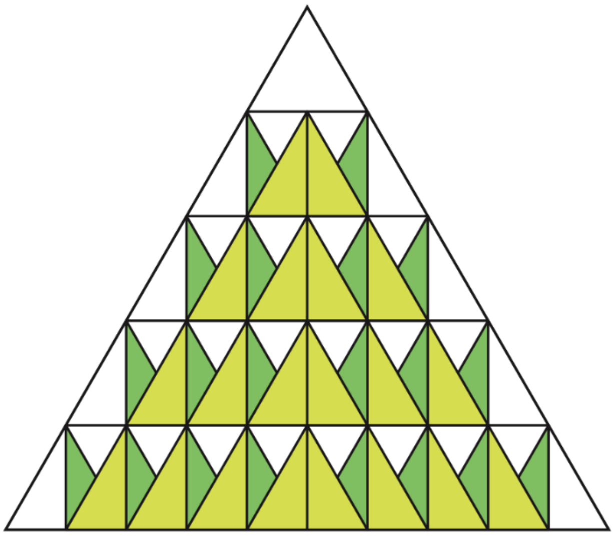

Tetractys

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Statement

The name Tetractys is derived from the ancient Pythagorean symbol that represents the structure of matter. Tetractys is a mathematical sculpture highlighting geometrical properties behind triangles and tetrahedrons.

Design Overview

Tetractys was inspired by the triangular numbers and the possibility of displaying the sequence in the third dimension. Our focus on triangular numbers came from Pascal's triangle and how the triangular numbers were a part of it. We quickly changed our focal point solely on the triangular numbers and how to display them in the third dimension. We decided to use as an origin tetrahedron units stacked as larger tetrahedron modules, as they naturally follow the same triangular nature. The displaying of the sequence led to even different geometrical properties inside the configuration that are highlighted with the help of acrylic sheets.

Mathematical Idea

The core behind Tetractys are the triangular numbers. Every cell layer consists of tetrahedrons that represent the corresponding triangular number. As tetrahedrons are not space-filling but they form octahedrons in the empty space, we wanted to emphasize this surprising quality. The octahedrons formed in between, also following triangular numbers in each cell level, are highlighted with yellow and orange acrylic triangles. Finally, we wanted to emphasize the triangular numbers once more by separating the orange-coloured acrylics.

Levels:
1: 1 tetrahedron; 0 octahedron
2: 3 tetrahedron; 1 octahedron
3: 6 tetrahedron; 3 octahedrons
4: 10 tetrahedron; 6 octahedrons
5: 15 tetrahedron; 10 octahedrons

Milestones during the course

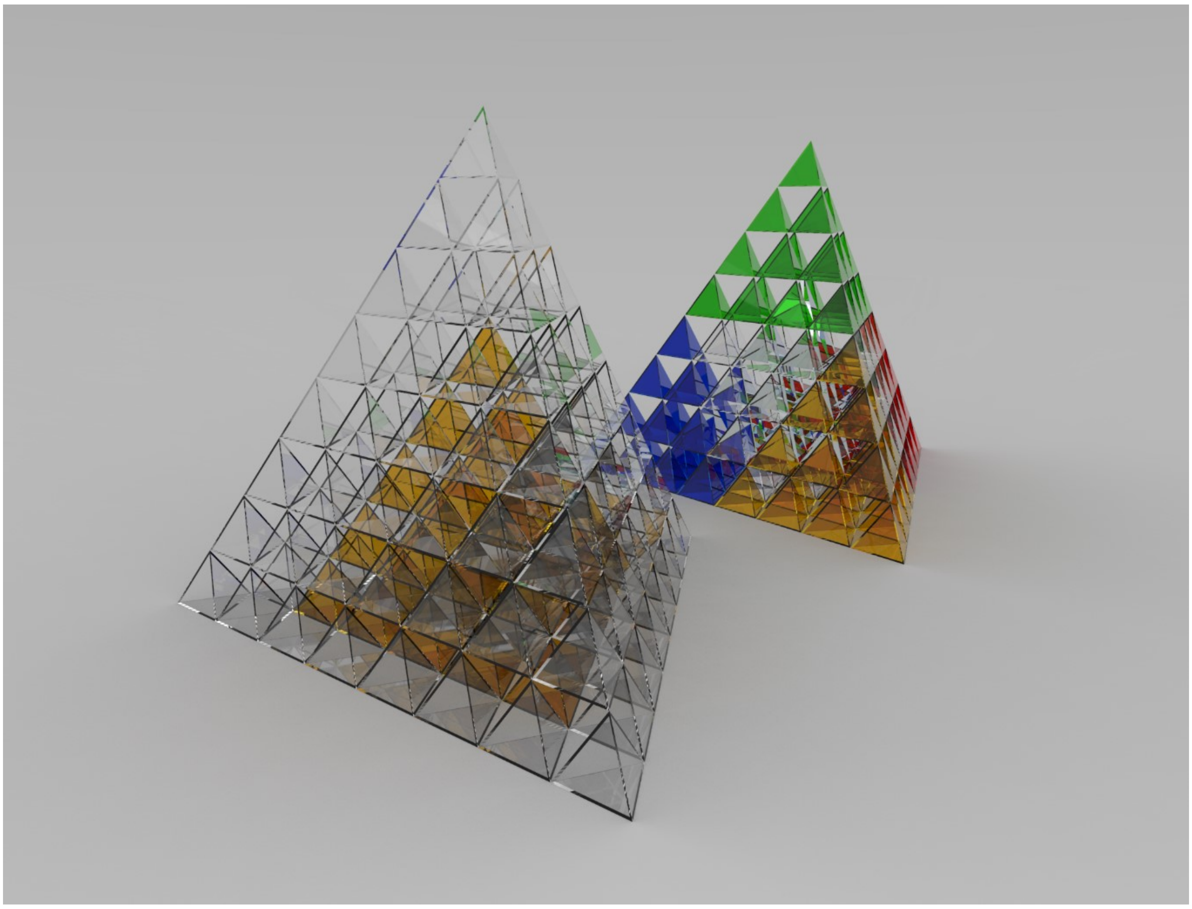
Stage 01 / January – February

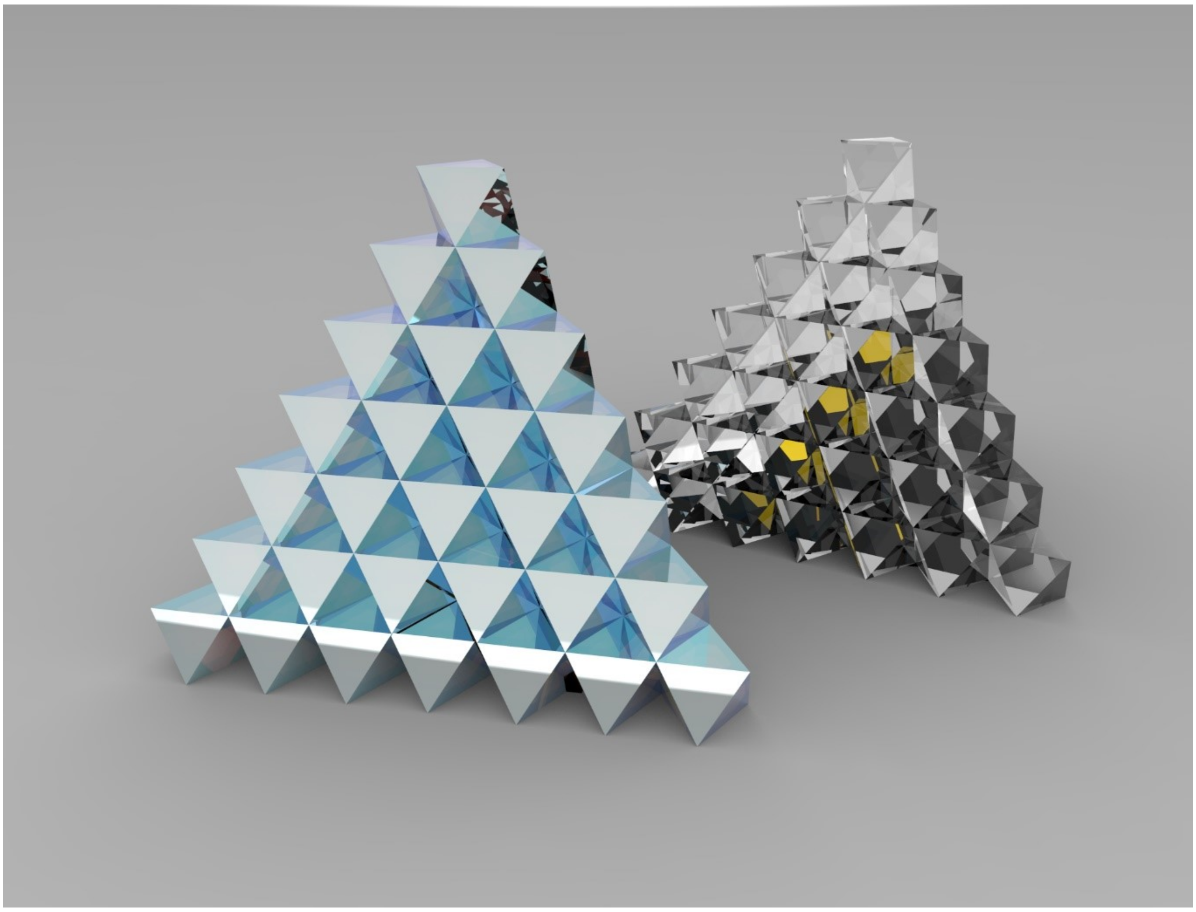
We started by gathering inspirational pictures. The pictures had a clear theme, shapes. We were drawn to different geometrical shapes and properties. The geometrical aspects are as well present in the final piece.

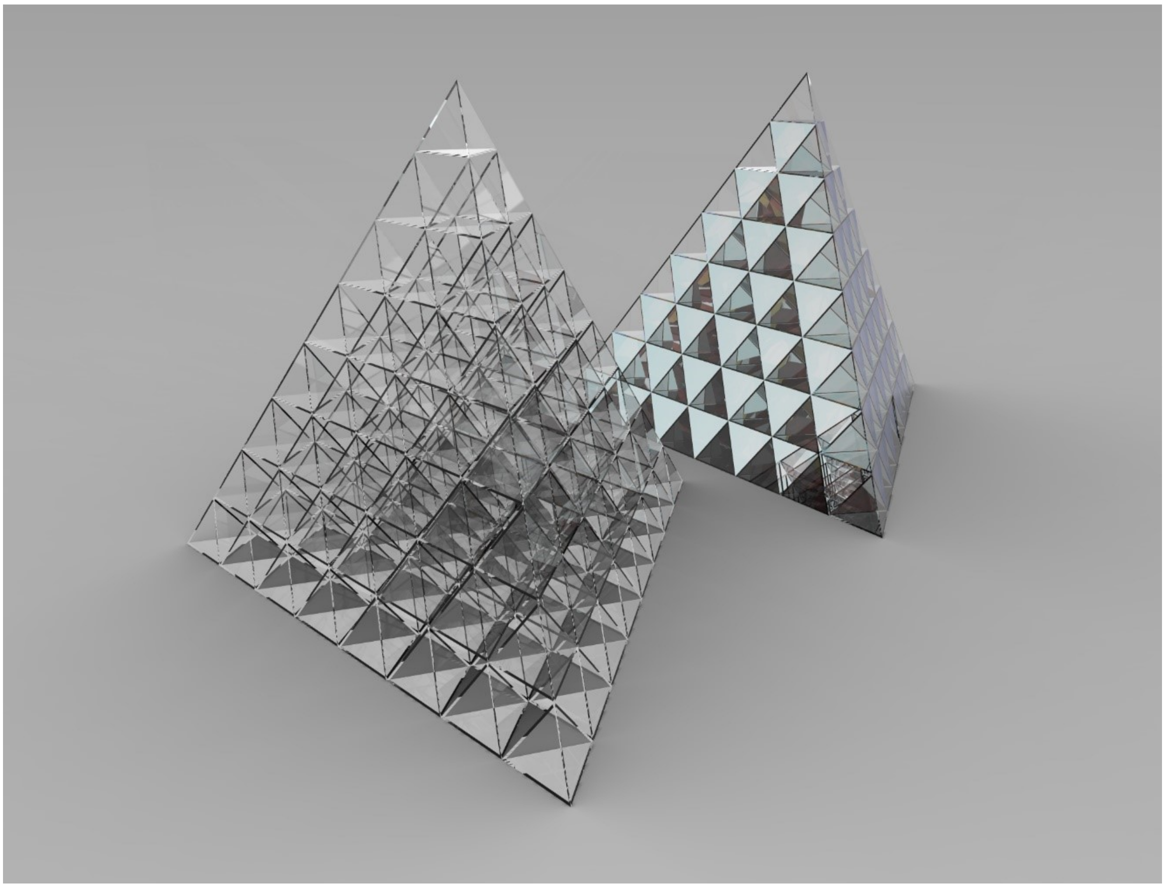


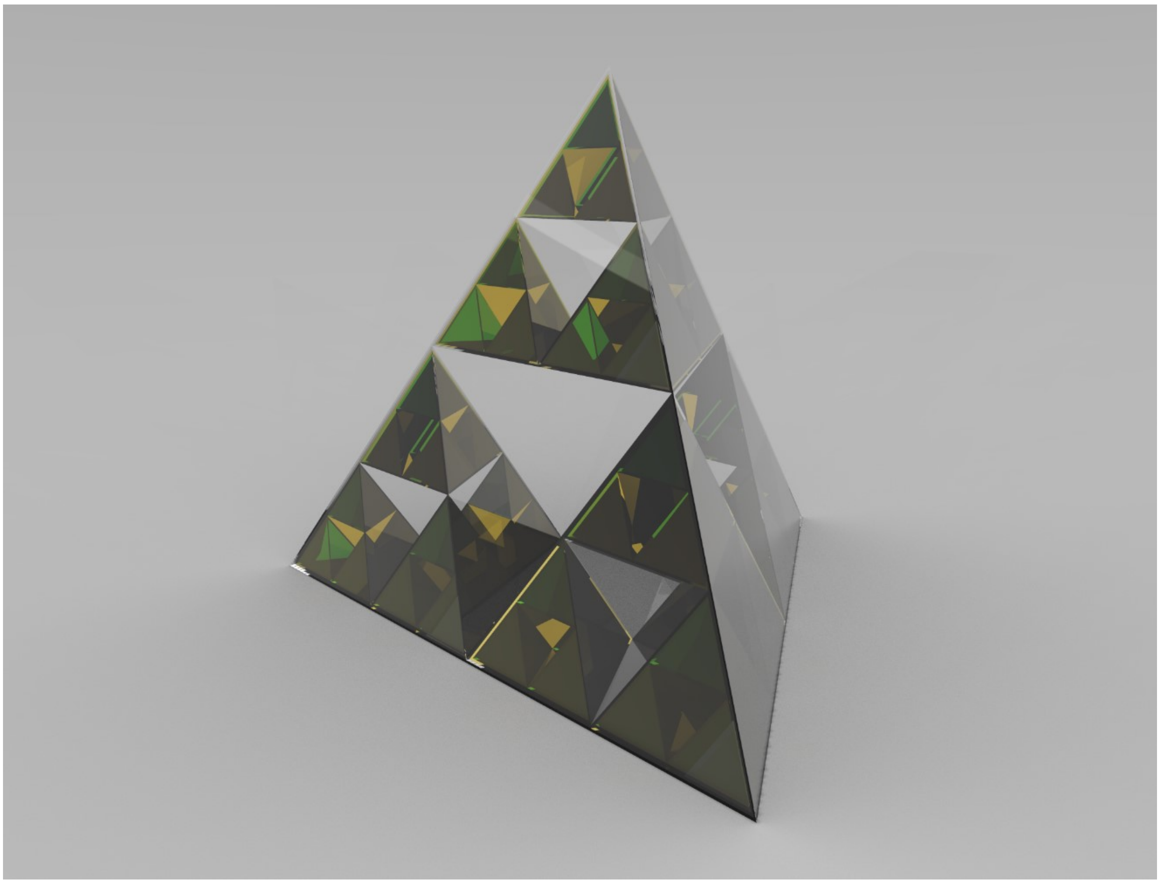
Stage 02 / February – March

Here we decided to opt for visualizing the triangular numbers with the help of tetrahedrons. In this stage, we planned to manufacture the tetrahedrons from acrylic sheets. We wanted to use acrylics with different colours and optical properties to highlight different geometric properties and even discussed using mirror-like surfaces in the piece. We also discussed the use of Fractal-like structures (as in Sierpinski's triangle) or solely octahedrons as they contain the tetrahedron "data" in the negative space. Furthermore, using the structure to cast interesting shadows in the ground was an option.



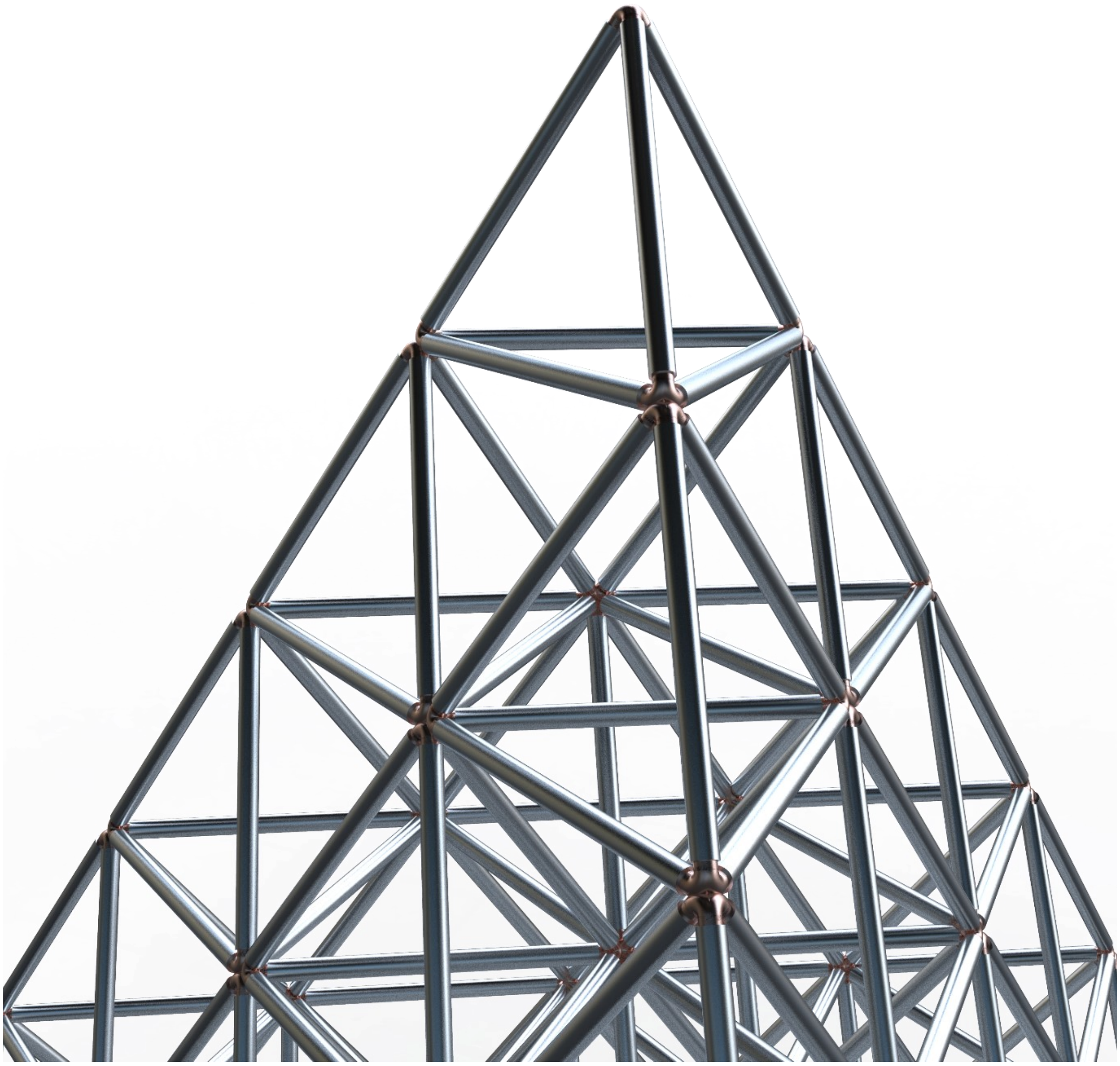






Stage 03 / March - April

After many different implementation ideas and trials, we decided to make the sculpture out of aluminium tubes and the joints from copper plated steel wire. As our original idea was to use acrylic sheets, we tried to come up with several options how to attach them neatly. However, it turned out to be difficult and we found mutually the tube structure to be visually more interesting. In addition, it enabled an airy appearance which we tried to achieve. Nevertheless, the acrylic sheets were not scrapped from the concept totally. The acrylic sheets will highlight the octahedrons inside the structure.




Then we started prototyping. The aluminium tubes are attached to each other with the help of steel wire. These joints were one of our main inspiration to make the structure out of tubes since they add another element to the piece. We tested with different tube widths and different amounts of steel wire in the tubes. Finally, after a couple of tries, we concluded that 10 mm tubes and 30 steel wires in each tube is optimal for our purpose.

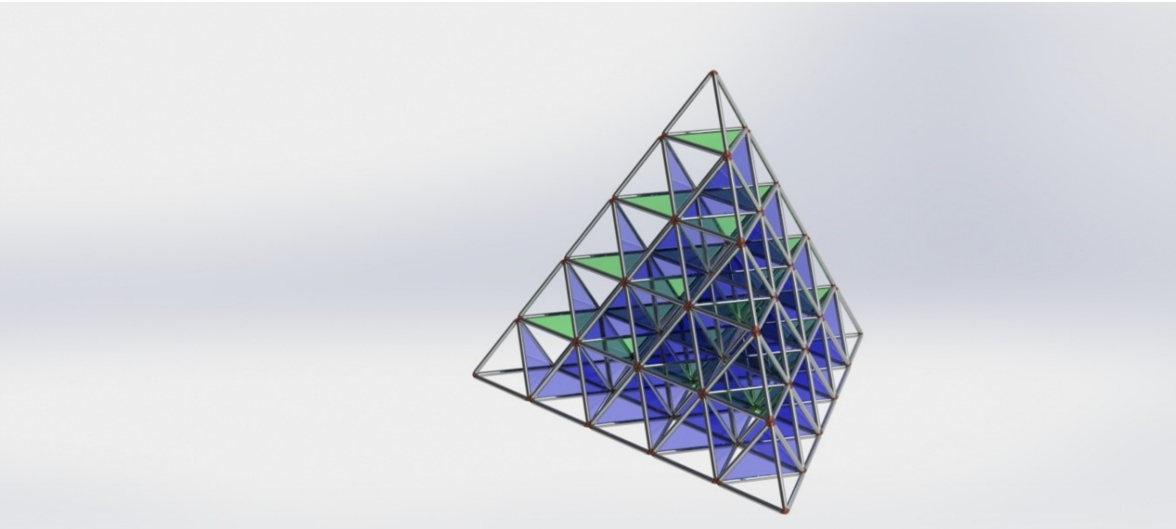
The biggest challenge was attaching the tetrahedrons to each other, since at most there will be 12 tubes in one joint. This led to us making the piece out of modules; first making the tetrahedron units one by one, then attaching the horizontal layers together as modules and finally assembling the whole piece together.

Implementation / April – May

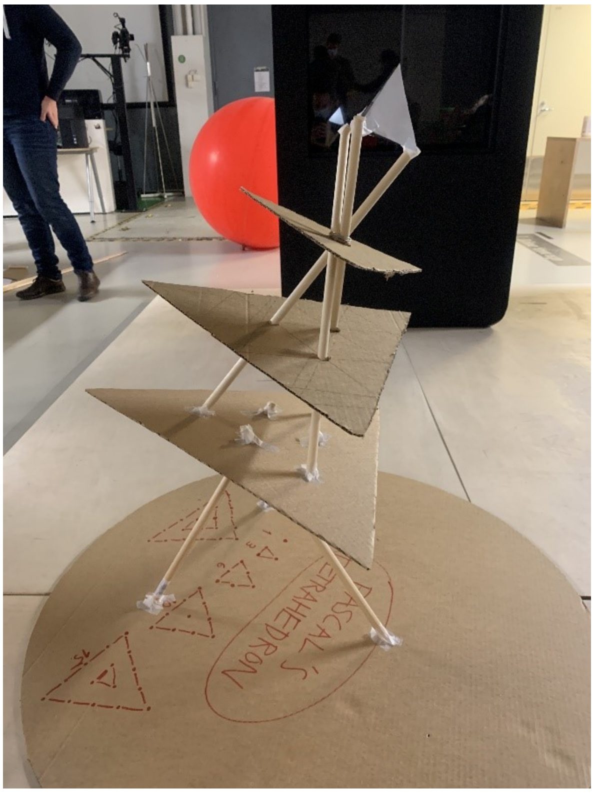
Our plan in the beginning was to make the piece consisting of 6 – 8 layers of tetrahedrons. However, we decided to reduce the number of layers to five, to make the construction faster and easier. Meanwhile, we increased the size of the tetrahedron units to achieve a certain size for the whole artwork. We started by using the metal and laser workshops in Väre to cut the tubes and acrylic sheets. This allowed us to create the pieces needed for construction. Once the needed materials were made, the construction of the piece took place in Väre and was later transported to the exhibition site.

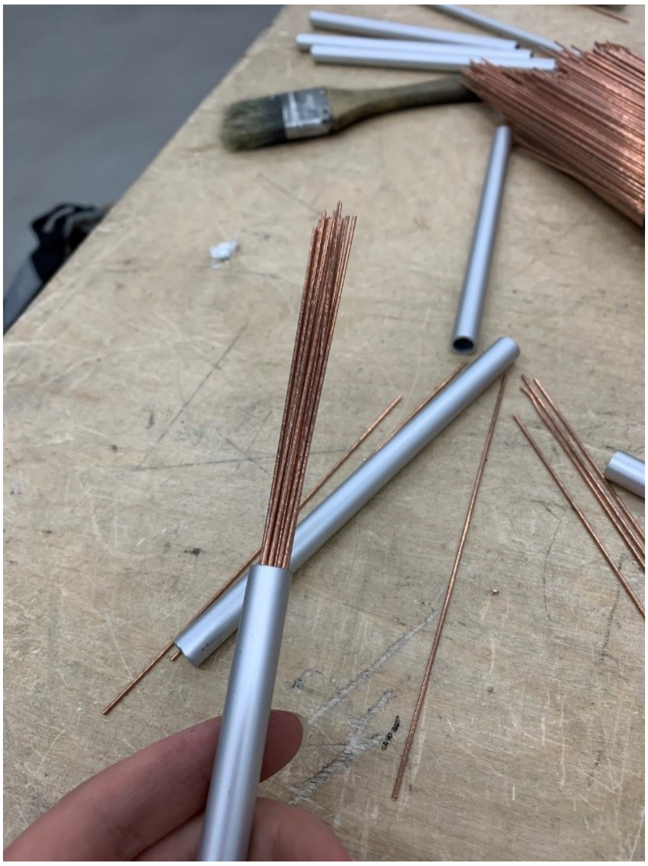
Finished product / May –

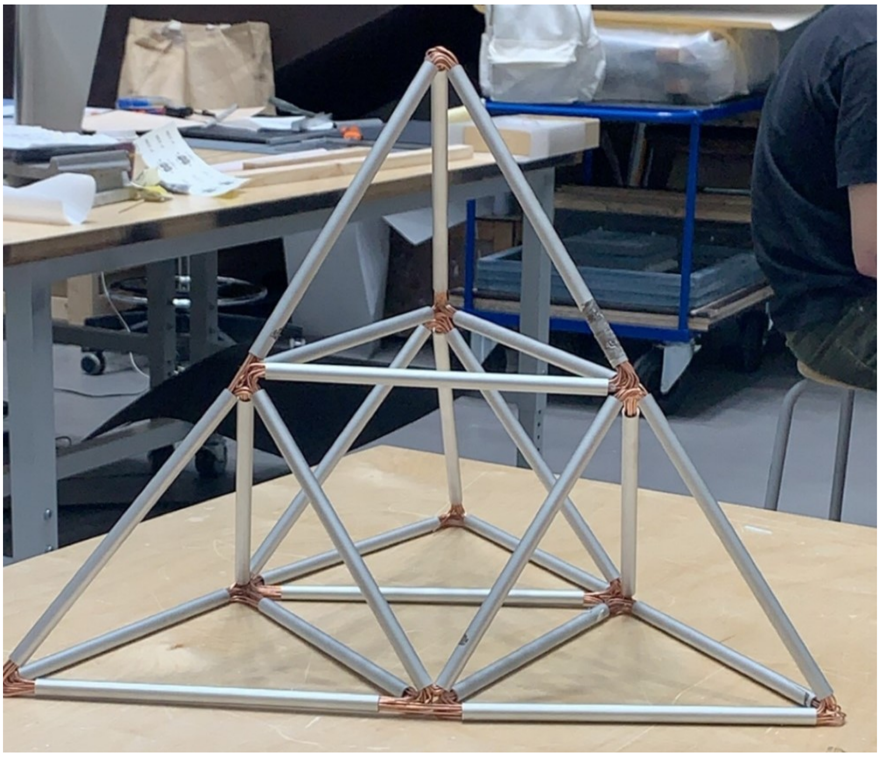
A model illustrating the outcome. The colours are different from the actual piece since the modelling program did not have the accurate colours. In reality, the green triangles are orange and the blue ones are yellow.

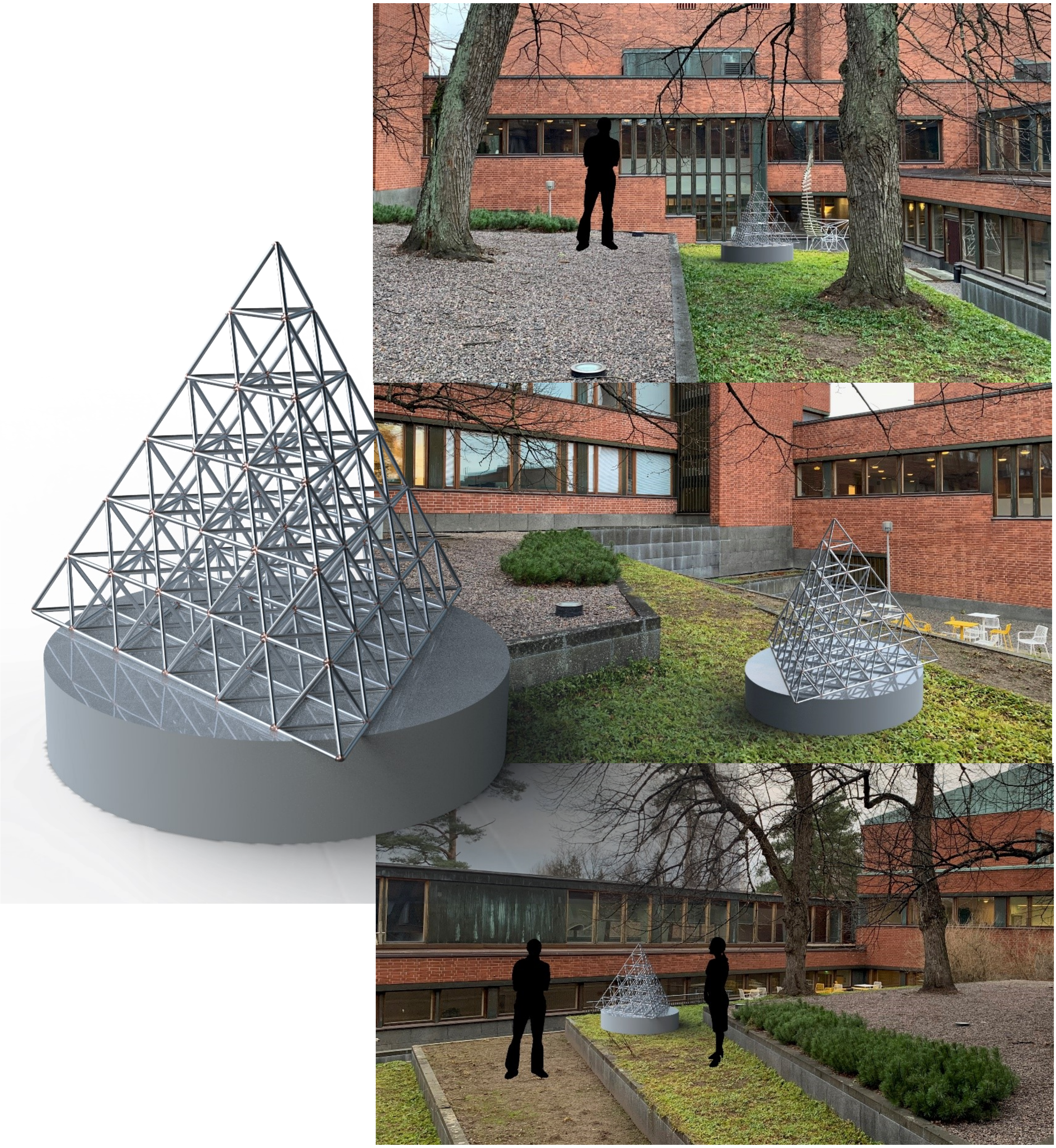


Design Development and Outcomes







Group Love Triangles

Ilkka Mutanen – Design
Emilia Söderström – Energy and environmental engineering
Helena Karling – Physics, mathematics and vet school