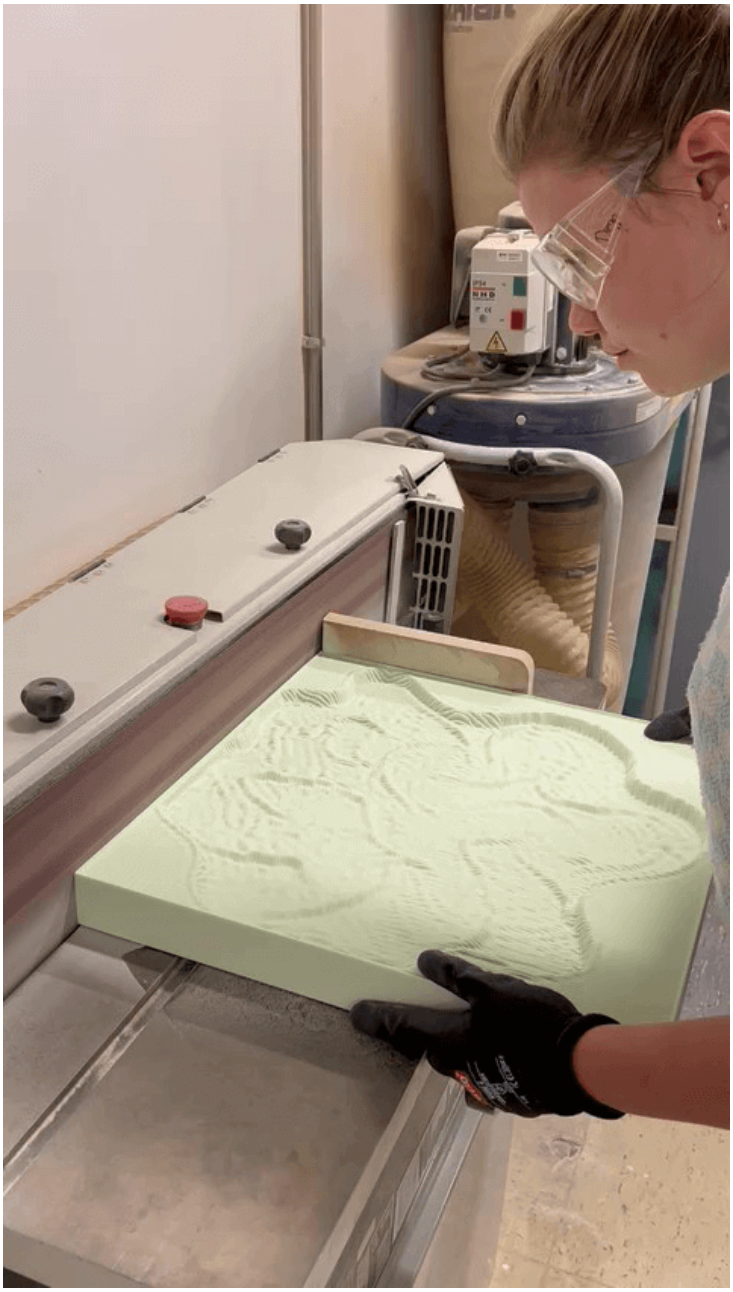
Sea N See: Where Parametric Design Meets CNC Craftsmanship

The Sea N See project is an outstanding example of how cutting-edge technology can merge with creative design processes. Developed by Peter Hansen, Lucienne de Waal, and Cooper Birnbaum for students of IED Barcelona's Bachelor of Arts in Design program (under the guidance of professor Affonso Orciuoli), the project harnesses the power of Grasshopper and RhinoCAM, in an innovative fusion.



THE POWER OF ALGORITHMIC DESIGN

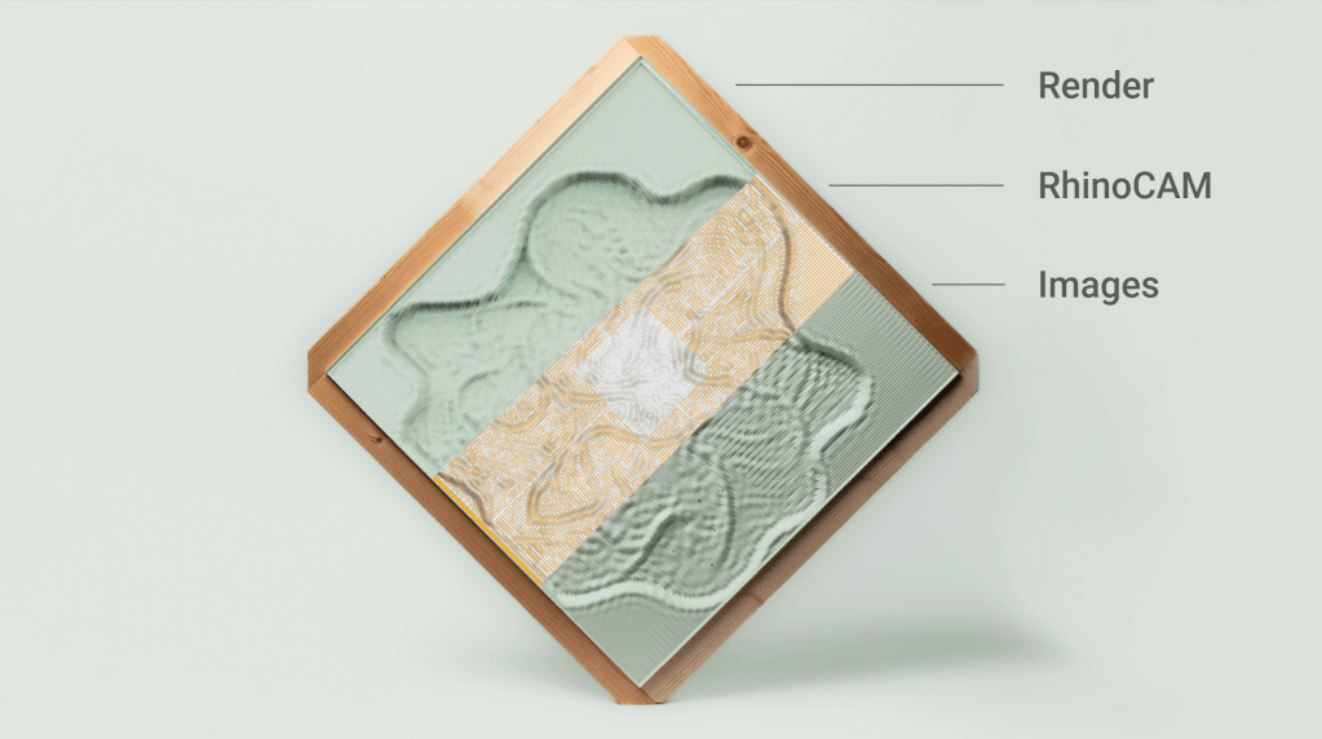
At the core of Sea N See is algorithmic thinking, a design approach that enables rapid adjustments and experimentation with minimal effort. By defining relationships between various design elements, the team could easily modify one parameter, automatically updating the entire model.

This dynamic and flexible method was instrumental in enabling the designers to explore multiple creative options, refine details such as materiality and finishes, and maintain control over the evolving design without having to restart from scratch.

This fluid approach to design allowed the team to go beyond conventional workflows. Changes in color schemes, surface textures, or even structural details could be quickly incorporated, helping to maintain momentum and explore a wide range of possibilities before finalizing the design.

INSPIRATION FROM ART & NATURE

Sea N See drew inspiration from the “Art and Nature” exhibition at CaixaForum in Barcelona, and used Grasshopper’s Image Sampler tool to convert visual art into a parametric design. The tool takes an image as input, reads pixel values, and uses factors such as color saturation and brightness to alter design parameters within Grasshopper.

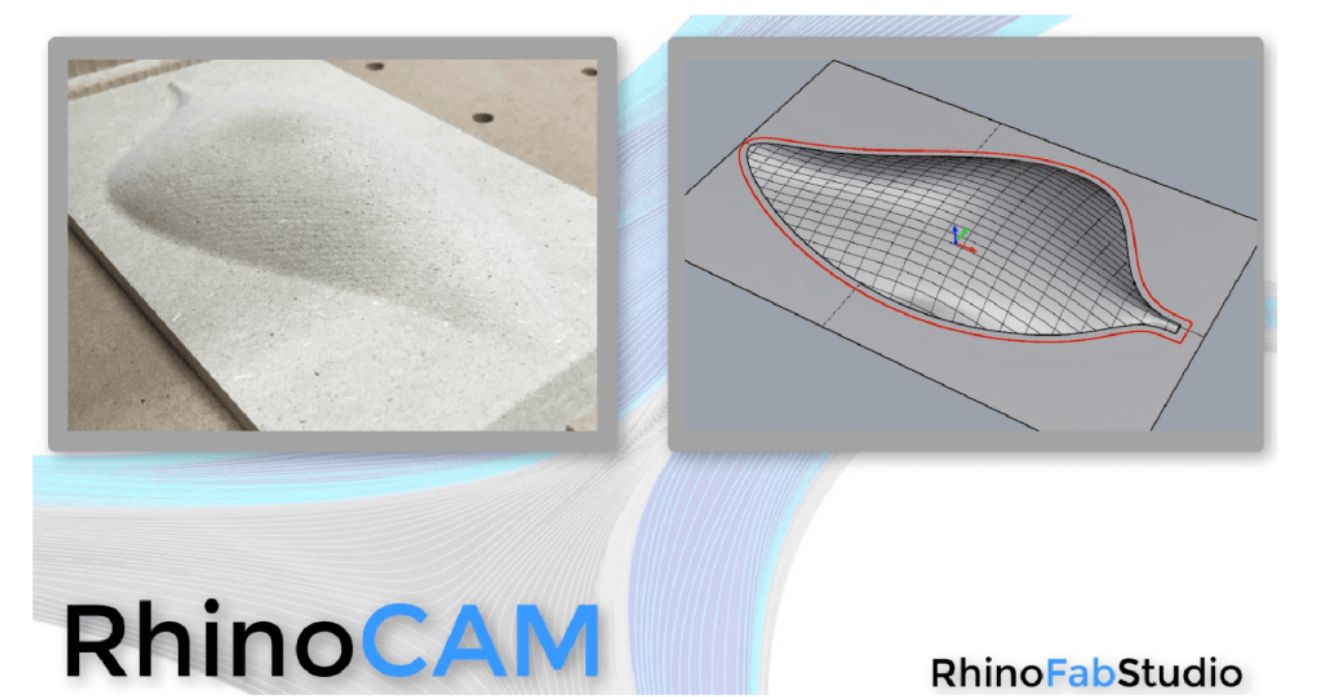


These features enabled the team to translate visual inspiration directly into geometric forms, resulting in a dynamic, parametric pattern that echoed natural textures.

Photoshop then played a key role in refining the source image. By tweaking image resolution and color balance, the team could achieve more precise control over how the image was sampled, ensuring that the final design closely matched their creative vision.

REALIZING THE VISION WITH RHINOCAM

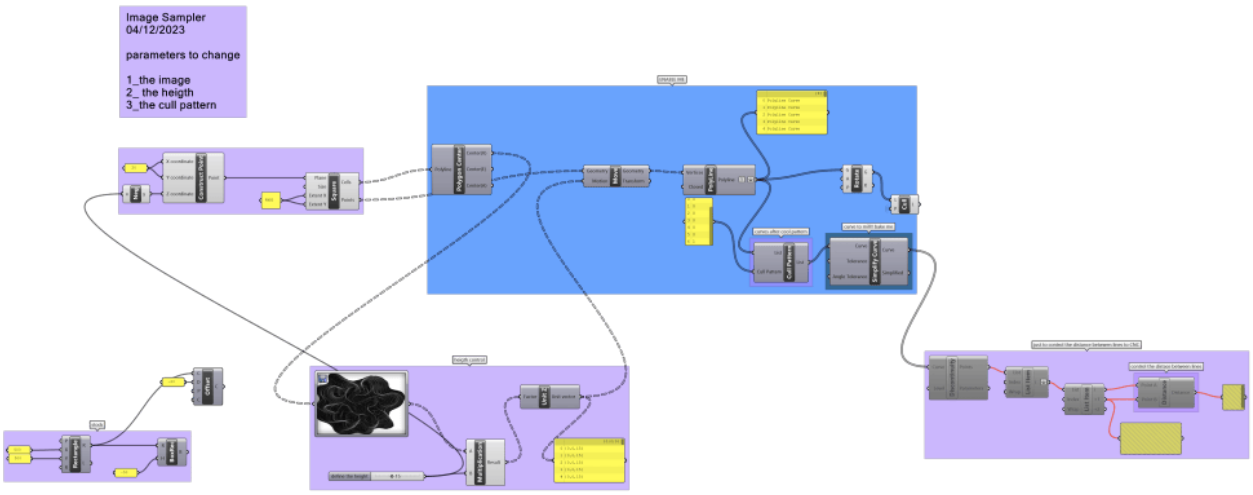
After the parametric design was perfected in Grasshopper, it was time to bring it to life using RhinoCAM. The CNC process presented unique challenges, especially given the complexity of the design. The team focused on achieving two distinct finishes on the panel using a single 6mm ball-end mill. By carefully rotating the finishing direction by 90 degrees and overlapping the machining paths, they created a striking texture reminiscent of “beach sand.”



See Also

RHINOCAM 2 1/2 & 3 AXES

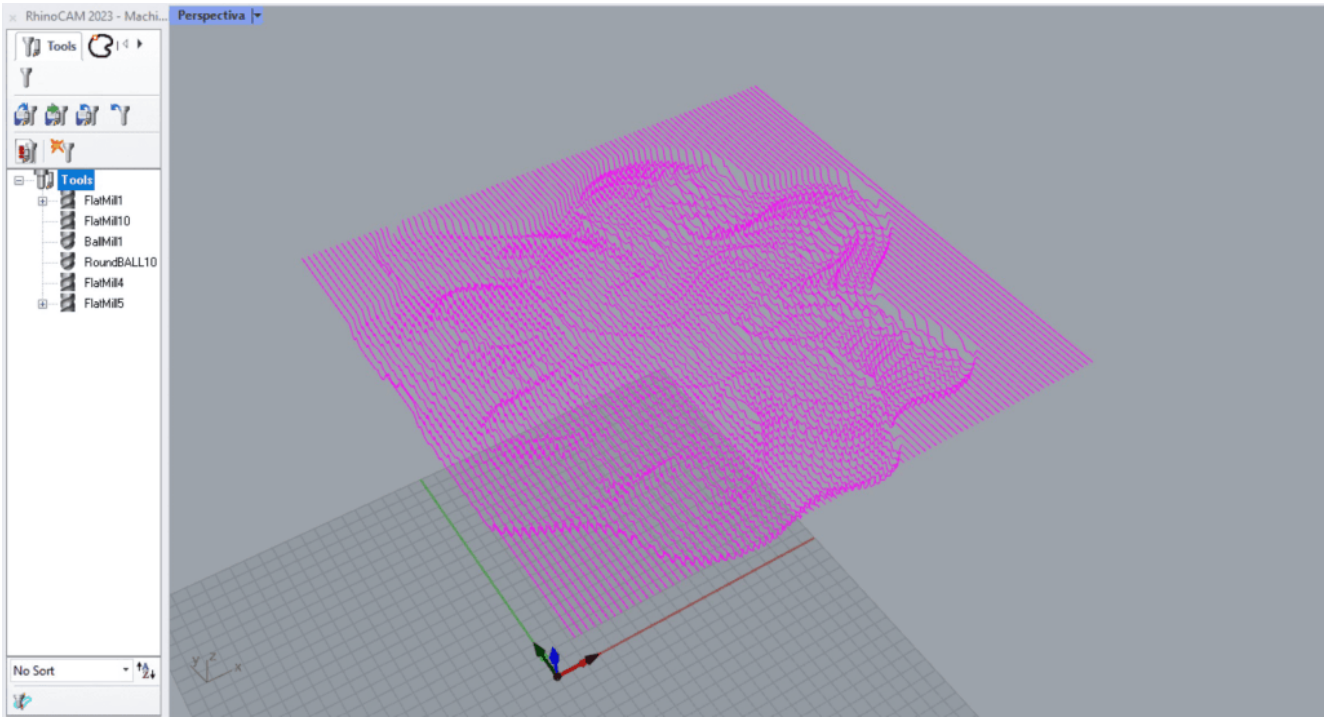
This machining approach required precise adjustments to the Grasshopper parameters, ensuring that the intricate digital design translated smoothly into physical form. Each iteration of adjustments improved the accuracy of the CNC toolpaths, resulting in a finished surface that captured the intended visual complexity and tactile quality.



OVERCOMING TECHNICAL HURDLES

One of the significant challenges the team faced was ensuring smooth communication between the parametric design in Grasshopper and the CNC toolpaths generated by RhinoCAM. This was a rare combination of tools, which led to troubleshooting sessions and iterative refinements to guarantee the digital model aligned with the physical machining process.

The collaborative effort between the designers allowed them to tackle these technical obstacles, ultimately succeeding in crafting a CNC panel that brought their parametric design to life. This journey showcased the potential of combining Rhino3D plugins, opening doors for future projects to explore similar workflows.



THE CREATIVE RESULTS

Sea N See exemplifies what can be achieved when parametric design is paired with CNC technology. The project highlights how tools like Grasshopper and RhinoCAM can be utilized to push the boundaries of creativity and precision. By combining these platforms, the team managed to develop a design that is both highly flexible and meticulously crafted, showcasing the future possibilities of digital fabrication.