



University
of Victoria

Graduate Studies

Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy

of

SHAWN TRAIL

MMus (Purchase College Conservatory of Music, 2008)
BA (Bellarmine University, 2002)

**“Non-invasive Gesture Sensing, Physical Modeling, Machine Learning
and Acoustic Actuation for Pitched Percussion”**

Interdisciplinary Studies

Friday, April 27th, 2018
10:30 a.m.
Clearihue Building
Room B017

Supervisory Committee:

Dr. George Tzanetakis, Department of Computer Science, University of Victoria (Co-Supervisor)
Dr. Andrew Schloss, School of Music, UVic (Co-Supervisor)
Dr. Peter Driessen, Department of Electrical and Computer Engineering, UVic (Co-Supervisor)

External Examiner:

Dr. Daniel Overholt, Department of Media Technology, Aalborg University Copenhagen

Chair of Oral Examination:

Dr. Daniel Bub, Department of Psychology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

This thesis explores the design and development of digitally extended, electro-acoustic (EA) pitched percussion instruments, and their use in novel, multi-media performance contexts. The proposed techniques address the lack of expressivity in existing EA pitched percussion systems. The research is interdisciplinary in nature, combining Computer Science and Music to form a type of musical human-computer interaction (HCI) in which novel playing techniques are integrated in performances. Supporting areas include Electrical Engineering- design of custom hardware circuits/DSP; and Mechanical Engineering- design/fabrication of new instruments. The contributions can be grouped into three major themes: 1) non-invasive gesture recognition using sensors and machine learning, 2) acoustically-excited physical models, 3) timbre-recognition software used to trigger idiomatic acoustic actuation. In addition to pitched percussion, which is the main focus of the thesis, application of these ideas to other music contexts is also discussed.