ENGINEERING & DESIGN

TOPOGRAPHICAL DESIGN

using Origami

Design Inputs

Folds into

Origami Pattern

The standard Miura - Ori pattern, made of parallelograms, forms two parallel surfaces when folded along its crease pattern.

&

A 3D surface with arbitrary Gaussian Curvature, which the origami solution conforms to.

Target Surface

Crease pattern

Starting with the standard Miura crease pattern, the algorithm aims to impose the design constraints and obtain a crease pattern that folds into the solution origami structure.

Folds into

Engineering behind it!

RIGID

Functional constraints

- Developable from flat sheet.
- All faces remain rigidly planar.
- Structure is rigidly foldable.

Unit cell

Non-linear system

The set of variables include co-ordinates of the pattern nodes, angles of faces and folds and size of the panels. Employed a least-squares based non-linear solver with a certain tolerance limit on deviations.

Strain visualization

Studied the rigid foldability of solutions by simulating the static strains developed during the folding motion and observed the same with physical models as well.

Publication

The work is published in the conference - link.

Co-authored with Kishore S. Shenoy and Dr. Phanisri Pradeep Pratapa.

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International Conference on Spatial Structures 2021/1

FUNCTIONAL DESIGN

Daylight analysis

Daylight contours showing the sufficiency of natural lighting during the day.

Lighting in the kitchen

Wind analysis

Axis of the house is aligned with the prevelant wind direction.

Wind Rose Diagram

Thermal comfort analysis

Curved boundary to reduce the surface area in turn minimising heat gain through walls.

Inclined wall profile at the junction with roof to create pressure difference for easy exhaust.

LIFE CYCLE ASSESSMENT OF AN EWS HOUSE

EWS House A house designed for economically weaker sections.

Analysed the building material requirement and performed LCA using tally plug-in through Autodesk Revit.

Stage

Product stage of construction contributes the highest to CO_2 emissions.

Material

Materials constituting **cement** are the major contributors.

Sustainable alternative

Cement manufacturing process, inspired from coral reefs, from sea water and CO_2 emissions, reduces the carbon footprint by 1.5 times.

UI/UX DESIGN AND PROTOTYPING - WORKFLOW

Heatmap analysis shows accessibility and visibility of a particular frame.

Navigation icons

Final proceeding button is always at the bottom of the frame, to create a sense of ending and have a glimpse at the verge of clicking it.

Most accessible wheel position. Draggable too!

Color scheme to indicate *medical* and go with the company logo.

Grey for a sense of subtle warning.

Minimized video button for simultaneous interaction.

USER

The product is designed for a healthcare startup, that allows seamless doctor - patient consultations. Find the working prototype here - link.

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