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Natalie Priebe Frank and Lorenzo Sadun

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FUSION TILINGS WITH INFINITE LOCAL COMPLEXITY

NATALIE PRIEBE FRANK AND LORENZO SADUN

Abstract. We propose a formalism for tilings with infinite local complexity (ILC), and especially fusion tilings with ILC. We allow an infinite variety of tile types but require that the space of possible tile types be compact. Examples include solenoids, pinwheel tilings, tilings with fault lines, and tilings with infinitely many tile sizes, shapes, or labels. Special attention is given to tilings where the infinite local complexity comes purely from geometry (shears) or comes purely from combinatorics (labels). We examine spectral properties of the invariant measures and define a new notion of complexity that applies to ILC tilings.

1. Definitions

In the standard theory of tiling dynamical systems, which is motivated in part by the discovery of aperiodic solids, tilings are constructed from a finite number of tile types that can be thought of as atoms. It is usually assumed that these prototiles have only a finite number of possible types of adjacencies and this is called *finite local complexity*, or FLC. Recently, many interesting tiling models have arisen that do not satisfy this property.

In a tiling with *infinite local complexity* (ILC), there are infinitely many 2-tile patterns, that is, infinitely many ways for two tiles to meet. Consider an ILC tiling that is made from a finite set of tile types. If we then 'collar' the tiles by marking each tile by the pattern of tiles around it, we obtain an equivalent tiling with infinitely many tile types. We therefore allow arbitrarily many tile types from the start, but require that the space of tile types should be compact. In particular, it should only be given the (usual) discrete topology when the set of possible tiles is finite.

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