University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

PAUL OLDRIDGE

BSc (University of Victoria, 2013)

"Characterizing the Polyhedral Graphs with Positive Combinatorial Curvature"

Department of Computer Science

Monday, April 10, 2017
2:00 P.M.
Engineering and Computer Science Building
Room 660

Supervisory Committee:
Dr. Wendy Myrvold, Department of Computer Science, University of Victoria (Supervisor)
Dr. Frank Ruskey, Department of Computer Science, UVic (Member)

External Examiner:
Dr. Matt DeVos, Department of Mathematics and Statistics, Simon Fraser University

Chair of Oral Examination:
Dr. Darlene Clover, Department of Education Psychology & Leadership Studies, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The combinatorial curvature of a vertex *v* is defined as

$$\Phi(v) = 1 - \frac{deg(v)}{2} + \sum_{f \in F(v)} \frac{1}{|f|}$$

where $F(v)$ is the set of faces that are incident to *v* in a graph embedding. A graph *G* is called PCC if every vertex of *G* has positive combinatorial curvature and the graph is not a prism or antiprism. In this thesis it is shown that the maximum order of a 3-regular PCC graph is 132 and the 3-regular PCC graphs which match that bound are enumerated. A new PCC graph with a 39-face and 208 vertices is constructed, which has the same number of vertices as the largest PCC graphs discovered by Nicholson and Sneddon. A conjecture that there are no PCC graphs with faces of size larger than 39 is made, along with a proof that if there are no faces of size larger than 122, then there is an upper bound of 244 on the order of PCC graphs.