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THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON PURE MATHEMATICS

From two dimensional triangulations to three dimensional polyhedra

by

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Abstract

In this talk, I will introduce my two recent projects about triangulations and polyhedra. One is on the flip graph of triangulations on planar polygons, and the other is on the moduli space of convex polyhedra. Given a planar polygon P, its triangulation is the decomposition of P into triangles using the vertices of P. A "flip" of a diagonal d in the triangulation, provided that d lies in a convex quadrilateral, is the replacement of d by the other diagonal in this quadrilateral. The flip distance between two triangulations is the minimal number of flips required to change one of them into the other. There is a close relationship between flip distance among triangulaions and rotation distance among binary trees. This makes computation of flip distance an important question. I will summarize some open questions and my results in this area.

A convex polyhedron is a three-dimensional solid bounded by polyhedral faces whose dihedral angles are less than π, such as the five Plato Solids. Two polyhedra are similar if they differ by a composition of scalings and Euclidean isometries. The moduli space of convex polyhedra up to similarity has many interesting properties. For example, there is a metric on this space that endows it with the structure of a complex hyperbolic manifold. Inspired by this result, I study the space of centrally symmetric convex polyhedra. I showed that the space of octahedra is a real hyperbolic ideal tetrahedron by decomposing their surfaces into parallelograms. I conjecture that such parallelogram-decomposition is possible for all centrally symmetric convex polyhedra.

Date : 03 May 2024 (Friday)

Time : 2:00pm – 3:00pm

Venue : Room 2408 (near Lifts 17/18)

All are Welcome!