

*Geometric Folding Algorithms:
Linkages, Origami, Polyhedra [DO07]*

Updates to Chapter 25, Folding Polygons to
Polyhedra
Section 25.2: Edge-to-Edge Gluings

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1 Edge-to-Edge Gluings

- (1) Squares. “Enumerating All Convex Polyhedra Glued from Squares in Polynomial Time.” [LPZ21].

“We show that the number of such gluings of n squares is polynomial in n .” In particular, $O(n^{36})$ edge-to-edge gluings.

- (2) Pentagons. “A Complete List of All Convex Polyhedra Made by Gluing Regular Pentagons.” [ALZ20].

“a complete description of all convex polyhedra whose surface can be constructed from several congruent regular pentagons.”

See Fig. 1.

- (3) Hexagons. “Which convex polyhedra can be made by gluing regular hexagons?” [AL20].

“there are only 15 possible types of shapes, 5 of which are doubly-covered 2D polygons.”

Related: “Deltahedral Domes over Equiangular Polygons,” [GAD⁺24].

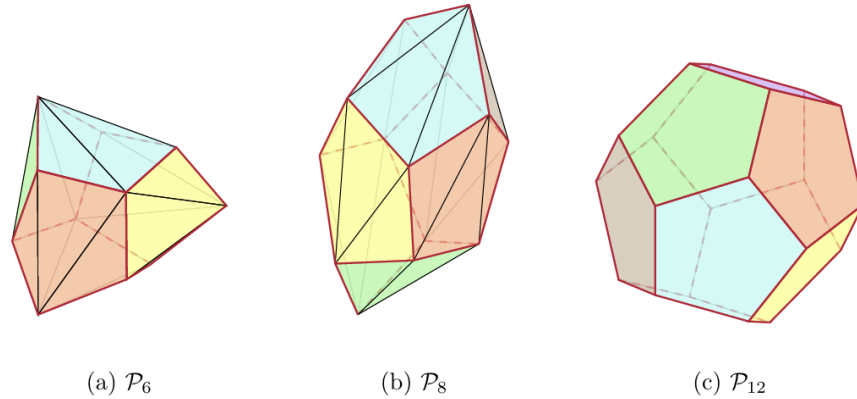


Figure 1: Detail from Fig. 5 in [ALZ20].

References

- [AL20] Elena Arseneva and Stefan Langerman. Which convex polyhedra can be made by gluing regular hexagons? *Graphs and Combinatorics*, 36(2):339–345, 2020.
- [ALZ20] Elena Arseneva, Stefan Langerman, and Boris Zolotov. A complete list of all convex polyhedra made by gluing regular pentagons. *J. Info. Processing*, 28:791–799, 2020.
- [DO07] Erik D. Demaine and Joseph O’Rourke. *Geometric Folding Algorithms: Linkages, Origami, Polyhedra*. Cambridge University Press, 2007.
- [GAD⁺24] MIT-CompGeom Group, Hugo A Akitaya, Erik D Demaine, Adam Hesterberg, Anna Lubiw, Jayson Lynch, Joseph O’Rourke, Frederick Stock, and Josef Tkadlec. Deltahedral domes over equiangular polygons. arXiv:2408.04687, 2024.
- [LPZ21] Stefan Langerman, Nicolas Potvin, and Boris Zolotov. Enumerating all convex polyhedra glued from squares in polynomial time. arXiv:2104.06787, 2021.