

UNDERGRADUATE HONORS THESIS DEFENSE

Relationships between areas in a triangulation of a square

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Abstract: For a triangulation of the unit square—that is, a tiling of the square by triangles—we consider the general problem of studying the relationships between the areas of these triangles. For a particular combinatorial arrangement of vertices and edges, by a dimension argument we expect that there must be a relation among the areas of the triangles. By generalizing the notion of triangulating a square and applying some facts from algebraic geometry, we can prove that this relation is in fact a homogeneous polynomial equation that is an invariant of the combinatorial triangulation. Our focus is on calculating the degree of this polynomial for any arbitrary triangulation. We develop an algorithm to compute this degree by inductively relating a triangulation to simpler “factor” triangulations and studying the relationship between the associated polynomials.

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