



TRILLIUM

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Statement

We all are in a continuous process of evolution and transformation. Our ideas, feelings, experiences, and emotions change over time, and even our interpretations of those changes. Going from one state to another evolving and mutating. From softness to hardness, from light to dark, from openness to closeness, from the artificial to the organic. Trillium is an exploration of the concept of maturing. The piece is a reflection on the idea that the only constant in life is change.

Design Overview

Our concepts are about the different ways mathematics, architecture, and art can be used to create systems or experiences that make the observer have different perspectives of themselves and their environment around them. Our main interests are about how these systems change depending on the seasons or sunlight, the point of view of the observers, and the emergence of complex from simple rules.

The goal is to create self-forming modular structures that depend on the material properties such as elasticity, stiffness, and dimensions, that appear different appearances from different angles and perspectives. These modules are made of wicker material, in this case willow, that work independently from each other but from their interaction the final shape of the module emerges.

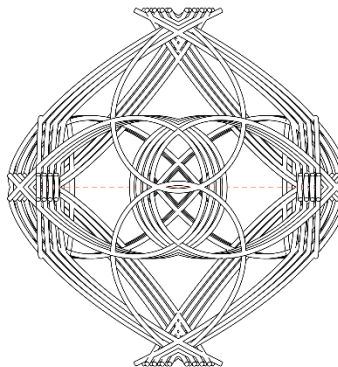
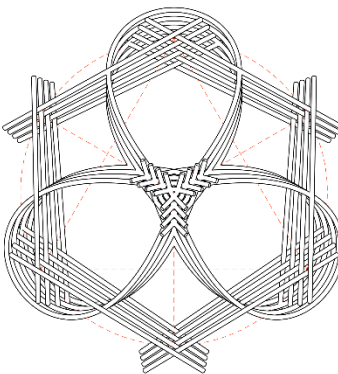
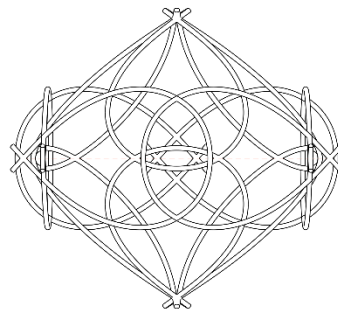
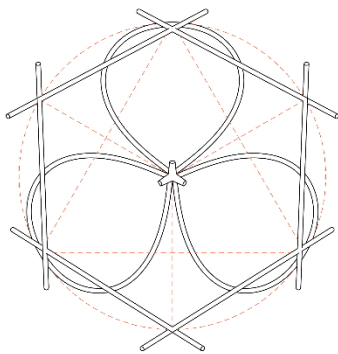
Our main inspiration were the symmetries found in nature, like flowers and tree branches, the intricate weaving patterns found in textiles and handicrafts, and the spatial relationships found in projective geometry.

Mathematical Idea

Our main goal was to create a modular piece that could incorporate different mathematical ideas. We were primarily interested in dynamic symmetries in nature (the trillium flower), project geometries, and emergent forms.

First, we have the 3-fold axial symmetries of the equatorial modules, where there are 6 modules on the XY plane, each have a 60-degree rotation around the centre of the piece. Then we have the top and bottom modules on the Z axis, which are mirror of each other. There are 3 modules for each hemisphere, and they rotate 120 from the centre.

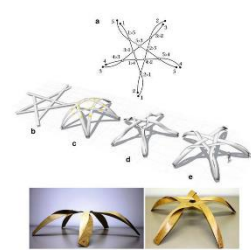
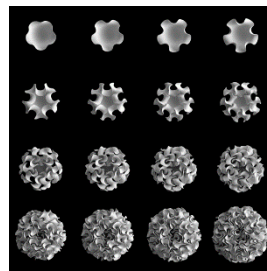
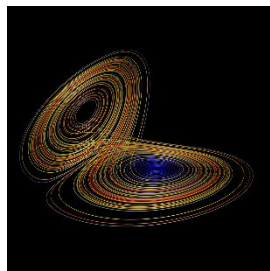
Second, we have the self from minimal curve that emerges from the bending of the willows. Each one of them is different so each curve will be slightly different and will minimizing the tension until it reaches equilibrium. Finally, the shadows that this piece can create, depending on the time of the day, are a nod to projective geometries.



Milestones during the course

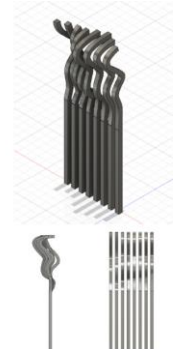
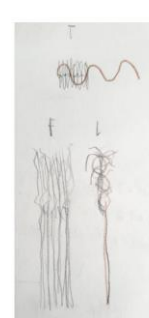
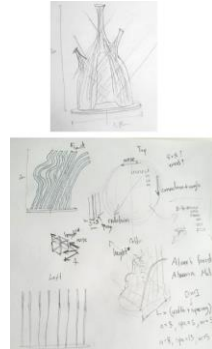
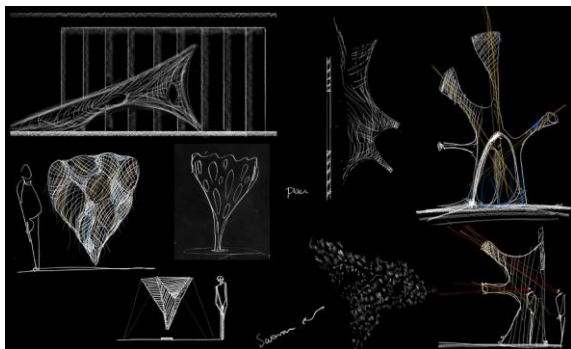
Stage 01 / January – February

The development of ideas started with brainstorming in different subjects and aspects of art, design, architecture, and mathematics by collecting projects we liked. Our main interests and keywords in these fields were: art, design, architecture, duality of forms, physicality of light, different perspectives, interactivity, non-Euclidean spaces, folding and cutting, emergence, attractors, generative systems, interference patterns, and mathematical structures.



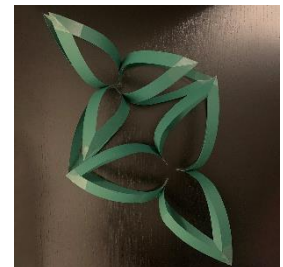
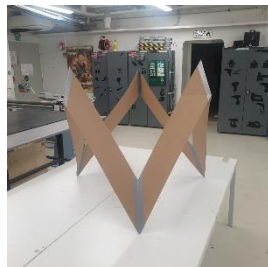
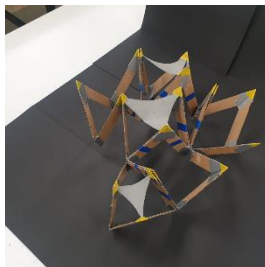
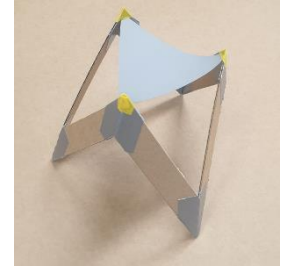
Stage 02 / February – March

The concepts were driven by abstract ideas. We generated and developed concepts in different ways to shape the results. Our concepts are about the different ways mathematics, architecture, and art can be used to create systems or experiences that make the observer have different perspectives of themselves and the environment around them. Our main interests are about how these systems change depending on the seasons or sunlight, the point of view of the observers, and the emergence of complex from simple rules. Accordingly, we generated different drawings and sketches. We were surprised that some of our ideas converged into the same concepts independently.



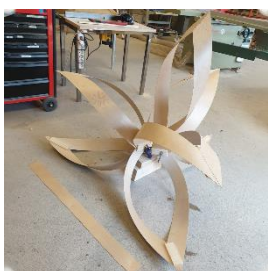
Stage 03 / March - April

In this stage, we started experimenting with different materials, scales, and the development of modules. What worked for us was to have several prototyping sessions. That helped us to understand the idea and behaviour of different materials.



Implementation / April - May

Based on the prototyping that we did and our interest in the interaction and relationship between materiality and space, we decided to change the properties of the material we used from the flat sheet to straight sticks. This decision ended up choosing the natural wicker. Using the wicker material, in this case, willow which we chose due to its bendability, durability on the outside, and nice finish, gave this opportunity to develop the idea of self-forming structure. Accordingly, the idea of interconnecting the willows instead of using the independent extra joint also added to the design.





Finished product / May

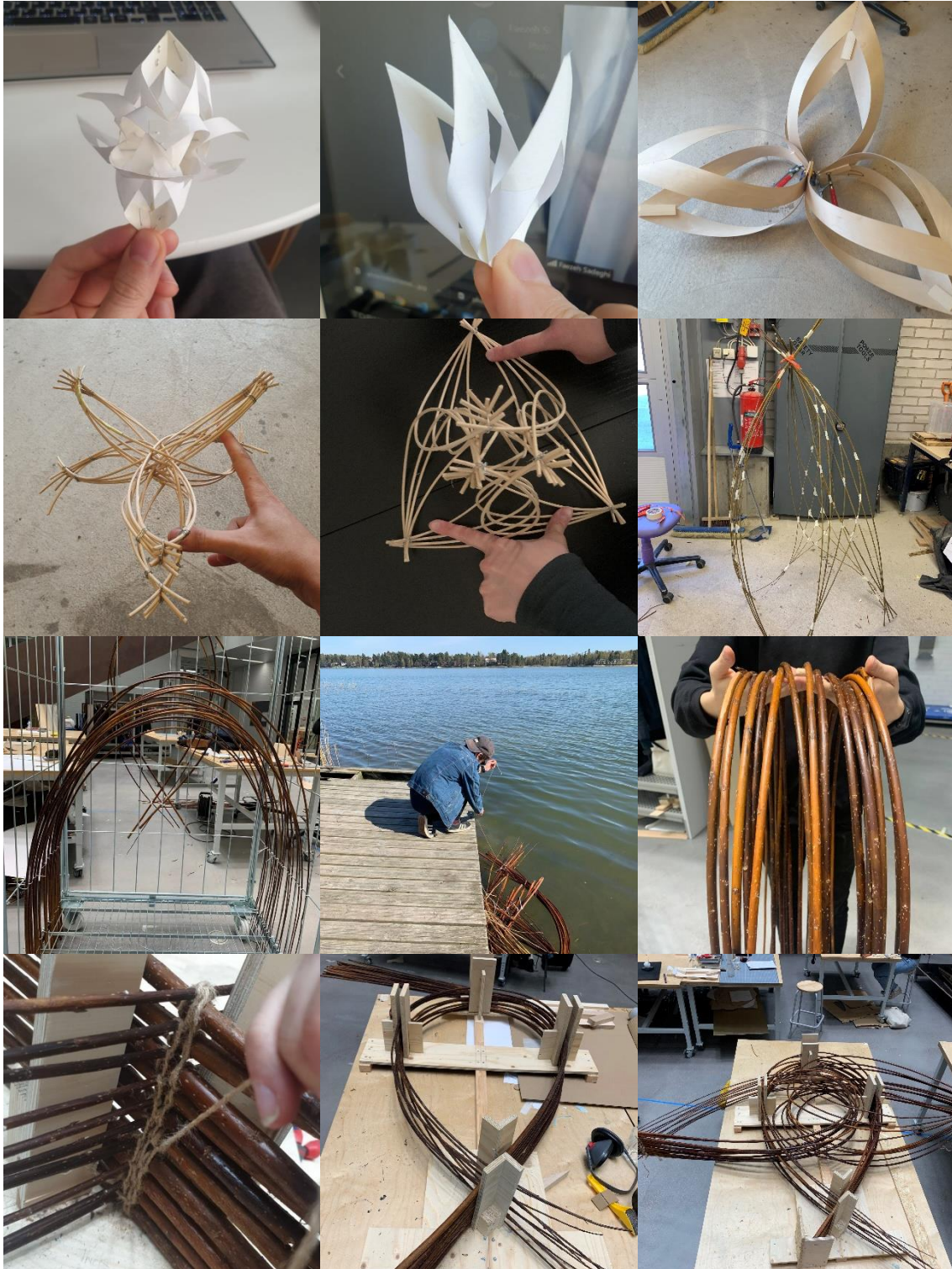
The final structure is made of 12 modules in total. The modules are all the same, each is made out of 10 willow sticks. All the 120 willows were interconnected to each other, that is the structure was generated self-formed by weaving the natural straight sticks in the length of 350 centimetres and an average thickness of 1 centimetre. The scale of the structure is approximately 200 centimetres in height and the diameter of that is 150 centimetres.

The final product is made of only 2 materials: The willow (*Salix schwerinii*) as a structural component, and the jute fibre (*Corchorus olitorius*) used for tightening the willows together. There are no extra joints or any artificial materials. This was one of our main goals because we wanted the price to come completely from nature. Additionally, to build a sustainable piece without too much waste and to experiment with the architectural potential of natural materials. The following is the final small-scale prototype.



Design Development and Outcomes

Here we can see the different stages and more pictures about the building process, other prototypes, and some of the workshops.



The Team



Faezeh Sadeghi is a master's student of Architecture at Aalto University. She is graduated in architectural engineering from the Faculty of Fine Arts at the University of Tehran. She has been involved in multiple seminars and workshops related to architecture, computational architecture, and digital fabrication which she had been a teacher assistant in some of them. She holds a Master of Business Administration (MBA). Faezeh began her professional career as a program manager of the Research Center of Art and Architecture at the University of Tehran, and later as an architectural designer at Valosima ky Company in Finland, Tehran Platform architecture studio, and as an architect and researcher in SETUParchitecture Studio in Tehran. She had the opportunity to work in different aspects of architectural project which resulted in a more mature attitude towards architecture. All her efforts and interest led her to continue her studies in an international and multidisciplinary environment at Aalto University in 2019. You can find more information about her at <https://www.linkedin.com/in/faezehsadeghi/>.



Calvin Guillot is master's student of New Media Arts at Aalto University from Colombia. He also holds a Master's in Automation Engineering and Computer Science from Aalto University as well. He is particularly interested in the relationship between art and machines, and their impact on the human experience. He has participated in many projects involving generative art, artificial intelligence and electronics, traditional and street art, and digital fabrication. He has worked as a designer and engineer for several companies in Finland and abroad. You can find more information about him at <https://calvinguillot.com/>.

