The Development of the Tangent Acoustic Wall Panel

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The acoustics of a space are a very important factor in how that space is experienced, to the point where bad acoustics can hinder the functionality of that space. A common way to improve the acoustics of a space is by using acoustic wall panels.

The goal of this assignment was to design an acoustic wall panel for Studio Samira Boon. Studio Samira Boon is a design studio based in Amsterdam and Tokyo that focusses on textile and origami based design. They have helped develop Biofold, a biocomposite material made from waste textile and PLA fibres.

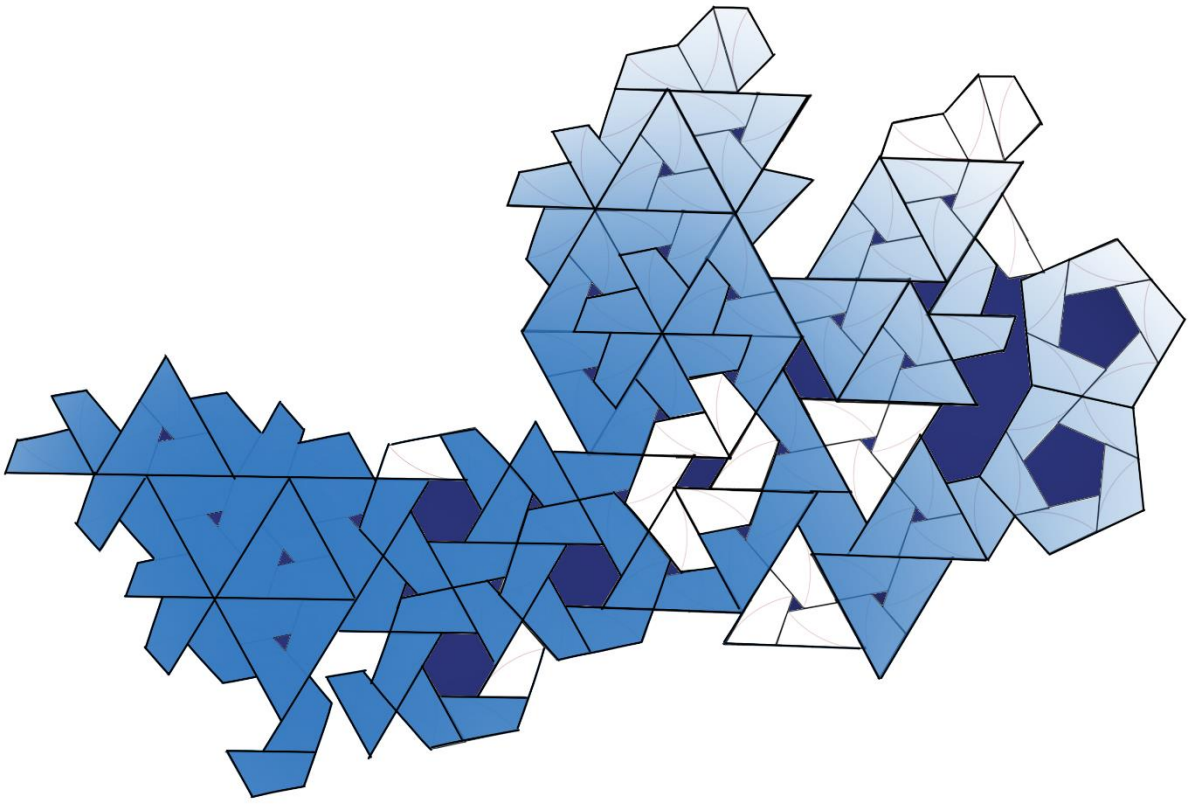
The design brief for this project was to 'Design a high-performance acoustic wall panel made with Biofold, that is suitable for large indoor spaces and can create unique patterns in repetition'. The goal was to have a prototype at the end of the project.

In order to fulfil this brief, some research had to be done in various topics before the design phase started. Due to the limited time available for the project, an approach was taken that effective, but less rigorous than normal. In this approach, steps are taken to ensure that everything that is being researched is actually relevant to the project. This can for instance be done by actively looking for requirements and restrictions that narrow the scope of research to a more specific field.

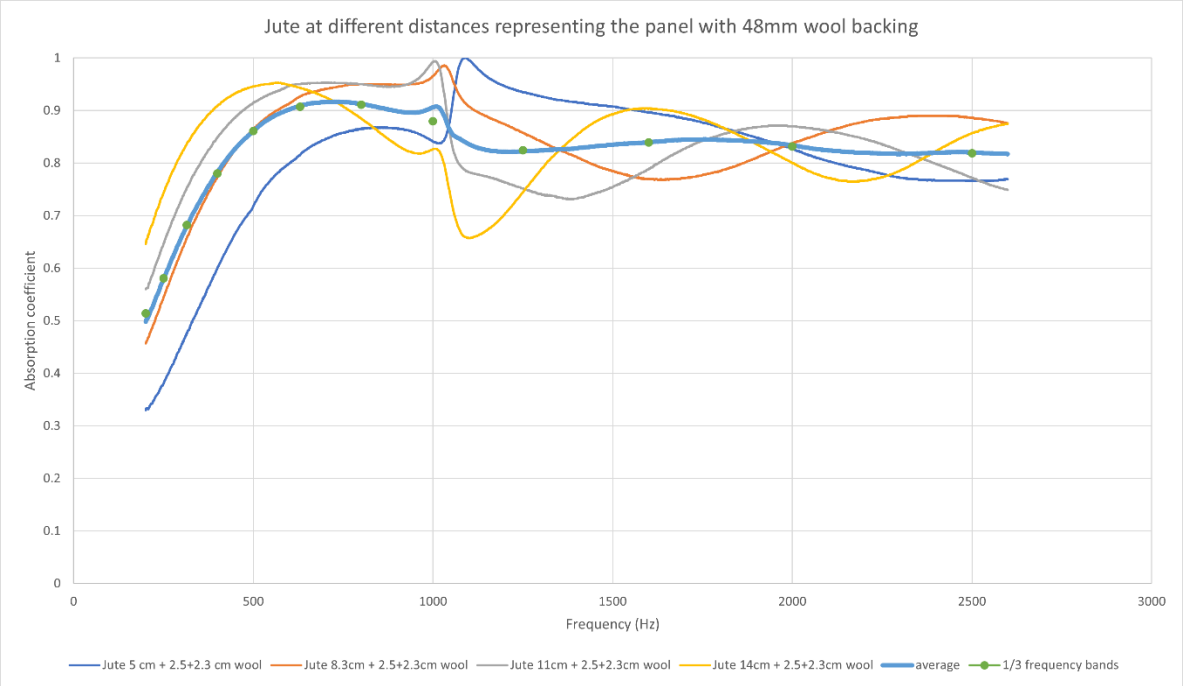
Five main topics were researched: Studio Samira Boon, Biofold, Modularity, Acoustics, and Wall mounting. Most of this was literature research, however some practical research was also done to, for example, develop an understanding of how Biofold actually behaves. The conclusions from this research were combined into a list of requirements.

One of the conclusions from the literature research was that the available acoustic data of Biofold was not detailed enough to properly work with. To supplement this data, the acoustic absorption of various Biofold samples was tested using an impedance tube. These tests were done in two series. The first series focussed on acquiring frequency-bound acoustic data of Biofold and comparing it with the data from the earlier tests. The second series was conducted much later in the process and focussed on validating the acoustic properties of the final design.

The result of this project is the Tangent Acoustic Wall Panel. The panel is made from a single piece of Biofold that is folded over a frame, with space to add additional acoustic material inside as needed. Multiple panels can be combined together to form regular triangles, hexagons, or pentagons, which can be used as a base for larger installations. The figure below illustrates shows an example of a large configuration.



According to the tests conducted with the impedance tubes, the panels should absorb about 80% of the acoustic energy that they interact with for frequencies higher that 500Hz, as can be seen in the figure below. It is likely that the actual acoustic performance is better than that as the geometry of the panel could not be taken into account with the measuring method used.



There are still a couple things that need to be developed further before the panel is market-ready. The most important of these is the mounting system. The panel currently does not have a proper way to be mounted to the wall. As this optimal mounting system is very dependent on the use case, recommendations have been made for the two most likely scenarios.

Another aspect that needs to be developed further is the frame. As the frame is very interwoven with the mounting system, it should be developed alongside that system.