i-Block Transitive Tilings by Convex Pentagons

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This talk will concern tilings of the plane by polygons. A tiling (or tessellation) of the plane is a covering of the plane by shapes (called the tiles of the tiling) in which the interiors of the tiles are disjoint. In particular, in this talk we will discuss monohedral tilings by convex polygons; that is, tilings in which all tiles are congruent to a single convex polygon. Convex n-gons admitting tilings of the plane have been classified for all n ≠ 5. We will discuss the history of the search for all convex pentagons that tile the plane and our recent contribution to this long-standing unsolved problem.

All known types of convex pentagons that admit tilings of the plane also admit tilings with a special kind of symmetry called i-block transitivity. We will present combinatorial results on pentagons that admit i-block transitive tilings. These results form the basis for an automated approach to finding all pentagons that admit i-block transitive tilings. We will present the methods of this algorithm and the results of our computer search so far, which includes a complete classification of all convex pentagons admitting 1-, 2-, and 3-block transitive tilings, among which is a new 15th type of convex pentagon that admits a tile-3-transitive tiling.

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