Research Description

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My main research interest is group actions on polygonal and cube complexes.

Given a natural number $k \geq 3$ and a finite graph L (respectively a finite flag simplicial complex L), it is natural to consider the CAT(0) (k, L)-complexes (resp. CAT(0) L-cube-complexes); these are polygonal complexes (resp. cube complexes) obtained by gluing regular k-gons (resp. cubes) such that at each vertex the link is isomorphic to L. The study of these complexes may provide various examples for geometric group actions which exhibit interesting algebraic and geometric properties.

A natural question arises: can one give a necessary and sufficient condition on the pair (k, L) (resp. on the complex L) such that there is a unique, up to isomorphism, CAT(0) (k, L)-complex (resp. L-cube-complex)? The few known examples of unique (k, L)-complexes have provided a fertile ground for many theorems.

Thus far, we were able to answer this question fully for the pair (k, L) when k is even and for cube complexes. The main result describes a simple combinatorial condition, called superstar-transitivity, on L for which there exists at most one (k, L)-complex (resp. L-cube-complex). This condition is also sufficient for uniqueness in pairs (k, L) where k is odd.

In light of these results, it is clear that complexes with superstar-transitive links play a special role in the world of polygonal/cube complexes. The aim of this research is to investigate the special properties of these complexes through the study of the general theory.