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BSc (Mathematics), University of New Brunswick, 2012

MSc (Mathematics), Dalhousie University, 2013

DEPARTMENT OF MATHEMATICS AND STATISTICS

TITLE OF THESIS: THE CLASS OF STRONG PLACEMENT GAMES: COMPLEXES, VALUES, AND TEMPERATURE

TIME/DATE: 9:30 am, Monday, June 18, 2018

PLACE: Room 3107, The Mona Campbell Building, 1459 LeMarchant Street

EXAMINING COMMITTEE:

Dr. Alex Fink, School of Mathematical Sciences, Queen Mary University of London (External Examiner)

Dr. Jason Brown, Department of Mathematics and Statistics, Dalhousie University (Reader)

Dr. Rebecca Milley, Department of Mathematics and Statistics, Dalhousie University (Reader)

Dr. Richard Nowakowski, Department of Mathematics and Statistics, Dalhousie University (Co-Supervisor)

Dr. Sara Faridi, Department of Mathematics and Statistics, Dalhousie University (Co-Supervisor)

DEPARTMENTAL REPRESENTATIVE: Dr. David Iron, Department of Mathematics and Statistics, Dalhousie University

CHAIR: Aaron Newman, PhD Defence Panel, Faculty of Graduate Studies

ABSTRACT

Strong Placement (SP-) games are a class of combinatorial games in which pieces are placed on a board such that the order in which previously placed pieces have been played does not matter.

It is known that to each such game one can assign two square-free monomial ideals (the legal and illegal ideal) and two simplicial complexes (the legal and illegal complex). In this work we will show that reverse constructions also exist, in particular when restricting to invariant SP-games.

We then use this one-to-one correspondence between games, ideals, and simplicial complexes to study several properties of SP-games. This includes the structure of the game tree of an SP-game, and the set of possible game values.

The temperatures of SP-games are also considered. We prove a first general upper bound on the boiling point of a game, and will show through several games that this bound is particularly applicable for SP-games.

Motivated by the connection to commutative algebra, we then explore what it could mean for an SP-game to be Cohen-Macaulay, as well as several related properties.