Thesis Title

Name of the scholar:

Roll number:

Name of the research guide(s):

Research Objectives/Scope

- Objective 1
- Objective 2
- Objective 3

Not to exceed one slide

Significant Contributions

- Contribution for one slide for each objective

- Publication (if available) related to this contribution
- Preferred to show the image of the title/author list of the paper as published (one sample example shown here)

Folding-Angle Framework for Structural Modeling of Rigid Triangulated Miura-ori Lattices

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Origami is rapidly gaining prominence in the research of metamaterials as it allows for tuning the properties of interest by change in the folded state. Origami-based lattices that allow low-frequency wave-propagation can potentially find use as acoustic metamaterials. Rigid-panel origami tessellations have lattice modes which are exclusively due to the low-energy folding deformations at creases and hence will be suitable for low-frequency wave-propagation applications. Modeling frameworks like bar-and-hinge that are typically used to study origami lattice mechanics allow for panel stretching behavior which is forbidden and redundant in rigid-panel origami lattices. This drives the necessity for an efficient analysis framework dealing exclusively with folding-angles for the study of origami lattices with rigid panels. As a first step in this direction, in this paper, we propose a folding-angle-based analytical framework for structural modeling of infinite lattices of triangulated Miura-ori (an origami pattern studied widely for its metamaterial applications) with rigid panels. We assign rotational stiffness to the creases and analytically derive the stiffness matrix for the lattices based on a minimal number of folding-angle degrees of freedom. Finally, we study the influence of the equilibrium state of folding and the relative crease stiffness on the modal energies, to demonstrate the tunable and programmable nature of the structure. The framework proposed in our work could enable the study of wave dynamics in rigid-panel Miura-ori-based lattices and our findings show significant promise for the future use of 1D origami with rigid panels as acoustic metamaterials.
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Keyword: folding and origami

Thesis Organization

- Chapter 1: Introduction
  - Details of section headings
- Chapter 2: Literature Review
  - Details of section headings

Provide details for each chapter similarly

If possible, map the thesis chapter with publications

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