6.5310: Geometric Folding Algorithms, Spring 2025

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Problem Set 1

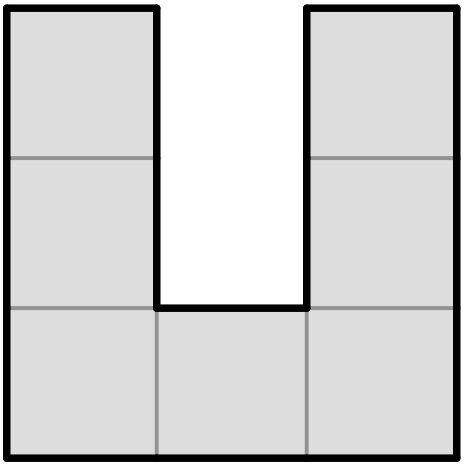
Due: Tuesday, February 11, 2025 at 10am

Problem 1.1 [Problem Invention]. Write a problem (solved or unsolved) related to folding or its applications. The problem should be original to the best of your knowledge, so be creative and diverse! Folding can be applied to mathematics, computation, engineering, architecture, biology, and beyond, so write a problem that is related to a field that interests you. If you write a problem that can be solved from the material covered in class, then we may adapt it for future problem sets. If you pose a problem whose solution is not yet known, we may try to solve it in class during our open problem sessions, or it may become inspiration for a class project. Feel free to include solutions or commentary for your problem. While writing a problem is required, your submission will be graded generously, so have fun and share with us your exploration of the course material.

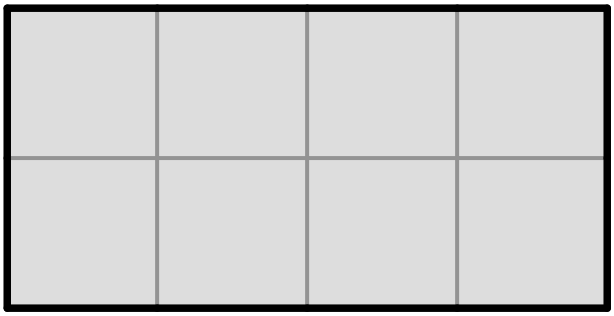
Problem 1.2 [Cube Folding]. Fold a unit cube from at least two of the four polyominoes in Figure 1. All foldings are possible in the half-grid model, where

- creases are horizontal, vertical, or 45° diagonal lines;
- creases connect endpoints with half-integer coordinates; and
- creases are folded by ±90° or ±180°.

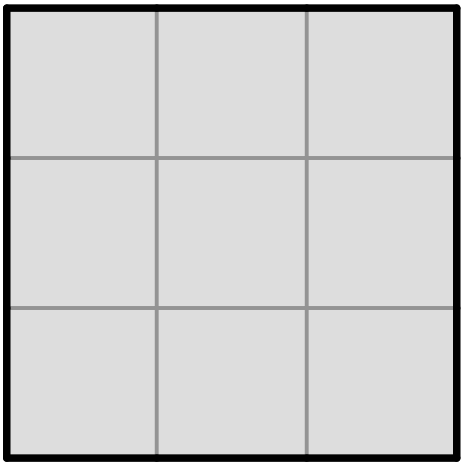
Label each cube with your name/email and subproblem letter (a–d). Upload photos of your cubes to Gradescope. You may also optionally bring the physical models to class to show them to us in person.



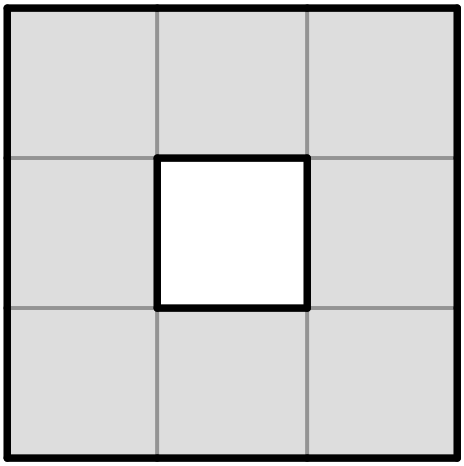
(a) U heptomino



(b) 2×4 octomino



(c) 3×3 nonomino



(d) O octomino

Figure 1: Fold at least two of these nets into a unit cube.