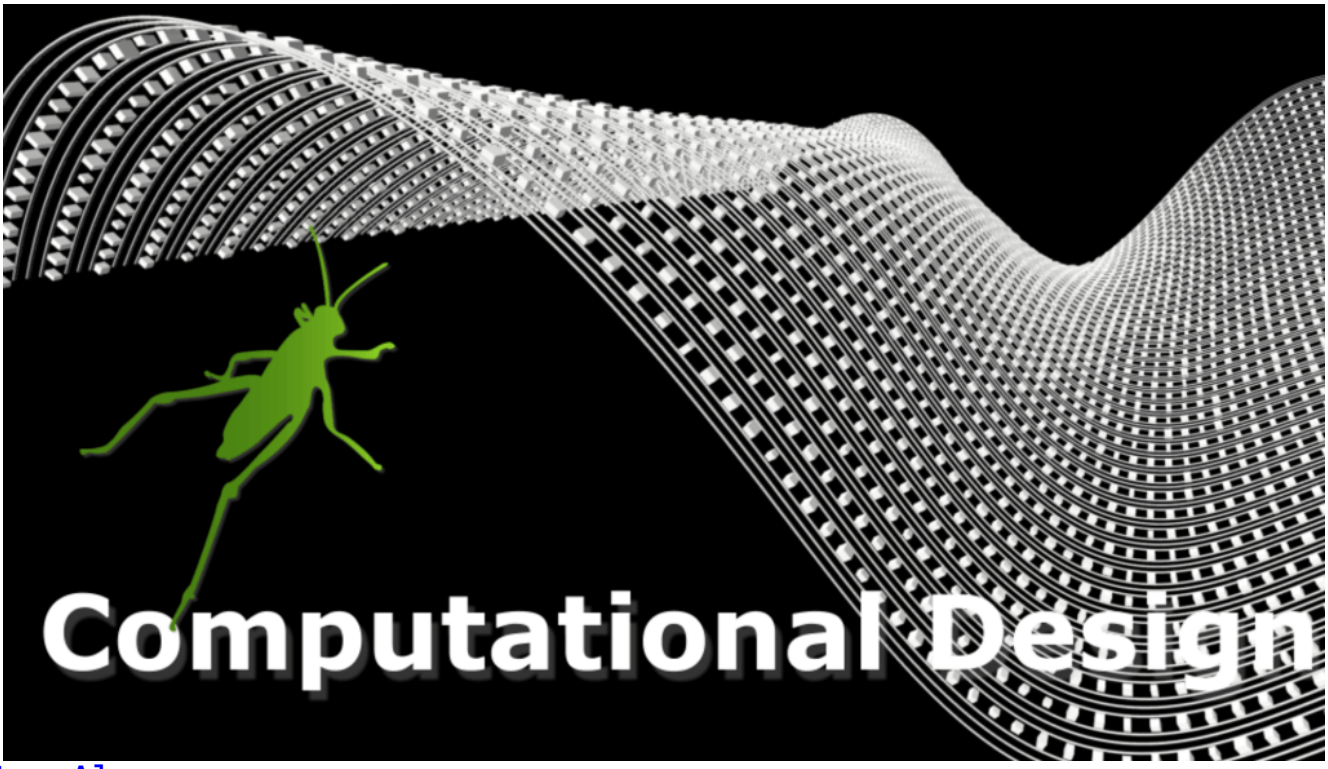
This approach allows for optimizing forms and geometries, facilitating rapid modifications, and ensuring that designs are suitable for 3D printing in various sizes and dimensions. The flexibility provided by Grasshopper's algorithmic modeling was instrumental in adapting to the unique properties of the sawdust-based bio-composite.

INNOVATIVE USE OF SAWDUST IN BIO-COMPOSITE DEVELOPMENT

The project focuses on utilizing sawdust from the Tzalam tree (Lysiloma latisiliquum), a species native to southeastern Mexico, known for its attractive reddish color and hardness. The team developed a bio-composite resistant to humidity and fungal growth by combining sawdust with organic binders and lime. This composite was optimized for 3D printing, mainly using sawdust from calibrating machines and CNC routers, providing the most suitable physical properties.

ADVANCED 3D PRINTING TECHNIQUES WITH KUKA PRC

A key challenge in The Wood Project was integrating traditional woodworking techniques with modern digital fabrication. The team used an extruder for semi-liquid materials mounted on a KUKA KR-150 industrial robotic arm. This setup, guided by KUKA PRC (Parametric Robot Control), followed precise trajectories to lay down the bio-composite material. This method allowed the generation of diverse, intricate geometries, ensuring efficient material use, waste reduction, and high precision.



See Also

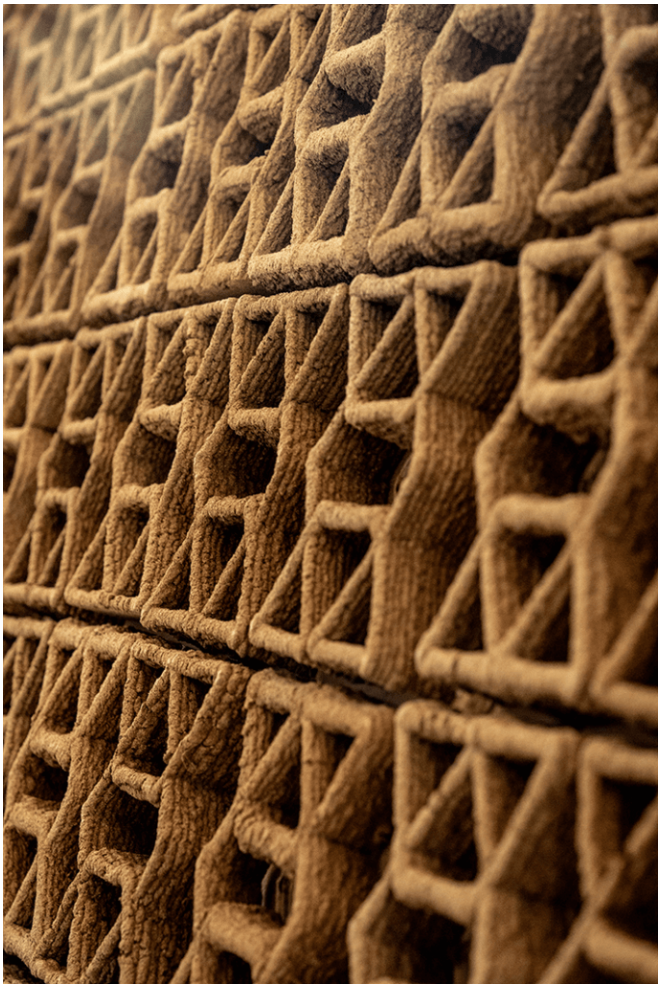
COMPUTATIONAL DESIGN WITH GRASSHOPPER

Ensuring the precise printing of the complex geometries generated by Grasshopper required meticulous calibration and iteration. The physical properties of the bio-composite, influenced by the type of sawdust and its particle size, needed meticulous adjustment to align the digital models with the physical outputs. Despite these challenges, the project successfully produced architectonic-scale partition walls composed of 72 pieces, each measuring 20 x 20 cm, within a three-week timeframe for printing and drying.

CONTRIBUTING TO SUSTAINABILITY & CIRCULAR ECONOMY

The Wood Project exemplifies a circular economy approach, transforming timber waste into valuable construction materials. The project not only addresses waste reduction but also promotes environmental sustainability. Sawdust, rich in cellulose, hemicellulose, and lignin, produces light yet strong components. The project’s sustainable bricks, weighing an average of 207 grams each, are easily replicable and scalable, providing innovative solutions for thermic isolation, semi-structural elements, furniture, and other architectural systems.

FUTURE PROSPECTS & ENVIRONMENTAL IMPACT



This initiative highlights the potential of computational design, digital fabrication,

and material innovation in promoting sustainability. The Wood Project paves the way fo

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able resources. Integrating diverse skills, from recycling to robotic fabrication, crea

tes new job opportunities and fosters a deeper dialogue between humans and machines in

the construction industry.

Further material analysis and refinement are anticipated through ongoing collaboration with the Laboratory of Materials and Structural Systems (LMSE) at Mexico's Autonomous National University (UNAM). The project aims to contribute to a more sustainable and conscious future by questioning traditional manufacturing methods and redefining our perspective on waste.

In conclusion, The Wood Project showcases the synergistic combination of Rhino, Grasshopper, and advanced 3D printing technology, transforming timber waste into sustainable, valuable materials. This project is a testament to the power of computational design and digital fabrication in fostering environmental consciousness and promoting a circular economy.