

Self Deployable Origami for MoonMars Architecture

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Abstract

We give an update on the development of self deployable origami for MoonMars architecture. On the 19th and 20th of April 2018, the International Lunar Exploration Working Group (ILEWG) and ESA-ESTEC held the annual *EuroMoonMars* Workshop. On the second day of the workshop, a field test of our first prototype was carried out during Lunar Analogue simulations.

1. Self deployable origami for MoonMars architecture

Textiles can play a transformative role in future space architecture. Textile origami offers high performance external layer for extraterrestrial architecture. Origami structures facilitate kinetic transformation and can be unfolded into a myriad of different shapes due to their structural flexibility. They are lightweight. They can be easily deployed by embedding inflatable or hardware spine. Robotic pulling force could be an alternative compact support. Faceted origami surface helps avoiding harmful close to perpendicular confrontations with external particles. Embedded in textile solar paneling can alter direction following the sun and gathering more energy from this renewable source. Transparent vs. blind facets can alter direction allowing light and climate control. An added value of origami inspired structure as an external membrane for a Moon Village or a space station unit is its sustainability. Such structures can be re-used in different shapes and sizes as a solution for flexible spatial usage. Therefore, they enable spaces to stay functional for longer and fulfill their potential when requirements change. Space enhanced by such structures is temporal and alive as it transforms redefining itself in resonance to human and environmental factors. Extraterrestrial origami brings together technique, science and art.

1.1 Current status

Our first prototype was deployed and tested to extreme conditions on the 20th of April – origami structure as a gateway and sub-system between the exo-habitat, airlock system and exo-laboratory at EuroMoonMars2018 simulation.

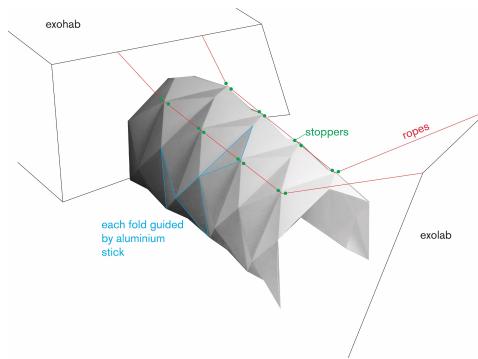


Figure 1 - origami structure drawing



Figure 2 - origami structure for MoonMars architecture prototype

1.2 Current challenge

The current challenge is finding optimal combinations of deploy systems and origami patterns. Through tentative model making and prototyping we can discover the most suitable combination allowing the most compact fold and lightweight, energy efficient deploy mechanism.

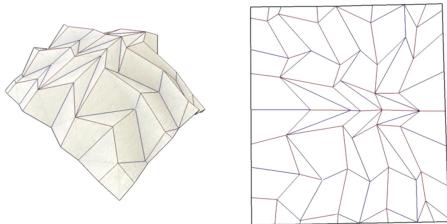


Figure 3 - software allows us to sculpt or generate complex origami forms while altering the crease pattern of the model

1.3 Perspectives

In collaboration with textile architect Studio Samira Boon we can implement origami structure into the digital weaving process. We're creating and digitalizing various origami patterns for MoonMars architectural applications. As the next milestone in our development process, we're planning to design a self deployable origami habitat.



Figure 4 - Studio Samira Boon – woven self supported origami dome from a single sheet of fabric

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