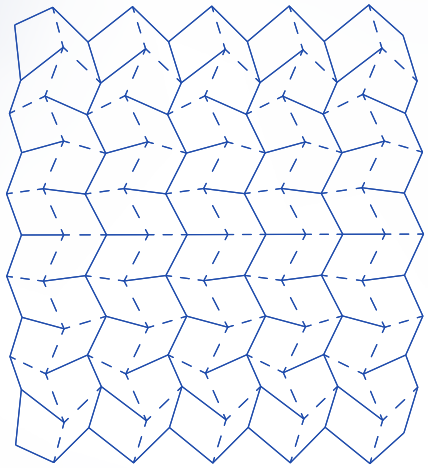
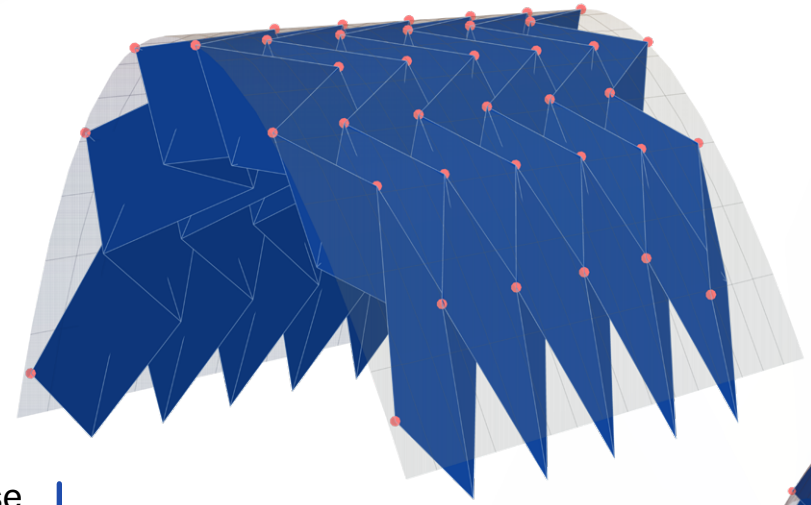
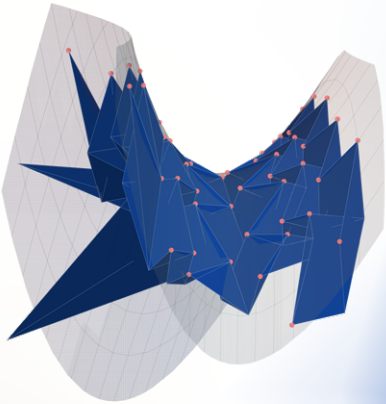
Kishore S. Shenoy

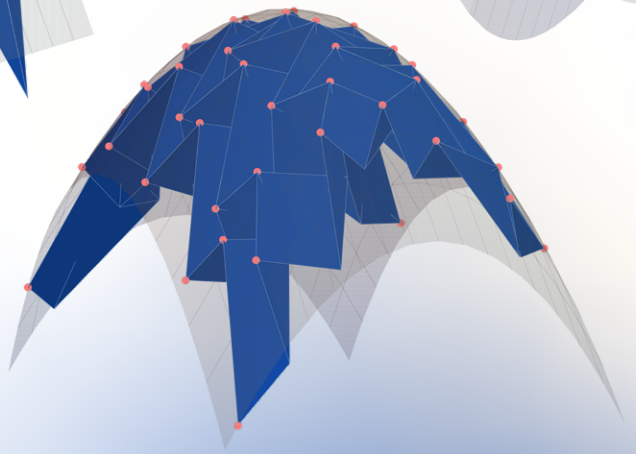
TOPOGRAPHICAL DESIGN

Structures in Computational Origami









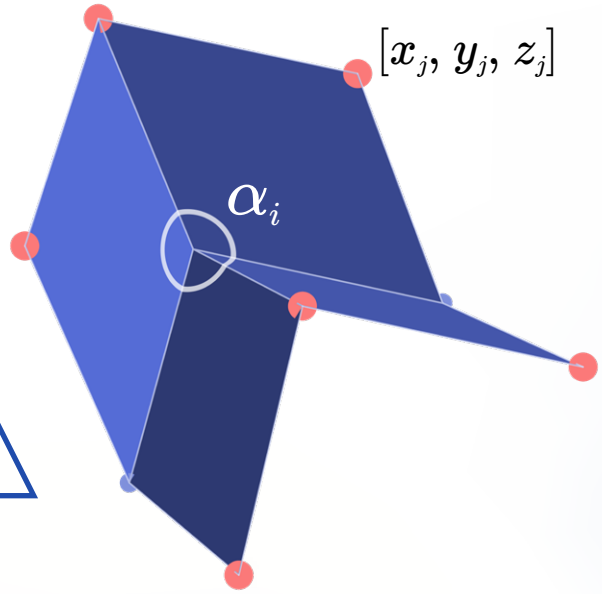
The algorithm generates crease patterns that rigidly folds into the required design surface.

Arch, Dome and Saddle form a mutually exclusive and exhaustive Gaussian curvatures of surfaces.

Brief

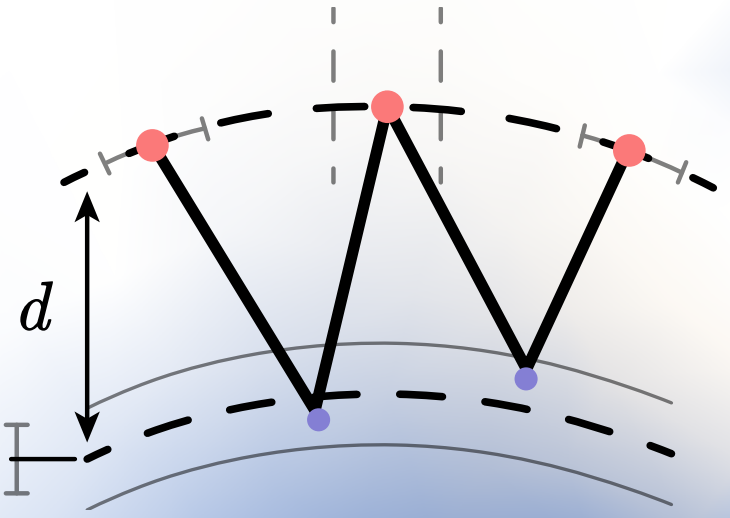
System Nonlinear and Over-constrained

Working with angles and coordinates at the same time makes the system non-linear.



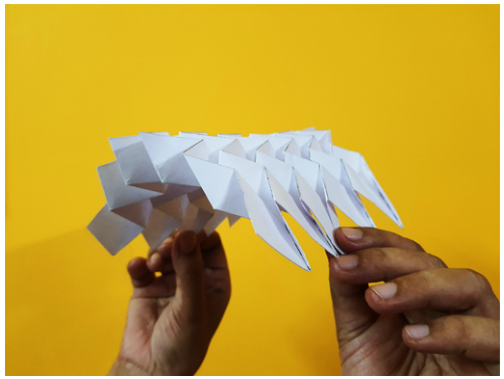
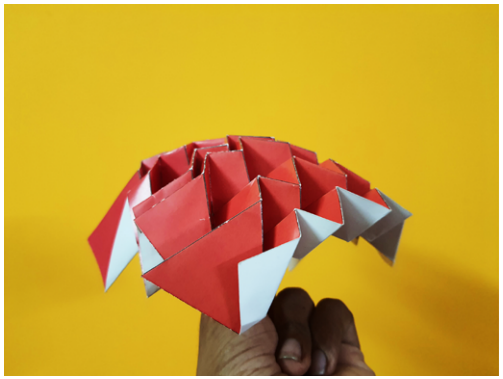
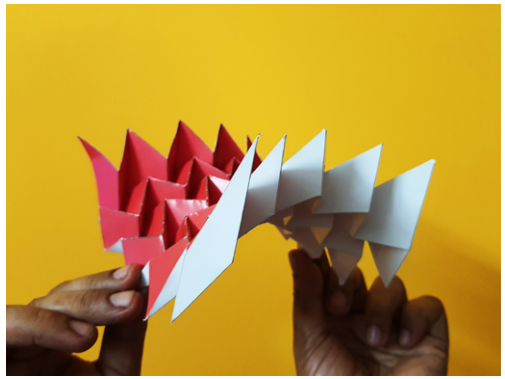
The objective of the work is to fold the top surface exactly into the required surface. This design constraint makes the system over-constrained.

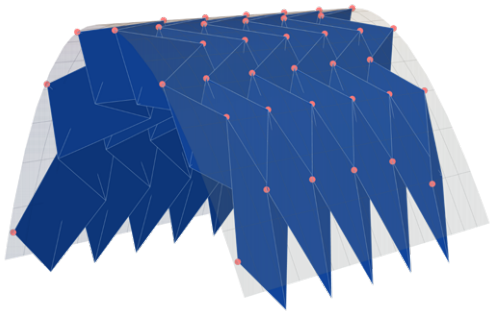
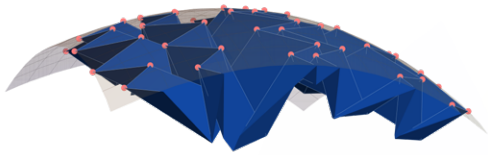
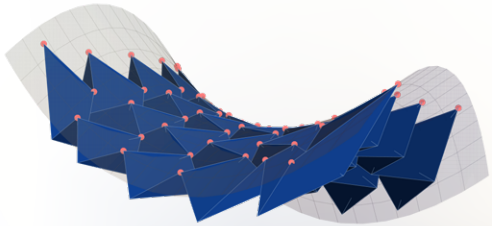
To find solutions in such a system using a least-squared based solver, inequalities are introduced to the system of equations. These inequalities act as perturbation bounds to control the perturbations from drifting off from the targeted design style.



Outputs

The results are proper Miura-like surfaces that are developable and rigidly foldable with top vertices hard constrained to the design surface.

The works described in here were presented in the IASS 2020/21 Surrey International Conference on Spatial Structures. This work is co-authored by Sree Chandana Madabhushi and Phanisri Pradeep Pratapa.

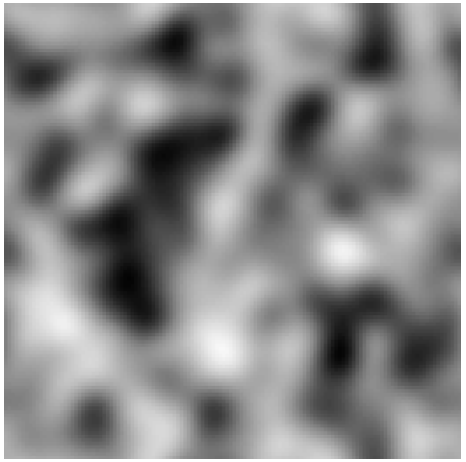
SPATIAL MODELLING

Urban Growth Models

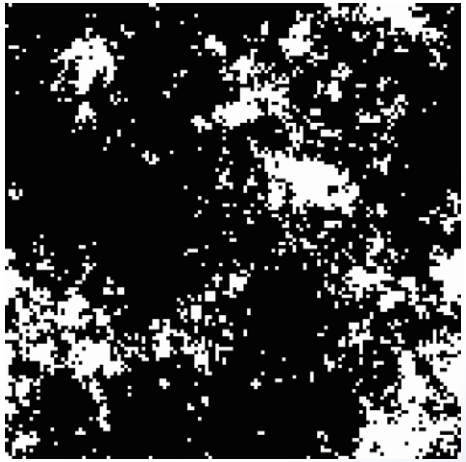
Predicted urban growth using these three models:

1. Structure from Randomness 1
2. Structure from Randomness 2
3. City Sanbox

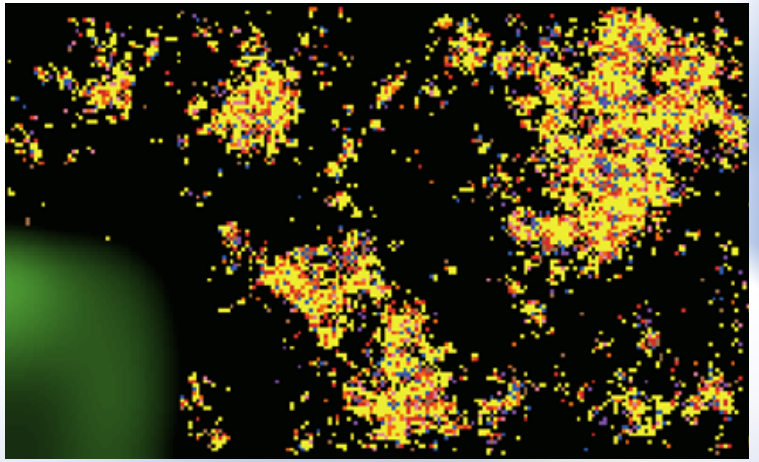
Analysed the predicted growth of each method based on the Emergence of Complex Systems, Interactions at the micro-level and the inherent Stochasticity present.



Structure from Randomness 1



Structure from Randomness 2



Green represent mountains

City Sanbox