

Digital Shingles: Interactive Robotic Shingle Facade Assembly

How can centuries-old woodcraft traditions be reinterpreted through digital technologies? Developed at the Digital Fabrication Group of the [Institute for Digital Construction and Wood Industry \(IdBH\)](#) at the [Bern University of Applied Sciences \(BFH\)](#), the project “Interactive Robotic Shingle Facade Assembly” explores this question through an exhibition experience that merges Swiss craftsmanship heritage with computational design and robotics.

At its core, the installation features a robotic arm assembling and disassembling a customizable wooden shingle facade panel in real-time. Visitors interact with a user-friendly digital interface to explore a vast design space and select shingle patterns of their choice. Their selected design is instantly translated into robotic motion, allowing them to witness the physical assembly as it unfolds before their eyes.



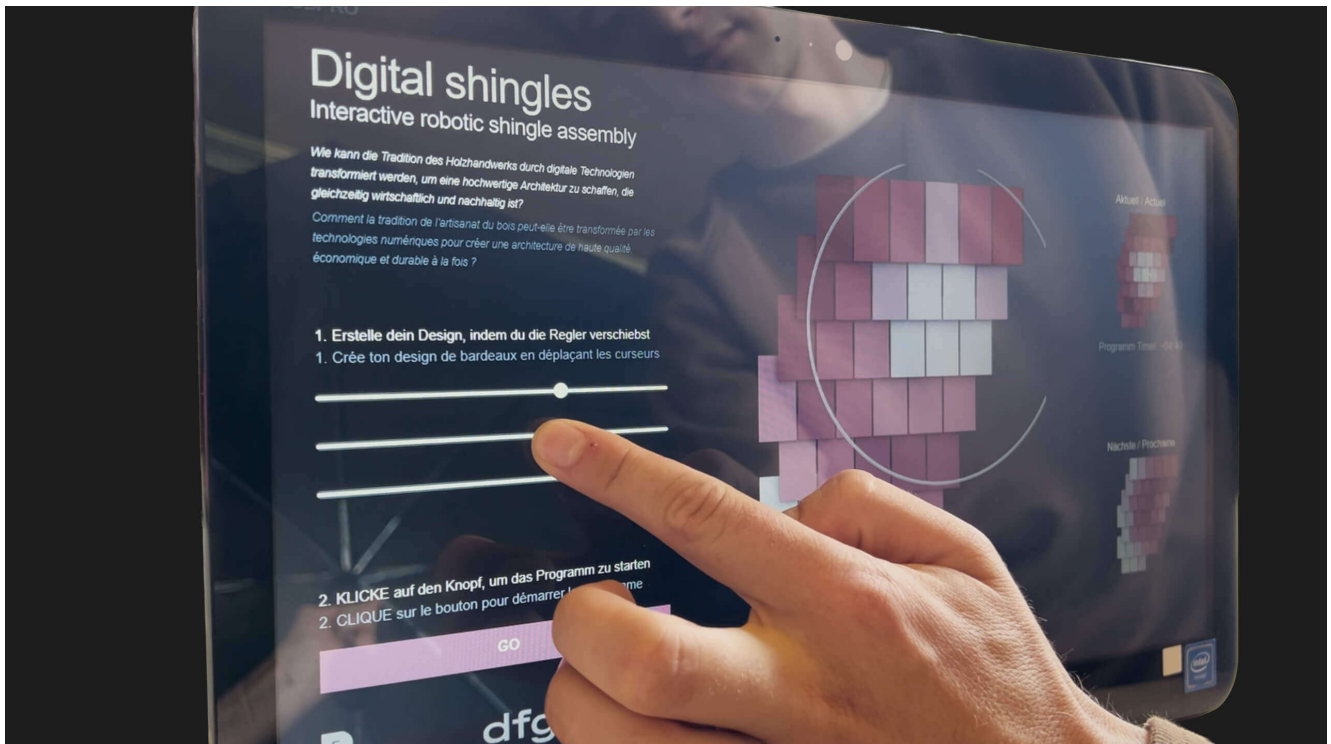
The installation features a robotic arm assembling and disassembling a customizable wooden shingle facade panel in real-time.

REVIVING TRADITION THROUGH INNOVATION

Swiss craftsmanship carries centuries of tradition: façades of hand-split shingles speak of patience, durability, and cultural heritage. Their making is labor-intensive and time-consuming, demanding both skill and commitment. *COOP* playfully reinterprets this practice, refreshing the technique and bringing it closer to the public.

Instead of natural timber tones, the exhibition presents intensely pink shingles—shiny and resistant through automotive paint finishes to endure the constant displacement. Designed in a new aesthetic language and produced with robotic processes, they are temporary and reusable, standing in contrast to the enduring presence of traditional crafted facades.

Through this shift in both design and production, *COOP* challenges visitors to experience craft from a new perspective. The exhibition is not about nostalgia or imitating the work of past generations. Instead, it creates a space to reflect and to play: to experience contrast, to sense the tension between permanence and ephemerality, between handwork and digital production, between heritage and speculation – and to rethink what craft might become in a time of advanced fabrication, sustainability, and playful invention.



The project “Interactive Robotic Shingle Facade Assembly” allows visitors to interactively design the shingle patterns via a user-friendly digital interface

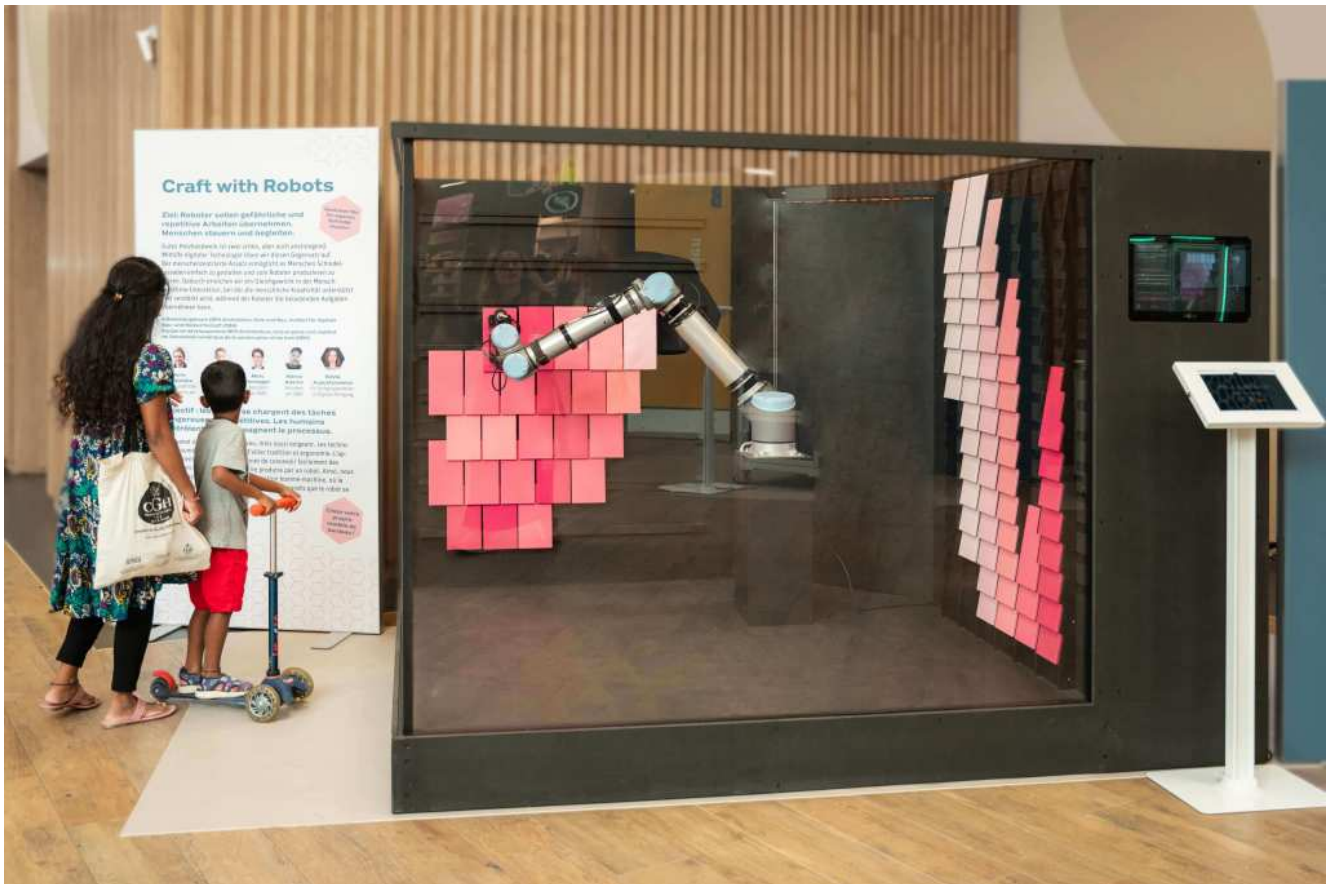
A HUMAN-CENTERED DIGITAL WORKFLOW

The installation adopts a human-centered digitization approach, enabling playful interaction and creative exploration while delegating labor-intensive tasks to robots. Visitors at the COOP exhibition engage directly with a web-based design interface, adjusting three intuitive sliders to experiment with shingle patterns and color organization.

Once a design is selected, the robotic arm executes the assembly process using parametric robot control tools developed specifically for this project. These tools generate new robotic paths automatically, ensuring smooth execution without requiring reprogramming for each unique pattern.

To support real-time communication between the web interface, design algorithm, and robotic logic, the system leverages Next.js, Tailwind CSS, Python-based socket communication, and Rhino’s [Grasshopper](#). The fully parametric Rhino model played a central role, allowing the team to simulate robot path planning and reachability via the Robots plugin for the UR10 robot, as well as to prepare CNC-cut components

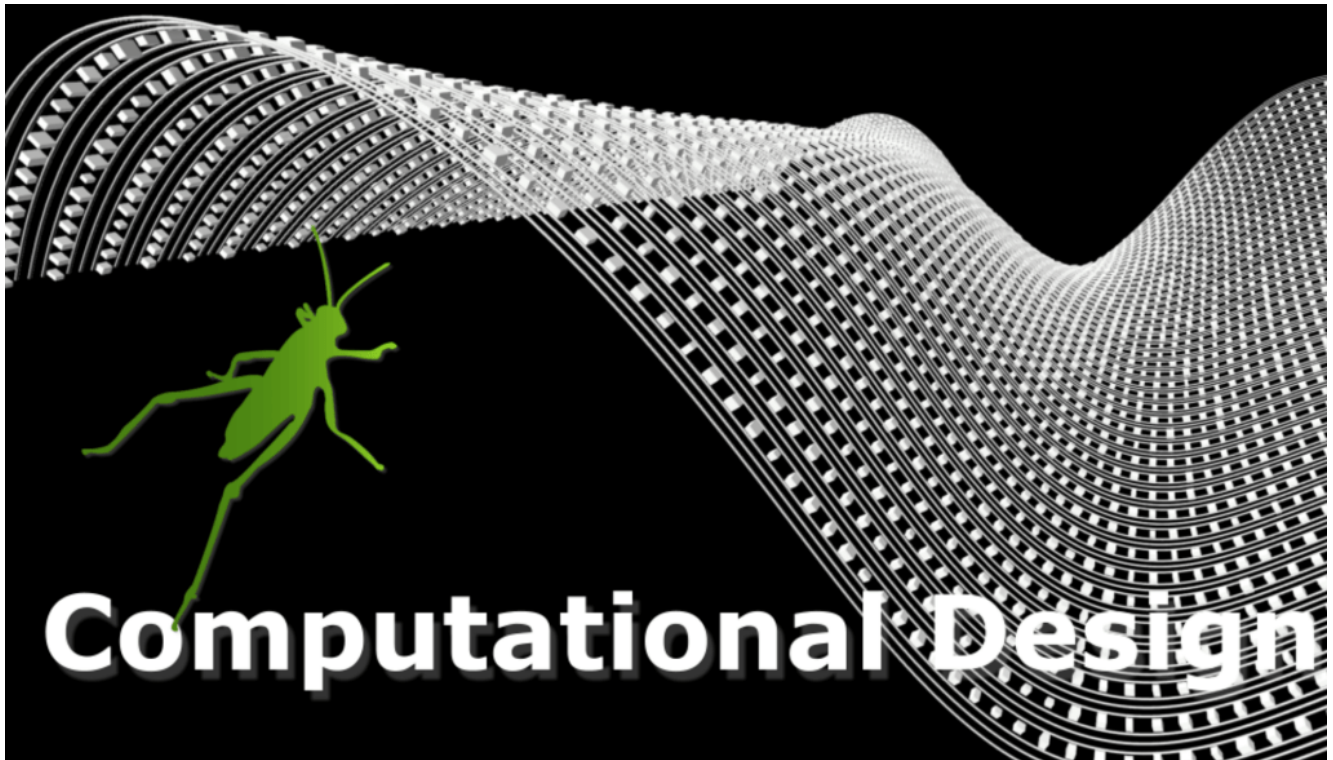
efficiently.



The installation is touring across Switzerland in 2025.

DESIGNING FOR CONTINUOUS INTERACTION

To accommodate the exhibition's need for uninterrupted operation, the team developed a magnetic shingle system that replaces traditional nails. Each shingle embeds static magnets, securely attaching to a steel assembly wall while enabling quick, reversible installation without damaging the wood.



[See Also](#)

[COMPUTATIONAL DESIGN WITH GRASSHOPPER](#)

Additional challenges, such as precision in vertical assembly, were addressed through a controlled spacing system and calibrated dispensers that maintain alignment over time. The result is a system robust enough for continuous use while maintaining the tactile qualities of handcrafted wood.



Shingles magnetic inserts and high quality painting.



Shingles magnetic inserts and and high-quality shingle spray painting.

BALANCING ENGAGEMENT & PERFORMANCE

Unlike industrial assembly, the exhibition prioritizes visitor interaction. The team carefully optimized the robot's reach, wall

dimensions, and assembly cycle times to maintain architectural scale while ensuring visitor wait times remain minimal.

Through this installation, visitors gain insight into the potential of robotics and parametric tools to enhance, rather than replace, craftsmanship. The project fosters appreciation for automation while reaffirming the enduring role of human creativity in the digital era.

EXHIBITION DATES:

The installation is touring across Switzerland in 2025:

- **Biel Bienne Coop Centre Bahnhof:** until 19 August 2025
- **Schönbühl Center:** 21 August – 2 September 2025
- **Wankdorf Center Bern:** 4 – 16 September 2025
- **Heimberg Center:** 18 – 30 September 2025
- **Lyssach Center:** 2 – 14 October 2025
- **Boujean Biel Bienne:** 16 – 28 October 2025
- **Ilfis Center Langnau:** 30 October – 11 November 2025

CREDITS

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The project was developed at the Digital Fabrication Group, Institute for Digital Construction and Wood Industry IdBH at the BFH (Bern University of Applied Sciences).