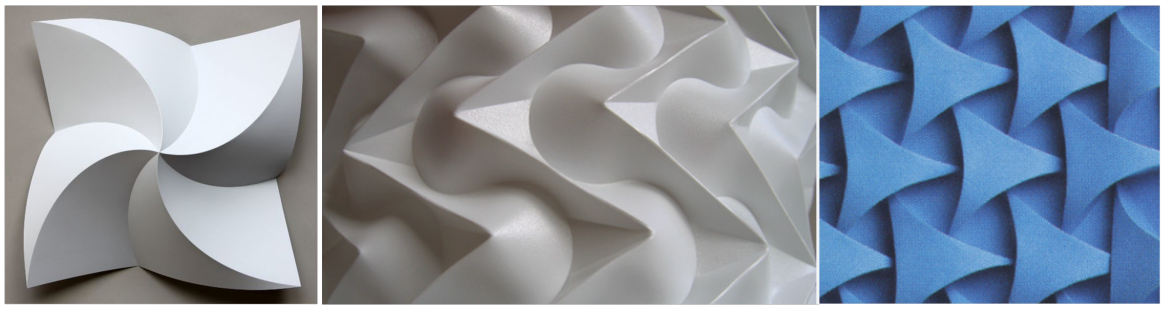
ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

CRL
Computational Robotics Lab

Master Thesis

Computational Design of Curved Crease Origami



Introduction

Computational Design of Curved Crease Origami is a problem at the intersection of geometry, mechanics, and design. With its ability to transform flat sheets into complex, functional forms, curved crease Origami has promising applications in areas such as architecture, product design, and robotics.

The project will focus on developing computational tools to model, simulate, and optimize curved crease origami structures. We will explore the mathematical foundations of curved folds, investigate their mechanical properties, and implement algorithms for design automation.

We will focus on periodic Origami sheets defined over the family of isohedral tilings which provide a continuous space of patterns with high regularity and symmetry. Although isohedral tilings are made from polygons with straight edges, we will add extensions to allow for curved edges that either preserve or reduce pattern symmetry in controllable ways. This construction will allow for smooth changes in tile shapes, which we will leverage for gradient-based design optimization with high-level folding targets.

The methods developed in this context will be applied to generate a wide range of periodic curved crease Origami sheets. For validation, we will manufacture physical prototypes for a set of selected examples.

Requirements

- Experience in computer graphics and/or geometry processing
- Experience with numerical simulation and/or optimization
- Very good programming skills in C++
- Willingness to work with experimental setups

Remarks

This thesis is overseen by Prof. Dr. Stelian Coros and is supervised by Dr. Bernhard Thomaszewski.

Contact

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