The Hong Kong University of Science and Technology

Department of Mathematics

PhD THESIS EXAMINATION

Some Geometric Aspects of Polyhedral Graphs from Perspective of Combinatorial Curvature

By

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ABSTRACT

Combinatorial curvature is defined for polyhedral graphs analogue to Gaussian curvature for 2 dimensional Riemannian manifolds. Motivation and important properties of combinatorial curvature are revised. The Gauss-Bonnet Theorem and many other results in Riemannian geometry can be proved for polyhedral graphs. Some results are reviewed.

In particular, the combinatorial Bonnet-Myers Theorem, that was proved by Stone but found invalid later on, is recovered in our work as follows.

Euclidean and spherical polygonal surfaces are constructed from a polyhedral graph. This can be viewed as kind of deformation through re-distribution of curvature. The polygonal surfaces are proved to be Alexandrov spaces. Alexandrov space, in which singularities are allowed, is a generalization of Riemannian manifold. Well-established theorems for Alexandrov spaces are used as a key step for the proof of the Bonnet-Myers Theorem for polyhedral graph. Having said that there are still works on Lipschitz relations among metrics in different spaces so that results about diameters in different spaces can pass from one to the other. And finally the big face obstacle will be considered to ensure the respective results from Alexandrov spaces can pass back to polyhedral graphs.

It is realized that the use of Alexandrov geometry in studying polyhedral graphs is an effective and promising way as one can apply methods in continuous space to discrete settings such as polyhedral graphs. Other possible uses will be discussed briefly.

Date: 14 May 2019, Tuesday

Time: 10:00 a.m.

Venue: Room 3494 (near lifts 25-26)

***Thesis Examination Committee*:**

Chairman	**:**	**Prof. Levent YOBAS, ECE/HKUST**
Thesis Supervisor	**:**	**Prof. Beifang CHEN, MATH/HKUST**
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(Open to all faculty and students)

The student's thesis is now being displayed on the reception counter in the General Administration Office (Room 3461).