University of Victoria | Graduate Studies

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

of

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BSc Hons. (Trent University, 2018)

"Étale equivalence relations and *C**-algebras for iterated function systems"

Department of Mathematics and Statistics

Monday, December 14, 2020
2:00 P.M.
Conducted Remotely

Supervisory Committee:
Dr. Ian Putnam, Department of Mathematics and Statistics, University of Victoria (Supervisor)
Dr. Marcelo Laca, Department of Mathematics and Statistics, UVic (Member)

External Examiner:
Prof. Aidan Sims, School of Mathematics and Applied Statistics, University of Wollongong

Chair of Oral Examination:
Dr. Margo Matwychuk, Department of Anthropology, UVic

Dr. Stephen Evans, Acting Dean, Faculty of Graduate Studies

Abstract

There is a long history of interesting connections between topological dynamical systems and C^*-algebras. Iterated function systems are an important topic in dynamics, but the diversity of these systems makes it challenging to develop an associated class of C^*-algebras. Kajiwara and Watatani were the first to construct a C^*-algebra from an iterated function system. They used an algebraic approach involving Cuntz-Pimsner algebras, in the case where the functions in the system are inverse branches of a continuous map; however, this excludes many famous examples, such as the standard construction of the Siérpinski Gasket. In this thesis, we provide a construction of an inductive limit of étale equivalence relations for a broad class of affine iterated function systems, including the Siérpinski Gasket and its relatives, and consider the associated C^*-algebras. This approach provides a more dynamical perspective, leading to interesting results that emphasize how properties of the dynamics appear in the C^*-algebras. In particular, we show that the C^*-algebras are isomorphic for conjugate systems, and find ideals related to the open set condition. In the case of the Siérpinski Gasket, we find a explicit isomorphisms to a subalgebras of the continuous functions from the attractor to a matrix algebra. Finally, consider the K-theory of the inductive limit of these algebras.