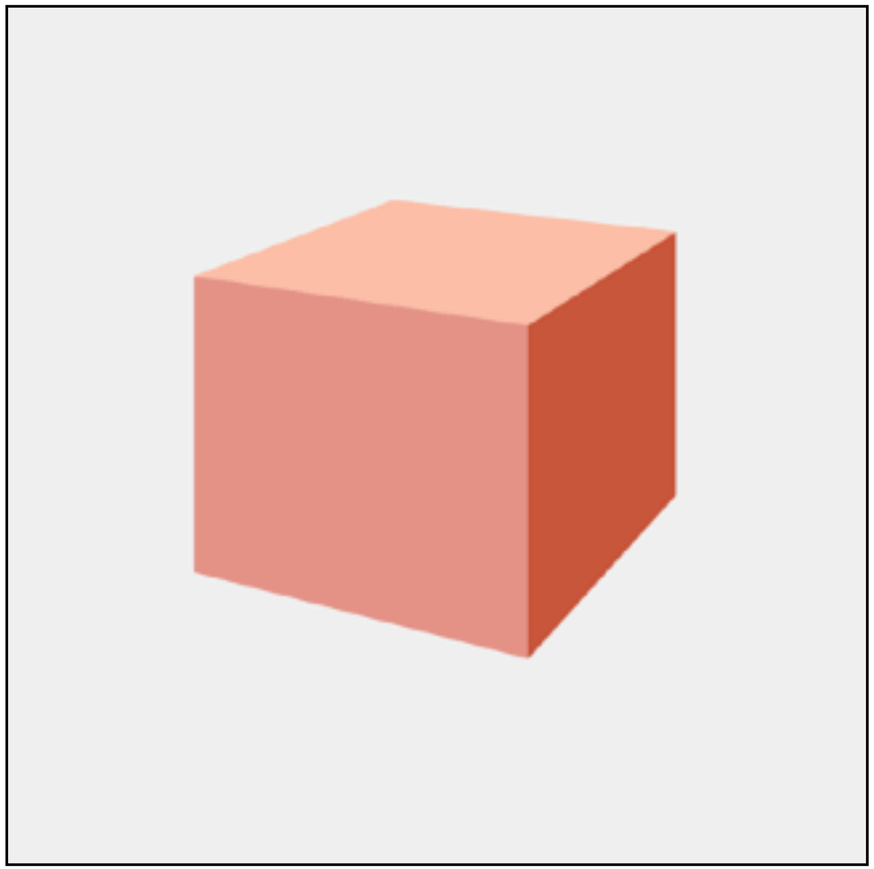
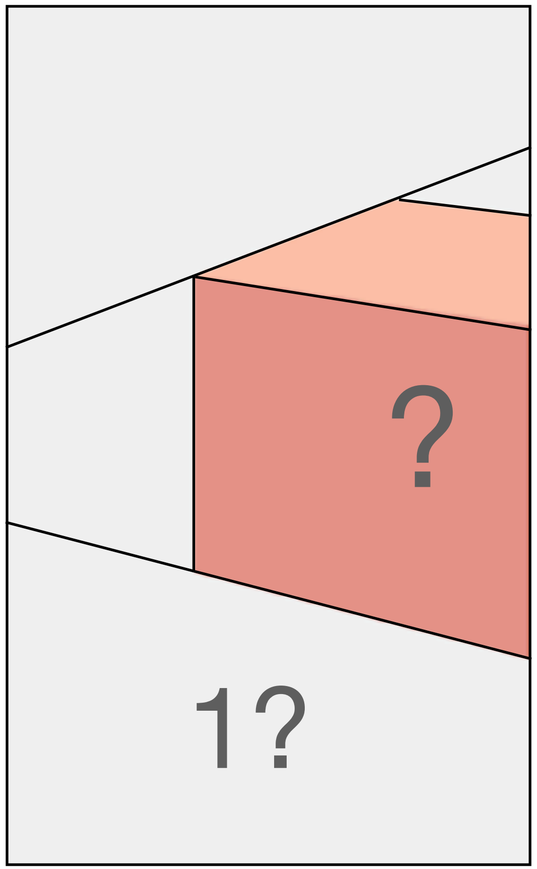
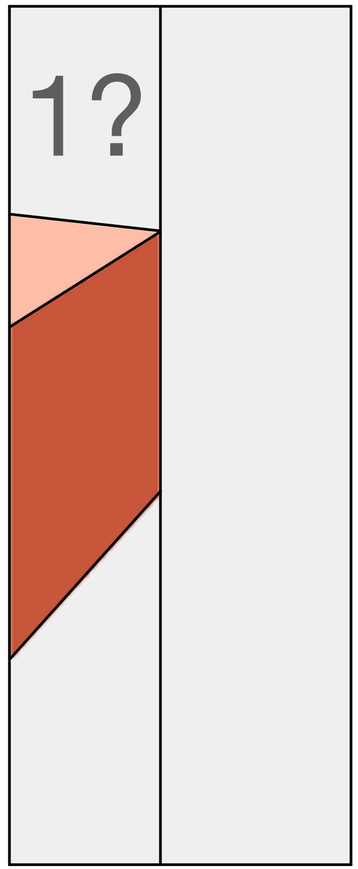
?




?
1?


1?

?

A Mathematical Foundation for Foundation Paper Pieceable Quilts

MACKENZIE LEAKE, Stanford University, USA
GILBERT BERNSTEIN, UC Berkeley, USA
ABE DAVIS, Cornell University, USA
MANEESH AGRAWALA, Stanford University, USA

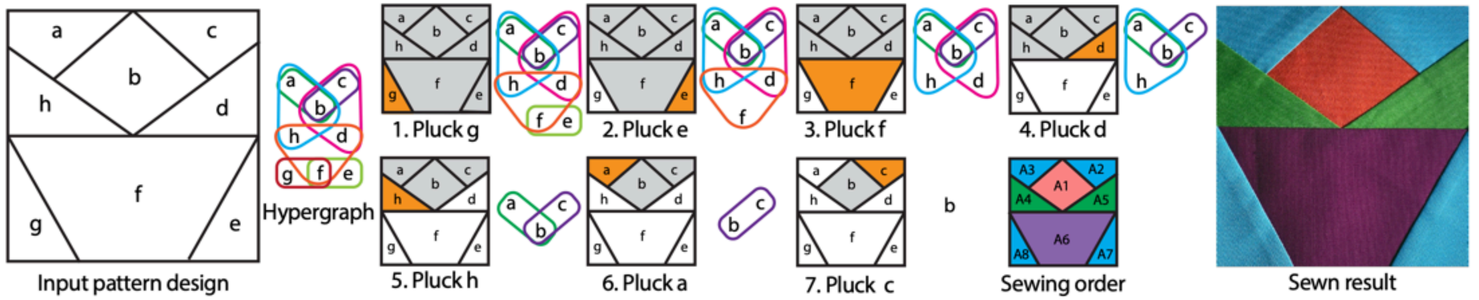


Fig. 1. Given an input pattern design we encode the geometry as a *dual hypergraph*, where nodes represent faces and hyperedges represent *seams* connecting two or more faces. We visualize the hyperedges with colored boundaries (left). In this work we prove that if this hypergraph is acyclic, the pattern design is foundation paper pieceable, and we present a *leaf-plucking* algorithm that iteratively removes leaf hyperedges, where a node is only contained in that hyperedge, to generate a sewing order for the design, which is the reverse of the order in which we plucked the nodes (center). Our quilt design tool shows the resulting sewing order by numbering the faces (center, Sewing order) and lets users color the faces to visualize the design. Quilters can use foundation paper piecing to sew the quilt by attaching fabric pieces one at a time in the sewing order and precisely construct the quilt top (right).

Foundation paper piecing is a popular technique for constructing fabric patchwork quilts using printed paper patterns. But, the construction process imposes constraints on the geometry of the pattern and the order in which the fabric pieces are attached to the quilt. Manually designing foundation paper pieceable patterns that meet all of these constraints is challenging. In

ACM Reference Format:
Mackenzie Leake, Gilbert Bernstein, Abe Davis, and Maneesh Agrawala. 2021. A Mathematical Foundation for Foundation Paper Pieceable Quilts. *ACM Trans. Graph.* 40, 4, Article 65 (August 2021), 14 pages. https://doi.org/10.1145/3450626.3459853