

The combinatorics of $CAT(0)$ cubical complexes and robotic motion planning

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Abstract

We say that a cubical complex X is “ $CAT(0)$ ” if it has non-positive curvature. Such objects play an important role in pure mathematics (group theory) and in applications (phylogenetics, robot motion planning, etc.). In particular, as Abrams and Ghrist observed, when one studies the possible state of a discrete robot, one often finds that they naturally form a $CAT(0)$ cube complex.

Gromov gave a remarkable topological/combinatorial characterization of $CAT(0)$ cube complexes. We give an alternative, purely combinatorial description of them, allowing a number of applications.

The talk describes joint work with Tia Baker, Megan Owen, Seth Sullivant, and Rika Yatchak. It will require no previous knowledge of the subject.